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(54) **Unit for forming the star shape in the working of wire hoods for bottle corks made of metal wire**

Einheit zur Formung der Sternform eines halbfertigen Sicherheitsdrahtstücks für Flaschen mit Verschlussstopfen

Unité de formage du croisillon dans la fabrication de muselets de fil métallique pour bouchons de bouteilles

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FR-A- 942 540

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Description

[0001] The present invention relates to a unit for forming the star shape in the manufacture of wire hoods made of metal wire to restrain corks of bottles that contain sparkling wines or champagnes.

[0002] As it is known, a wire hood for corks is essentially composed of three different parts: a cap, a hood and a belt, as they are called in technical terms.

[0003] The manufacture of a wire hood for corks is essentially divided into three phases that correspond to the three parts that make up the wire hood. The first phase foresees the production of the hood, the second one the production of the belt and the third one the creation of the cap and its application to the hood together with the belt.

[0004] The hood is composed of a metal wire frame with an essentially circular upper section from which the four equidistant twisted wire stems run down.

[0005] In particular, the ends of the stems feature eyelets inside which the belt runs, which is also composed of a metal wire, and forms, once the two ends thereof are sealed by twisting them together, the mobile belt that serves to restrain the cork. The cap is composed of drawn foil with a curbed form and with a side edge in which there are four grooves which create corresponding housings designed to accommodate the stems of the hood.

[0006] The manufacture of the components of the hood requires a rather complex machine which must perform a series of operations and steps in order to obtain a complete wire hood. In fact, it is initially necessary to form a star shape, composed of a single metal wire, and then the stems must be configured with the twisted shape, taking care to form the eyelets for the belt. Next, the cap is applied, which engages, by interference, in correspondence with the four stems. Finally, as the last step, the belt is machined and made to run through the eyelets and the ends thereof are then sealed by twisting them one around the other.

[0007] In particular, the forming of the star foresees the following operations:

- creation of a metal wire ring using a bending unit which takes the wire from a reel and guides it into a groove on the disc of the unit until a ring is formed;
- wire cutting;
- gripping of wire in four diametrically opposed points using gripping units that grip and retain the wire;
- pushing of the wire towards the centre of the ring by means of four diametrically opposed pushers inserted between the gripping units:
- rotation of the gripping elements that twist the wire each one creating a stem of the hood.

[0008] The star is obtained at the end of the above mentioned operations and the said star is transformed into the real truncated cone shaped hood after the bending of the rays of the star which correspond to the stems of the hood.

[0009] Currently, as mentioned previously, the wire that makes up the ring is gripped and retained by four gripping elements that comprise pliers gripping heads.

[0010] The said pliers gripping heads are illustrated in the Italian patent no. 1264109.

[0011] As described in the above mentioned patent "each gripping head comprises pliers devices that twist positively around the ring". In particular, "the pliers devices comprise a pair of rocking jaws which are hinged onto the arms of a fork with orthogonal pins to the arms and to the respective axis to balance around the pin axes between an open and closed position to grip and retain the ring under the thrust of an actuator unit".

[0012] The pliers gripping heads, briefly outlined earlier, while performing their task, nevertheless, present various drawbacks from the construction and aesthetic point of view of the wire hood.

[0013] In fact, a first drawback encountered derives from the fact that the pliers scratch the hood stems, thus generating aesthetic problems to the overall hood.

[0014] Another drawback derives from the fact that by scratching the metal of the hood, the retention thereof is compromised as the galvanization is damaged and missing in certain parts of the metal wire which, exposed to air and humidity, may rust, thus triggering problems related to the mechanical retention and aesthetics of the metal hood.

[0015] In addition, a hood which is not perfect or is damaged compromises the aesthetics of the corked product with consequent damage to the image and products which have to be discarded.

[0016] To overcome the drawbacks described above, the pliers are treated to prevent them from scratching the metal wire with consequent machine management and maintenance costs.

[0017] A further drawback encountered is caused by the fact that if the two parts of the pliers do not close in a symmetric and uniform manner the wire may slip out compromising the execution of the star and consequently of the entire hood. The possibility that the two parts of the pliers may not close correctly derives from the fact that they are hinged separately and independently. Furthermore, in the pliers there is a rubber ring to help it open and close. It has been found that the ring often wears and breaks therefore it has to be often replaced otherwise the pliers cannot open correctly.

