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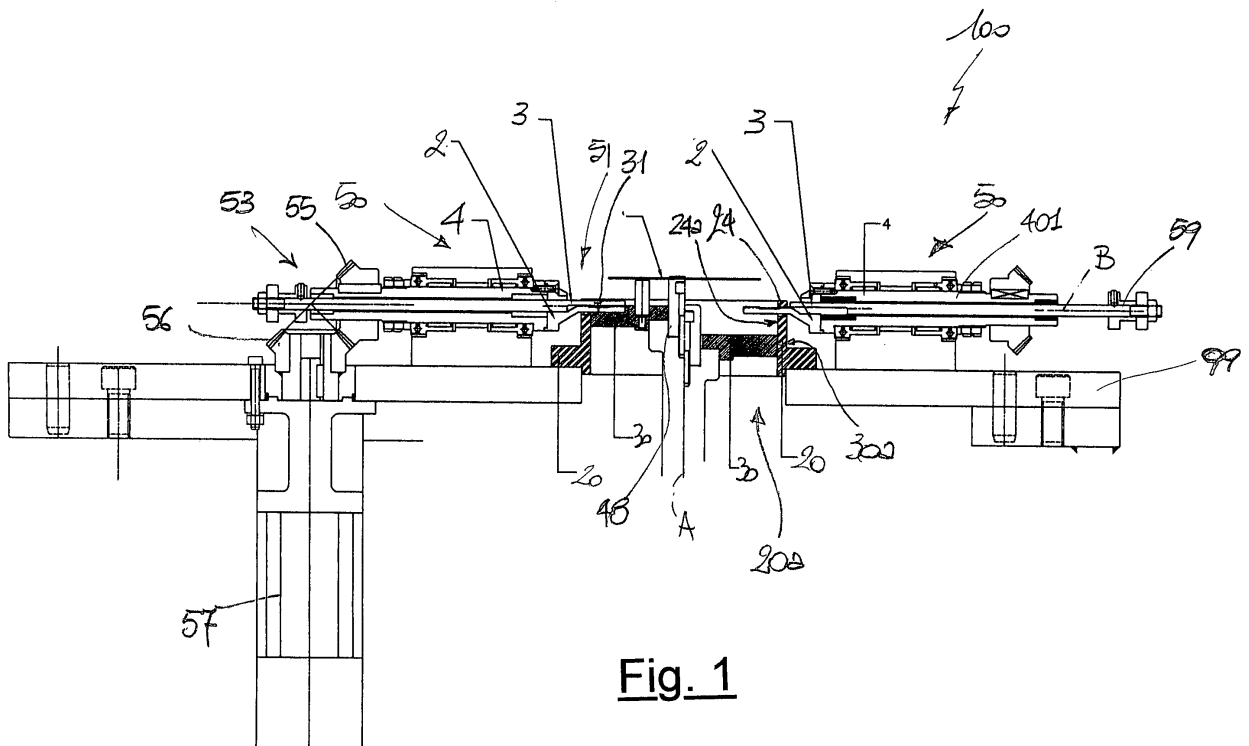
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**(54) Unit for the production of safety cages for corks of bottles for effervescent beverages**

(57) A unit (100) for the production of safety cages for corks of bottles for effervescent beverages provided with: an annular groove (21) designed to bend a metal wire (101) about an axis (A) of bending to form a substantially circular closed loop; and four forming assemblies (50) set about the axis (A) of bending and provided with respective gripping heads (51) for constraining the loop itself in respective gripping points (P); each gripping head (51) being able to turn about a respective axis (B)

of rotation transverse with respect to the axis (A) of bending to twist the metal wire (101), and being provided with a portion that is axially fixed with respect to the corresponding axis (B) of rotation and with a portion that can slide axially with respect to the axis (B) of rotation itself between a position of superposition, in which it forms a seat (52) that can be engaged by said wire (101) in a corresponding gripping point (P), and a position of release, in which it releases the gripping point (P) once the wire (101) is twisted.



**Fig. 1**

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## Description

**[0001]** The present invention relates to a unit for the production of safety cages for corks of bottles for effervescent beverages.

**[0002]** In the field of units for the production of safety cages in general, and from the Italian patent No. 01264109 in particular, there is known a unit for the production of safety cages for corks of bottles for effervescent beverages, which comprises:

- a bending device, designed to bend a metal wire to form a substantially circular closed loop;
- a station for forming the cage, in which the closed loop is designed to be set in a position substantially sharing a vertical axis;
- four forming assemblies set in the forming station and provided with respective gripping heads, which are designed to couple positively to the loop for constraining the loop itself in respective gripping points and are mobile along respective radial axes transverse with respect to the horizontal axis;
- four thrust devices set between the forming assemblies and designed to deform said loop by feeding, towards the horizontal axis itself, a respective portion comprised between two consecutive gripping points to define four so-called petals gripped in the gripping heads; and
- four spindles for turning the gripping heads about the respective radial axes to twist the respective petals with respect to one another.

**[0003]** In the unit described above, each gripping head is defined by a respective gripper provided with two jaws set in a vertical plane passing through the vertical axis and mobile in the same plane both along the corresponding radial axis away from and towards the closed loop and about respective axes transverse with respect to the vertical plane. These grippers must be moved away from and towards the vertical axis both in order to be gripped on the closed loop and in order to be able to release the twisted wire. Consequently, said grippers not only entail a vertical encumbrance of the entire unit, but since they are normally moved by means of cams, they also involve long operations of setting-up to arrive at a synchronization of all four corresponding spindles.

**[0004]** The purpose of the present invention is to provide a unit for the production of safety cages for corks of bottles for effervescent beverages that will be free from the drawbacks described above.

**[0005]** According to the present invention, a unit for the production of safety cages for corks of bottles for effervescent beverages is provided, comprising:

- an annular groove, designed to bend a metal wire about an axis of bending to form a substantially circular closed loop; and
- four forming assemblies, set about the axis of bend-

ing and provided with respective gripping heads for constraining the loop itself in respective gripping points, each gripping head being able to turn about a respective axis of rotation transverse with respect to the axis of bending to twist the metal wire;

the unit being characterized in that each gripping head comprises a portion that is axially fixed with respect to the corresponding axis of rotation and a portion that can slide axially with respect to the axis of rotation itself between a position of superposition, in which it forms a seat that can be engaged by said wire in a corresponding gripping point, and a position of release, in which it releases the gripping point once the wire is twisted.

**[0006]** The invention will now be described with reference to the annexed drawings, which illustrate a non-limiting example of embodiment thereof, and in which:

- Figure 1 illustrates, in side elevation and with parts in cross section and parts removed for reasons of clarity, a preferred embodiment of a unit for the production of safety cages for corks of bottles for effervescent beverages;
- Figure 2 is a top plan view of the unit of Figure 1;
- Figure 3 is a top plan view at an enlarged scale of a detail of the unit of Figure 1; and
- Figures 4 and 5 illustrate, at an enlarged scale and with parts in cross section and parts removed for reasons of clarity, a detail of Figure 2 in two respective operating positions.

**[0007]** With reference to the annexed figures, designated as a whole by 100 is a unit for the production of safety cages for corks of bottles for effervescent beverages.

**[0008]** The unit 100 comprises:

- a fixed supporting table 99;
- a bending device 20a, which is mounted on the table 99 and is designed to bend a metal wire 101 about an axis A of bending to form a substantially circular closed loop 102;
- four forming assemblies 50 set on the table 99 about the axis A of bending and provided with respective gripping heads 51, each of which is designed to constrain the loop 102 itself in a respective gripping point P and is able to turn about a respective axis B of rotation transverse with respect to the axis A of bending; and
- four thrust devices 40, which are set on the table 99 in a position intermediate between the forming assemblies 50 and are designed to deform the loop 102 by feeding, towards the axis A and by means of respective tensioning arms 41, a respective portion of loop comprised between two consecutive gripping points P to define four bends constrained in the gripping heads 51.