[0018] Finally, in the construction of the hood stems, the slot formed by the pliers devices mentioned above is not always regular and straight therefore it causes an aesthetic defect of the hood. In fact when the slot is closed and twisted to form the eyelet inside which the belt runs, problems arise which affect the next processing phases with the consequent scrapping of hoods or presence of processing faults.

[0019] The applicants are aware of the French patent FR 942 540 (closest state of the art), which illustrates an entire machine for the production of wire hoods for bot-

tles. In said French patent a hood is formed with a quadrangular base and the wire is pinched for the handling thereof, as also described in the aforesaid Italian patent, with all the drawbacks already described.

[0020] In the machine of the French patent, there is a mechanism consisting of two jigs, positioned one on top of the other, which allows the wire ring to be formed that is needed to then produce the star.

[0021] Once the wire ring is formed, four clamps grip the wire and, by means of corresponding twisting shafts, turn the wire to form the stems of the hood.

[0022] The wire twisting operation ends when the wire comes into contact with a spindle that creates the square shape of the upper part of the hood.

[0023] The machine illustrated in the French patent has the already mentioned drawback that the wire that forms the hood is marked because it is gripped by clamps when the stems are produced, but above all, when it is pressed against the spindle that gives it its square shape.

[0024] It should be noted that a hood with a square top has the drawback that it does not grip the cork well and, therefore, is unable to house the cap.

[0025] The aim of the present invention is essentially to resolve the problems of the commonly known technique, overcoming the drawbacks described above by means of a unit for forming the star shape in the working of wire hoods made of metal wire that simply and firmly holds the metal wire during the formation of the star, optimising and speeding up the operational stages.

[0026] A second aim of the present invention is to realise a unit for forming the star shape in the working of wire hoods made of metal wire which is structurally very simple yet very functional.

[0027] A third aim of the present invention is to realise a unit for forming the star shape in the working of wire hoods made of metal wire which eliminates the presence of scratches and scores on the hood.

[0028] A further aim of the present invention is to have a unit for forming the star shape in the working of wire hoods made of metal wire which makes it possible to obtain aesthetically perfect and pleasant hoods.

[0029] A still further aim of the present invention is to have a unit for forming the star shape in the working of wire hoods made of metal wire with limited costs for the development, management and maintenance thereof.

[0030] A further but not final aim of the present invention is to have a unit for forming the star shape in the working of wire hoods made of metal wire which is easy to develop and highly functional.

[0031] These aims and others besides, which will better emerge over the course of the present description, are essentially achieved by means of a unit for forming the star shape in the working of wire hoods made of metal wire, as outlined in the claims below.

[0032] Further characteristics and advantages will better emerge in the detailed description of a unit for forming the star shape in the working of wire hoods made of metal wire according to the present invention, provided in the form of a nonlimiting example, with reference to the accompanying drawings, in which:

- figure 1 shows, schematically and from a three-dimensional and front view the unit for forming the star shape in the working of wire hoods made of metal wire, subject matter of the present invention;
- figure 2 shows, schematically and from a three-dimensional and rear view the unit for forming the star in figure 1;
- figure 3 shows, schematically and from a front perspective view, a first section plane of the unit in figure 1;
- figure 4 shows, schematically and from a front perspective view, a second section plane of the unit in figure 1;
- figure 5 shows, schematically, a detail of the unit in figure 1 in operative condition;
- figure 6 shows, schematically and from a front view, a second detail of the unit in figure 1,
- figure 7 shows, schematically and from a perspective view, a gripping unit present in the unit in figure 1 in operative condition;
- figure 8 shows, schematically and from a perspective view, the gripping unit in figure 7 in a different operative condition;
- figure 9 shows, schematically and from a perspective view, a detail of the gripping unit in figure 7;
- figure 10 shows, schematically and from a perspective view, a detail of the gripping unit in figure 8;
- figure 11 shows from a perspective view a wire hood for bottle corks.

[0033] A wire hood for bottle corks 50 essentially comprises a cap 51, a hood 52 and a belt 53 as shown in figure 11.