**[0009]** As illustrated in Figures 1 and 3, the bending device 20a comprises a fixed insertion template 20 mounted in a fixed position on the table 99 and having an internal groove 21 open towards the axis A, and a mobile insertion template 30, which is mobile along the axis A between a lowered position of disengagement, and a raised position of engagement, in which it closes the groove 21 to form a closed path for passage of the wire 101.

**[0010]** In particular, the template 20 is mounted in a position intermediate between the assemblies 50 and the axis A, as likewise between the devices 40 and the axis A itself, and comprises an annular body 24 set about the axis A, and radially delimited towards the axis A itself by a substantially cylindrical internal surface 24a. The groove 21 is made through the surface 24a, has substantially the same dimensions as a wire 101, and is provided with an inlet 21i and an outlet 21e set in a position corresponding to a head 51 to enable insertion of the wire 101 within the groove 21 itself by an insertion device 500 set on the table 99.

**[0011]** The template 20 moreover comprises four notches 22 set at 90° with respect to one another for positioning the gripping heads 51, and a further four notches 23 staggered by 45° with respect to the four notches 22 for passage of the tensioning arms 41 of the devices 40.

**[0012]** The template 30 is radially delimited towards the outside by a substantially cylindrical surface 30a, which reproduces faithfully the conformation of the surface 24a with which it couples in the raised position of engagement to close the groove 21 completely. The template 30 moreover comprises four top seats 31 set along the axes B to receive the gripping heads 51 in the raised position of engagement.

**[0013]** According to what is illustrated in Figures 3-5, each gripping head 51 is able to turn about the corresponding axis B of rotation to twist a corresponding bend and comprises a portion 2 that is axially fixed with respect to the corresponding axis B of rotation and a portion 3 that can slide axially with respect to the axis B of rotation itself between an initial position of superposition, illustrated in Figure 4, in which it forms a seat 52 that can be engaged by the metal wire 101 in a position corresponding to the gripping point P, and a final position of release, illustrated in Figure 5, in which it releases the gripping point P and opens the seat 52 once the corresponding bend is twisted, i.e., once a corresponding leg G of the star S has been made. In particular, each seat 52 has an axial length along the respective axis B, i.e., a radial length with respect to the axis A, such as to enable a radial displacement with respect to the axis A of the wire 101 within the seat 52 itself during the action of thrust of the arms 41.

**[0014]** Each assembly 50 comprises a respective spindle 4 angularly connected to a corresponding gripping head 51, which is rotated by the spindle 4 about the corresponding axis B, and the corresponding portion 2 of

which remains axially fixed without any need to perform gripping movements and/or to-and-fro movements through the template 20.

**[0015]** In particular, each portion 2 is set within a corresponding notch 22 of the template 20, and comprises an annular flange 201 connected to an axially hollow shaft 401 of the corresponding spindle 4, and a semi-cylindrical plate 202, which extends from the flange 201 towards the axis A and along the respective axis B, and is delimited by a flat surface 203.

**[0016]** Each portion 2 moreover comprises a central hole 204 made so that it passes through the flange 201, and an elongated central tooth 5, which is set in a position corresponding to the free end of the plate 202 to determine the length of the eyelet L on the legs G of the body of the star S, and extends from the flat surface 203.

**[0017]** Finally, each portion 2 comprises an undercut 207 made in the surface 203 in a position axially adjacent to the tooth 5, and an arched portion 6, which is raised with respect to the surface 203 by an amount substantially equal to a diameter of the wire 101, and is set on the same diameter as the internal groove 21 of the fixed template 20 to help said wire 101 during its insertion.

**[0018]** Each portion 3 comprises a semi-cylindrical terminal plate 208 having a shape complementary to the corresponding plate 202 and delimited by a flat surface 209 parallel to the surface 203, and a rod 210, which is inserted so that it can slide axially within the shaft 401 and is fixed with respect to the plate 208 itself.

**[0019]** The plate 208 is mobile along the axis B through the central hole 204 of the corresponding flange 201 so that, in the position of superposition, illustrated in Figure 4, the surface 209 is set on top of the surface 203 with the tooth 5 in contact with the surface 209 itself to define the seat 52 in a position corresponding to the undercut 207, and so that, in the position of release, illustrated in Figure 5, the plate 208 itself is substantially retracted within the hole 204 to leave the surface 203 completely free.

**[0020]** To define the relative position of the portions 2 and 3 uniquely in the position of superposition, both of the portions 2 and 3 have a respective inclined contrast surface 2a and 3a, of which the surface 2a is oriented towards the outside of the axis A starting from the surface 203 to insert into the hole 204, whilst the surface 3a is set in a position corresponding to a step 211 formed by the plate 208 and by the rod 210, and is designed to set itself axially up against the corresponding surface 2a.

**[0021]** Each device 50 moreover comprises an actuator device 53 for the spindle 4 designed to set in rotation the spindle 4 itself and the corresponding head 51 about the corresponding axis B, and an actuator device 54 for the portion 3 designed to displace the portion 3 itself along the axis B.

**[0022]** Each device 53 comprises a pinion 55, angularly fixed with respect to the corresponding spindle 4, and an output pinion 56 of a motor 57, which is synchronized with the motors 57 of the other devices 53 for si-

multaneous rotation of the heads 51. The pinion 55 is fitted on the spindle 4 on the side opposite to where the head 51 comes out of the spindle 4 itself and meshes with the pinion 56, the axis of rotation of which is transverse with respect to the table 99.

**[0023]** Each device 54 comprises a crank 58 coupled to a terminal end 59 of the corresponding rod 210 for displacing the rod 210 itself along the axis B and within the spindle 4, at the same time leaving the rod 210 free to turn together with the spindle 4 itself about the axis B. Also the cranks 58 are synchronized with one another for displacing in unison the corresponding rods 210 in order to bring the portions 2 and 3 into the corresponding position of superposition at the same instant.

**[0024]** Each tensioning arm 41 is mobile axially along a respective axis C of sliding coplanar to the axes B and angularly equidistant from the two adjacent axes B, and the corresponding thrust device 40 comprises a respective guide 42, which is constrained to the table 99 and supports the corresponding arm 41 slidingly along the axis C away from and towards a central cylinder 48 sharing the axis A. Each arm 41 is mobile starting from the outside of the groove 21 for intercepting a wire 101 set in the groove 21 itself and pushing the wire 101 up against the cylinder 48 during the simultaneous rotation of the heads 51.

**[0025]** Each device 40 moreover comprises a rack 43 made laterally with respect to the corresponding arm 41, a pinion 44 supported by the guide 42 so that it is able to turn in a plane parallel to the table 99 and engaged with the corresponding rack 43, and a toothed arched portion 45, which is coupled to the corresponding pinion 44 and forms part of a gear 46 that it is able to turn about the axis A under the action of a crank 47 supported by the table 99. In other words, each device 40 is actuated by the common rotation of the gear 46 as a result of the oscillation of the single crank 47, and the range of action of the four arms 41 away from and towards the cylinder 48 and through the groove 21 is defined uniquely in the design stage and can be reproduced faithfully and easily once the unit 100 is installed, reducing even further the times of setting, as well as the possible errors of operation.

**[0026]** Operation of the unit 100 will now be described starting from an initial configuration of insertion, in which the template 30 is set in its own raised position of engagement to close the groove 21, and the portions 3 are set in their initial positions of superposition, in which the seats 52 are set along the groove 21.

**[0027]** A wire 101 is fed by the device 500 to the inlet 21i and is introduced for the entire length of the groove 21 until it reaches the outlet 21e. Advance of the wire 101 along the groove 21 and through the seats 52 proves particularly simple given that the groove 21 is closed throughout its own length preventing any possible derailing of the wire 101 itself.

**[0028]** Furthermore, the peculiar conformation of the gripping heads 51 enables having said heads 51 not only

ready in their position of start of twisting, but also in a precise and error-proof configuration.

**[0029]** Once the wire 101 has filled the groove 21 entirely, a blade (known and not illustrated) cuts the wire 101 itself in a position corresponding to the inlet 22i, and the mobile template 30 returns into its own lowered position to leave the wire 101 itself free on the internal diameter of the template 20, with the advantage that, however, the wire 101 is already positioned on the four heads 51 and is ready to be worked to form the star S.