[0034] In particular, the hood 52 is of a truncated cone shape and is composed of a metal wire frame with an essentially circular upper section 520 from which the four equidistant twisted wire stems 521 run down and which are accommodated in corresponding grooves present on the cap 51. Furthermore, the free end of each stem 521 features an eyelet 522 inside which the belt 53 runs.

[0035] Now, with reference to the figures mentioned, and in particular figure 1, 1 denotes, as a whole, a unit for forming the star shape in the working of wire hoods made of metal wire, according to the present invention.

[0036] The star is nothing more that the hood in its two-dimensional configuration before the stems are bent down to give it the truncated cone shape.

[0037] Unit 1 features a support structure 2 to which a bending device 3 is connected, engaged with the support structure and composed of a die constituted of two semi-jigs: a fixed negative jig 30 and a mobile positive jig 31 for realising the metal wire ring 10 from which the star shape will be obtained.

[0038] In more detail when the mobile semi-jig 31 is coupled with the fixed one, it creates a ring shaping com-

partment 300 as the realisation of the ring is the first phase to obtain a hood.

[0039] Furthermore the fixed semi-jig 30 is secured to the support structure 2 and features a plurality of niches 30a positioned at reciprocal intervals and four passage areas 30b positioned reciprocally orthogonally.

[0040] The mobile semi-jig 31 is equipped with four openings 31b one of which, the one positioned at the top, is open.

[0041] When the die is closed and the two semi-jigs are one against the other, a metal wire 10 that is fed from the reel goes into the compartment 300 until it reaches the open passage way 31b through which it exits forming the shape of a metal wire ring. The wire 10 is then cut by commonly known cutting means.

[0042] The compartment 300 created by the position and conformation of the two semi-jigs 30 and 31 is not circular but has a precise configuration with interruption zones and slight displacements towards the centre so that the route of the wire, as shown in figure 5, is shaped for an easier and smoother passage.

[0043] According to the present invention, once wire 10 has occupied the entire compartment 300 forming the ring, the mobile semi-jig 31 moves with a shift motion driven by air pistons to release the compartment 300 as shown in figure 5. Unit 1 comprises four pushers 4, also commonly known, which are diametrically opposed and each one spaced with a 90° angle and whose task it is to modify the ring by pushing four portions thereof towards the centre thereof to create the upper circular part 51 of the future hood. In particular, in the present embodiment, the pushers 4 remain in resting position when the die is closed, so as to give a continuous passage through compartment 300 up to the exit so that the wire is always guided. In fact, the said pushers each feature a groove 40 inside which the wire runs during the shaping of the ring.

[0044] As previously mentioned, in one of the following phases, when the mobile semi-jig 31 shifts, the pushers 4 move radially towards the centre of the semi-jigs passing in the niches 30a to create the upper circular part of the hood. As shown in figure 1, the pushers 4 are driven by slotted cams 13, which in turn are driven by the machine's transmission means. More in detail, the pushers 4 have a double task: the first is to retain the wire because the mobile semi-jig 31 could jerk the wire while shifting and move it into a wrong position and the second one is to preform the star.

[0045] While the pushers 4 carry out the operation described above, four gripping units 7 located in position with the interruption zones (the openings 30b) of the mobile semi-jig, engage the metal wire 10 in four reciprocally diametrically opposed points and each one spaced with a 90° angle as shown in figure 3. In particular, each gripping unit 7 is placed between two pushers 4.

[0046] In particular, the four gripping units 7, not only engage the wire, but also have the task of rotating around their own axes to wind sections of wire which are the sections positioned between the two pushers in order to build the rays of the star shape which, after bending, will become the stems of the hood.

[0047] According to the present embodiment, each gripping unit 7 is constituted of two parts: a first fixed part 70 shaped at the tip by means of a lug 71a, slightly rounded off to facilitate unloading the star shape, which creates, with one portion thereof 71b, a guided passageway for the wire 10 and a second mobile part 75 constituted of a cylindrical pin envisaged to stop the wire 10 and lock it in place as shown in figures 5 and 6.

[0048] More in detail, the said first part 70 being envisaged to move solely in a rotary direction while the second mobile part 75 is envisaged to move in an axial direction moving out of the portion 71 b when driven by an air piston 76, and in a rotary direction following rotation of the first part.