**[0030]** Return of the mobile template 30 corresponds with advance towards the cylinder 48 of the four tensioning arms 41, which intercept the wire 101 inside the groove 21 and between two gripping points P and push the wire 101 itself towards the cylinder 48, determining the formation of respective bends constrained in a position corresponding to the points P themselves within the seats 52.

**[0031]** Simultaneously with advance of the wire 101 by means of the arms 41 towards the cylinder 48, the heads 51 are made to turn in unison about the corresponding axes B, determining twisting of each bend on itself and formation of the star S, the four eyelets L of which will have the same shape as the teeth 5.

**[0032]** Once rotation of the gripping heads 51 has taken place, each mobile portion 3 is brought into its own final position of release for exit of the star S formed, and once the star S has been released for the subsequent production of a safety cage for corks of bottles for effervescent beverages, the portion 3 will close again to receive other wire 101, as likewise the template 30 will return into its own raised position of engagement with the template 20.

**[0033]** From what has been described above, it is clear that the unit 100 enables reduction of the movements for forming the star S, enables a considerable simplification of assembly and installation, and also enables production of items, above all the gripping heads 51, in a very simple way, which has considerable repercussions on the simplicity of regulation and synchronization.

**[0034]** It is understood that the invention is not limited to the embodiment described and illustrated herein, which is rather to be considered as just one example of embodiment of the unit for the production of safety cages for corks of bottles for effervescent beverages, which may, instead, undergo further modifications as regards the shapes and arrangements of the parts, the constructional details, and the details of assembly.

## Claims

1. A unit (100) for the production of safety cages for corks of bottles for effervescent beverages, comprising:

- an annular groove (21) designed to bend a metal wire (101) about an axis of bending (A) to

form a substantially circular closed loop (102);  
and

- four forming assemblies (50), set about the axis of bending (A) and provided with respective gripping heads (51) for constraining the loop itself in respective gripping points (P), each gripping head (51) being able to turn about a respective axis of rotation (B) transverse with respect to the axis of bending (A) to twist the metal wire (101);

the unit being **characterized in that** each gripping head (51) comprises a portion (2) axially fixed with respect to the corresponding axis of rotation (B) and a portion (3) that is axially mobile with respect to the axis of rotation (B) itself between a position of superposition, in which it forms a seat (52) that can be engaged by said wire (101) in a corresponding gripping point (P), and a position of release, in which it releases the gripping point (P) once the wire (101) is twisted.

2. The unit according to Claim 1, **characterized in that** it comprises rotation axially fixed associated to the gripping heads (51) for turning each gripping head (51) starting from, and until it reaches, a position of insertion, in which said axially fixed portion (2) and said axially mobile portion (3) are set on opposite sides of said closed loop (102).
3. The unit according to Claim 2, **characterized in that** it comprises a bending device (20a) comprising a fixed template (20) provided with said annular groove (21) for bending the metal wire (101) and a mobile template (30) designed to close, in a respective position of engagement, said annular groove (21); the fixed template (20) being traversed in a rotatable way by said axially fixed portions (2) and the mobile template (30) having, for each axially fixed portion (2), a respective seat (31).
4. The unit according to Claim 3, **characterized in that** said fixed template (20) is defined by an annular body delimited internally by an annular surface, through which said annular groove (21) is made; the mobile template engaging positively with the annular surface for radially closing the annular groove (21) towards the inside.
5. The unit according to Claim 2, Claim 3, or Claim 4, **characterized in that** the axially fixed portion (2) and the axially mobile portion (3) have respective flattened surfaces that slide with respect to one another and designed to set themselves facing one another and in substantial contact with one another to block said wire (101).
6. The unit according to Claim 5, **characterized in that** the fixed portion comprises a tooth (5) extending

from the corresponding flattened surface and designed to set itself in contact with the flattened surface of the axially mobile portion (3) to form a seat (52) that can be engaged by the metal wire (101) in said position of insertion.