[0049] According to the present invention, the gripping unit 7 located at the top, where the two ends of the metal wire 10 cross, is able to create a closed wire holding chamber as the mobile part 75, by means of the pin, prevents the wire from moving over the lug 71 a up to the tip, thereby creating a second holding chamber for securing the slot which is formed. The gripping unit 7 located at the bottom has the same function of securing the wire but the pin is prevented from rotating by a peg 14, shown in figure 7, which moves into its seat in the portion 71b to prevent the wire from moving.

[0050] In particular, the gripping unit 7 starts rotating when operated by a pinion 8 driven by a toothed wheel 9 driven by moving means constituted of a brushless servomotor 11.

[0051] The servomotor 11 is envisaged to carry out a specific number of revolutions and fractions of revolutions in both directions in order to go over the wire elasticity limit so that the wire treated in this way maintains the shape established with a specific number of twists.

[0052] After the predominantly structural description above, the operation of the invention in question will now be outlined.

[0053] To form a star in the unit according to the present invention, a metal wire is fed from a reel and runs in the compartment created in the die when the two semi-jigs are in contact so that the wire can run in the compartment until it reaches the exit where it is cut with commonly know cutting means. While the ring is being shaped, the pushers have the task of guiding the wire along its route and to retain it when the mobile semi-jig moves to release the ring.

[0054] At this point, the gripping units engage the wire of the ring at four points which are reciprocally diametrically opposed spaced with a 90° angle, engaging it with the pin 75 which holds the wire between itself and the lug 71a.

[0055] In this condition the pushers start to move towards the centre of the unit while the gripping units hold the ring which will be transformed into as star with four rays each of which is composed of two parallel sections

of wire.

[0056] In particular, the wire of the ring is retained in the space between the lug and the pin in the gripping unit to prevent the wire from moving towards the centre as it is forced by the lug 71a to shape itself around the lug.

[0057] While the four pushers move forwards towards the centre of the ring shaping it to create the centre of the star which corresponds to the upper circular part 51 of the future hood and the rays with parallel wires, each gripping unit engages the sections of wire with its lug in order to form four loops each of which corresponds to a ray of the star which is formed by two parallel wire sections and by a curved union section shaped by the lug.

[0058] At this point, the gripping units start to rotate around their axes driven by the servomotor that moves the toothed wheel, which in turn rotates the pinion twisting the two parallel wire sections around each other to create, each one, a ray of the star which in the following working phase will be bent to become a stem of the hood.

[0059] Once this operation has been completed, the star is ready and moves onto the next processing phase and the unit is in the condition to create a new star.

[0060] Thus the present invention achieves the aims set.

[0061] The unit for forming the star shape in the working of wire hoods made of metal wire according to the present invention makes it possible to simply and firmly retain the metal wire during the forming of the star avoiding the risk of causing scratches and scores on the hood as there is not a point in which the wire is held tightly in a clamp as is the case with the pliers of the devices of the commonly known technique.

[0062] Advantageously, the pushers make sure that the wire is not involved in the movement of the mobile semi-jig when it moves away.

[0063] Furthermore, the unit in question can retain the metal wire in a simple way during the shaping of the star. In detail, the wire is not touched or engaged by a pliers element as in the commonly known technique, but the presence of the lugs and pin simply stops the wire from oscillating therefore when it is pulled it takes the shape of the lug.

[0064] The presence of the lug makes it possible to retain the wire straight, without any deformation or mark therefore a regular loop is created which in the following processing phases will become a perfect and harmonious eyelet.

[0065] In addition to what has been illustrated so far, the unit for forming the star is much faster in the creation of the star because, for example, the closing time of the gripping units with the pliers of the commonly known technique has been eliminated and the work time has been optimised because a number of actions are carried out at the same time.

[0066] Advantageously, the metal hoods obtained with the present forming unit are aesthetically perfect and pleasant because they do not show any marks, scores or scratches therefore there is not the risk of them becoming rusty as the galvanisation of the metal wire thereof is not damaged.

[0067] Furthermore, the unit in question in view of its particularly simple structure is decisively interesting as it has limited development and management costs and requires a very limited number of maintenance operations.