7. The unit according to Claim 6, **characterized in that** the fixed portion comprises a guiding arched portion (6) set on the opposite side of the corresponding tooth (5) with respect to the corresponding seat (52); the guiding arched portion (6) being set along the internal groove (21).
8. The unit according to any one of the preceding claims, **characterized in that** it comprises actuator means inserted so that they can slide axially through said means of rotation for displacing the axially mobile portion (3) of each gripping head (51) axially.
9. The unit according to any one of the preceding claims, **characterized in that** it comprises a thrust device (40) for each forming assembly (50) set between two adjacent forming assemblies (50) and designed to deform said loop by feeding, towards the axis of bending (A), a respective portion of loop comprised between two consecutive gripping points (P) to define four bends constrained in the gripping heads (51).
10. The unit according to Claim 9, **characterized in that** each thrust device comprises a respective tensioning arm (41) that is mobile along a respective axis (C) of translation starting from a position external to said closed loop (102).

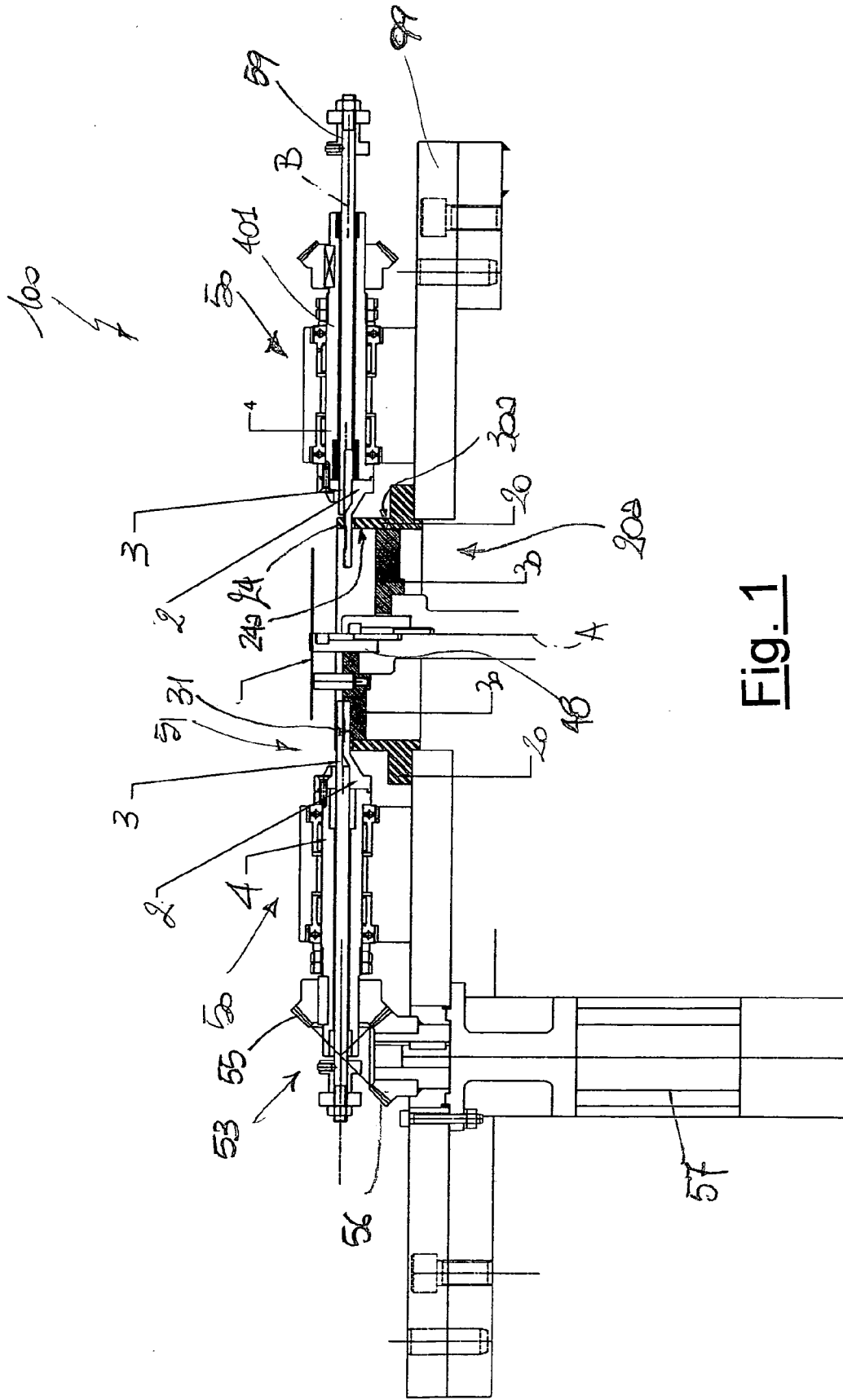


Fig. 1

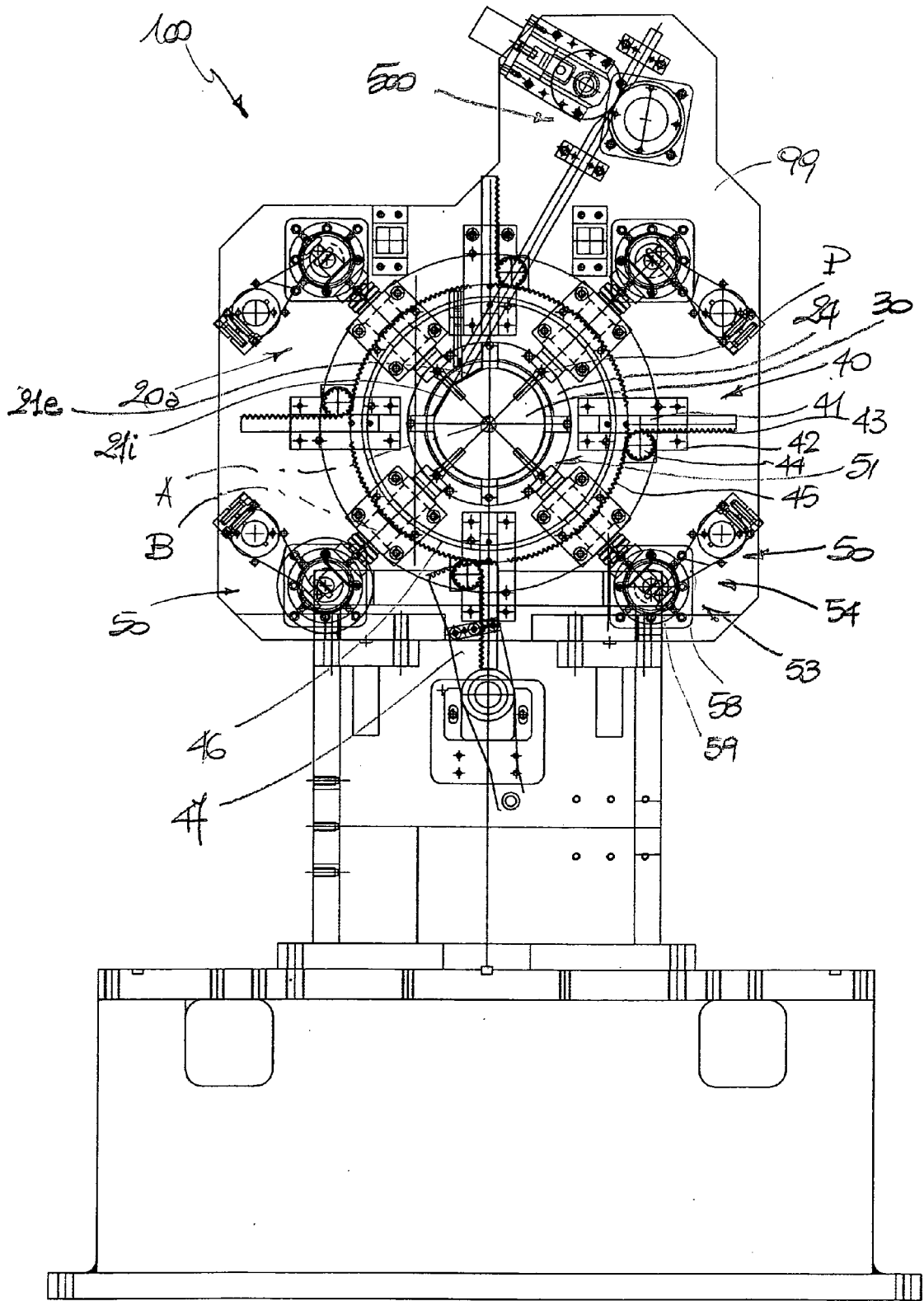


Fig. 2



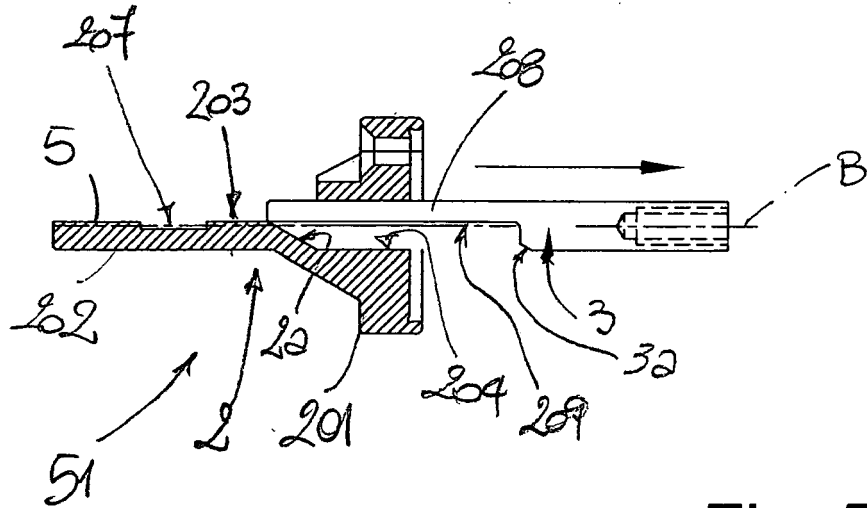


Fig. 5