[0068] A further but not final advantage of the present invention is that it proves remarkable easy to use and to manufacture and works well.

[0069] Naturally, further modifications or variants may be applied to the present invention while remaining within the scope of the invention as defined by the claims.

Claims

1. A unit for forming the star shape in the working of wire hood for bottle corks made of metal wire, said unit comprising a support structure (2);
a bending device (3), engaged with the support structurevand envisaged to realise a metal wire ring (10);
and four pushers (4) which are diametrically opposed and each one spaced with a 90° angle and adapted to modify the ring by pushing four portions thereof towards the centre thereof to create the central part of the star shape which corresponds to the upper circular part of the hood, wherein :

   - said bending device (3) is composed of a die constituted of two semi-jigs: a fixed negative jig (30) and a mobile positive jig (31) which, when they are coupled together, create a shaping compartment (300) for realising the metal wire ring (10) from which the star shape will be obtained, the said mobile jig (31) moving with a shift motion driven by air piston to release the compartment (300);
   - said pushers (4) each feature a groove (40) inside which the wire runs during the shaping of the ring so as to give continuity to the compartment (300), their movement being driven by slotted cams (13);
   - said bending device (3) comprises four gripping units (7) which engage the wire (10) at four points which are reciprocally diametrically opposed spaced with an 90° angle, since each gripping unit (7) is placed between two pushers, each gripping unit (7) being adapted to rotate around its own axis to wind the sections of wire which are sections that are positioned between the two pushers in order to build the rays of the star shape which, after bending, will become the stems of the hood.

2. A unit for forming the star shape according to claim 1, **characterised by** the fact that: - said fixed semi-jig (30) is secured to the support structure (2) and features a plurality of niches (30a) positioned at re-

ciprocal intervals and four passage areas (30b), positioned reciprocally orthogonally; and - said mobile semi-jig (31) is equipped with four openings (31 b) one of which, the one positioned at the top, is open.

3. A unit for forming the star shape according to claim 1, **characterised by** the fact that each gripping unit (7) is located in position with an interruption zone of the said mobile semi-jig (31) and is constituted of two parts: - a first fixed part (70) shaped at the tip by means of a lug (71a), slightly rounded off to facilitate unloading the star shape, which creates, with one portion thereof (71b), a guided passageway for the wire (10); and - a second mobile part (75) constituted of a cylindrical pin envisaged to stop the wire (10) and lock it in place, the said first part (70) being envisaged to move solely in a rotary direction while the second mobile part (75) is envisaged to move in an axial direction, moving out of the portion (71b) when driven by an air piston (76), and in a rotary direction following rotation of the first part.

4. A unit for forming the star shape according to claim 1, **characterised by** the fact that each gripping unit (7) located at the top, where the two ends of the metal wire (10) cross, is able to create a closed wire holding chamber as the mobile part (75), by means of the pin, prevents the wire from moving over the lug (71 a) up to the tip, thereby creating a second holding chamber for securing the slot which forms and the gripping unit (7) located at the bottom has the same function of securing the wire but the pin is prevented from rotating by a peg (14) which moves into its seat in the portion (71b) to prevent the wire from moving.

5. A unit for forming the star shape according to claim 1, **characterised by** the fact that the gripping units (7) start rotating when operated by a pinion (8) driven by a toothed wheel (9) driven by moving means constituted of a brushless servomotor (11).

Patentansprüche

1. Vorrichtung zum Formen des Sterns bei der Bearbeitung von Korkenhaltekäfigen aus Metalldraht, wobei diese Vorrichtung eine Stützkonstruktion (2); eine an der Stützkonstruktion befestigte sowie zur Herstellung eines Metalldrahtringes (10) vorgesehene Biegevorrichtung (3); sowie vier Schieber (4) umfasst, die sich im Durchmesser gegenüber befinden, zueinander in einem Winkel von 90° angeordnet sind sowie dazu dienen, den Ring durch Schieben von vier Teilen des Ringes zu seinem Mittelpunkt zu verändern, um den mittleren Teil des Sterns zu schaffen, der dem oberen runden Teil des Käfigs entspricht und **dadurch gekennzeichnet ist, dass**:

- Die genannte Biegevorrichtung (3) aus einer Form bestehend aus zwei Halbmasken gebildet wird: einer ortsfesten mit negativer Aufnahme (30) sowie einer beweglichen mit positiver Aufnahme (31), die wenn sie miteinander verbunden sind, einen Raum (300) zur Formgebung für die Herstellung des Metalldrahtringes (10) bilden, aus dem der Stern gebildet wird. Dabei bewegt sich die genannte bewegliche Halbmaske (31) in Querrichtung und wird von Luftkolben (12) verfahren, um den Raum (300) freizulegen;
- Die genannten Schieber (4) weisen jeweils eine Nut (40) auf, in der der Draht während des Herstellens des Ringes verläuft, so dass dem Raum (300) Kontinuität verliehen wird, wobei dessen Bewegung durch Langlochnocken (13) gesteuert wird;
- Die genannte Biegevorrichtung (3) umfasst vier Greifer (7), die den Draht (10) an vier auf dem Durchmesser gegenüberliegenden sowie zueinander im Winkel von 90° angeordneten Stellen erfassen, wobei sich jeder Greifer (7) zwischen zwei Schiebern befindet; jeder Greifer (7) kann sich um die eigene Achse drehen und Drahtstücken aufwickeln, die sich jeweils zwischen den beiden Schiebern befinden, um die Strahlen des Sterns zu bilden, die nach dem Biegen die Füße des Käfigs werden.

2. Vorrichtung zum Formen des Sterns entsprechend Patentanspruch 1, **dadurch gekennzeichnet, dass**:

- die genannte ortsfeste Halbmaske (30) an der Stützkonstruktion (2) befestigt ist und mehrere Nischen (30a) mit gleichem Abstand zueinander sowie vier Durchgangsbereiche (30b) aufweist, die zueinander im rechten Winkel angeordnet sind; sowie
- die genannte bewegliche Halbmaske (31) über vier Öffnungen (31b) verfügt, von denen eine, d.h. die obere, geöffnet ist.

3. Vorrichtung zum Formen des Sterns entsprechend Patentanspruch 1, **dadurch gekennzeichnet, dass** sich jeder Greifer (7) an einem Unterbrechungsbereich der beweglichen Halbmaske befindet und aus zwei Teilen gebildet wird: - ein erster ortsfester Teil (70), der an der Spitze durch einen leicht abgerundeten Vorsprung (71a) gebildet wird, um die Ausgabe des Sterns zu erleichtern, der mit einem Element (71b) einen gerührten Durchgang für den Draht (10) bildet; sowie

- einen zweiten beweglichen Teil (75), bestehend aus einem zylinderförmigen Zapfen zum Puffern und Arretieren des Drahtes (10), wobei sich der genannte erste Teil (70) nur drehen

kann, während sich der zweite bewegliche Teil (75) auch in axialer Richtung bewegen, aus dem Element (71b) durch Wirkung eines mit Luft betriebenen Kolbens (76) heraustreten und in Folge der Rotation des ersten Teils drehen kann.

4. Vorrichtung zum Formen des Sterns entsprechend Patentanspruch 1, **dadurch gekennzeichnet, dass** der oberhalb angeordnete Greifer (7), wo sich die beiden Enden des Metalldrahtes (10) kreuzen, eine Drahthaltekammer bilden kann, die geschlossen ist, da der bewegliche Teil (75) durch den Zapfen dem Draht die Möglichkeit nimmt, sich oberhalb des Vorsprungs (71a) bis zu Spitze zu bewegen, um eine zweite Haltekammer zu bilden und das sich bildende Langloch zu arretieren; dabei hat der unterhalb befindliche Greifer (7) die gleiche Aufgabe, den Draht zu halten, aber dem Zapfen wird durch einen Pflock (14), der in das Element (71b) greift, um eine Bewegung des Drahtes zu verhindern, eine Drehung in entgegengesetzter Richtung verliehen.

5. Vorrichtung zum Formen des Sterns entsprechend Patentanspruch 1, **dadurch gekennzeichnet, dass** die Greifer (7) durch Wirkung eines Ritzels (8) in Rotation versetzt werden, das von einem Zahnkranz (9) gesteuert wird, der wiederum Bewegungsvorrichtungen umfasst, die aus einem Servomotor (11) des Typs Brushless bestehen.