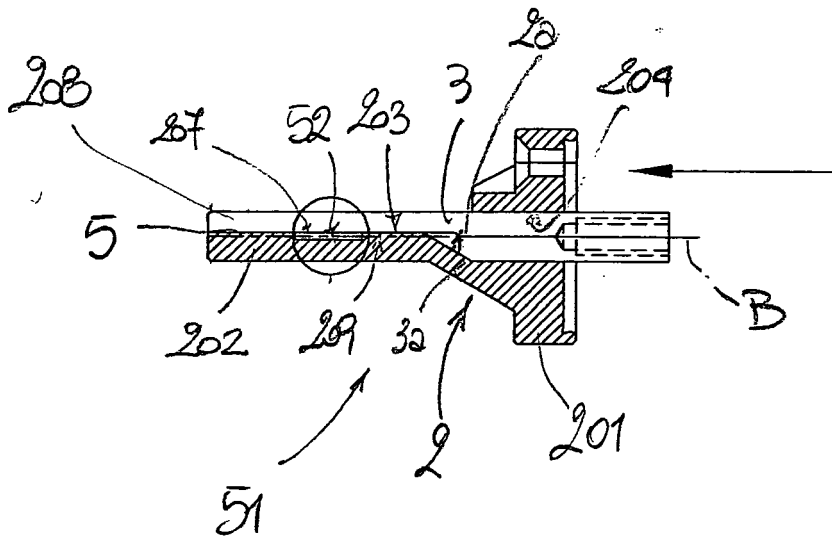


Fig. 4



EUROPEAN SEARCH REPORT

Application Number  
EP 08 01 3137

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			B21F
Place of search		Date of completion of the search	Examiner
Munich		14 October 2008	Ritter, Florian
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ..... & : member of the same patent family, corresponding document	

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT  
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EP 08 01 3137

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on  
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14-10-2008

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