Revendications

1. Unité pour le formage de l'étoile durant la réalisation de muselets de blocage du bouchon en fil métallique, ladite unité comprenant une structure de support (2) ; un dispositif de pliage (3), appliqué à la structure de support (2) et prévu pour réaliser un anneau en fil métallique (10) ; et quatre pousseurs (4) diamétralement opposés et espacés avec un angle de 90° destinés à modifier l'anneau en poussant quatre portions vers le centre de l'anneau pour créer la partie centrale de l'étoile qui correspond à la partie supérieure circulaire de la structure, **caractérisée par le fait que** :

- ledit dispositif de pliage (3) est constitué par un moulé composé par deux demi-masques : une moitié fixe à partie négative (30) et une moitié mobile à partie positive (31) qui, lorsqu'elles sont accouplées, créent un compartiment (300) de formage pour la réalisation de l'anneau en fil métallique (10) à partir duquel on obtiendra l'étoile, ledit demi-masque mobile (31) se déplace en décrivant un mouvement de translation commandé par des pistons à air (12) pour libérer le compartiment (300) ;
- lesdits pousseurs (4) présentent chacun un rainurage (40) à l'intérieur duquel passe le fil durant la formation de l'anneau de manière à donner une continuité au compartiment (300), leur mouvement étant guidé par des cames à rainure (13) ;
- ledit dispositif de pliage (3) comprend quatre groupes de prise (7) qui appliquent le fil (10) en quatre points diamétralement opposés et espacés avec un angle de 90°, chaque groupe de prise (7) étant interposé entre deux pousseurs ; chaque groupe de prise (7) étant destiné à tourner sur son axe et à tordre les segments de fil respectivement placés entre deux pousseurs de manière à construire les rayons de l'étoile qui, après le pliage, deviendront les jambes de la structure.

2. Unité de formage de l'étoile selon la revendication 1, **caractérisée par le fait que** :

- ledit demi-masque fixe (30) est lié à la structure de support (2) et présente une pluralité de niches (30a) placées à intervalles réguliers et quatre zones de passage (30b) positionnés orthogonalement ; et que
- ledit demi-masque mobile (31) est muni de quatre passages (31b) dont un, celui situé à l'arrière, est ouvert.

3. Unité de formage de l'étoile selon la revendication 1, **caractérisée par le fait que** chaque groupe de prise (7) est situé au niveau d'une zone d'interruption du demi-masque mobile et est constitué par deux parties :

- une première partie fixe (70) façonnée en pointe avec une saillie (71a), légèrement émoussée pour faciliter le déchargement de l'étoile, qui crée avec une portion (71b) un passage guidé pour le fil (10) ; et
- une deuxième partie mobile (75) constituée par un axe cylindrique prévu pour tamponner le fil (10) et le bloquer, ladite première partie (70) est disposée pour se déplacer uniquement dans le sens rotatoire tandis que la deuxième partie mobile (75) est disposée pour se déplacer dans le sens axial sortant de la portion (71b) grâce à l'action d'un piston à air (76) et dans le sens rotatoire suite à la rotation de la première partie.

4. Unité de formage de l'étoile selon la revendication 1, **caractérisée par le fait que** le groupe de prise (7) situé en haut, où se croisent les deux extrémités du fil métallique (10), est en mesure de créer une chambre de tenue des fils fermée car la partie mobile (75) empêche, grâce à l'axe, le fil de se déplacer en haut de la saillie (71a) jusqu'à la pointe, créant une deuxième chambre de tenue pour lier la rainure qui

se forme et le groupe de prise (7) situé en bas a la même fonction de liaison du fil mais l'axe est soumis à une anti-rotation par une broche (14) qui se place sur la portion (71b) pour empêcher les mouvements du fil.

5. Unité de formage de l'étoile selon la revendication 1, **caractérisée par le fait que** les groupes de prise (7) tournent grâce à l'action d'un pignon (8) commandé par une couronne dentée (9) alimentée par des moyens d'actionnement constitués pat un servomoteur (11) de type sans balai.

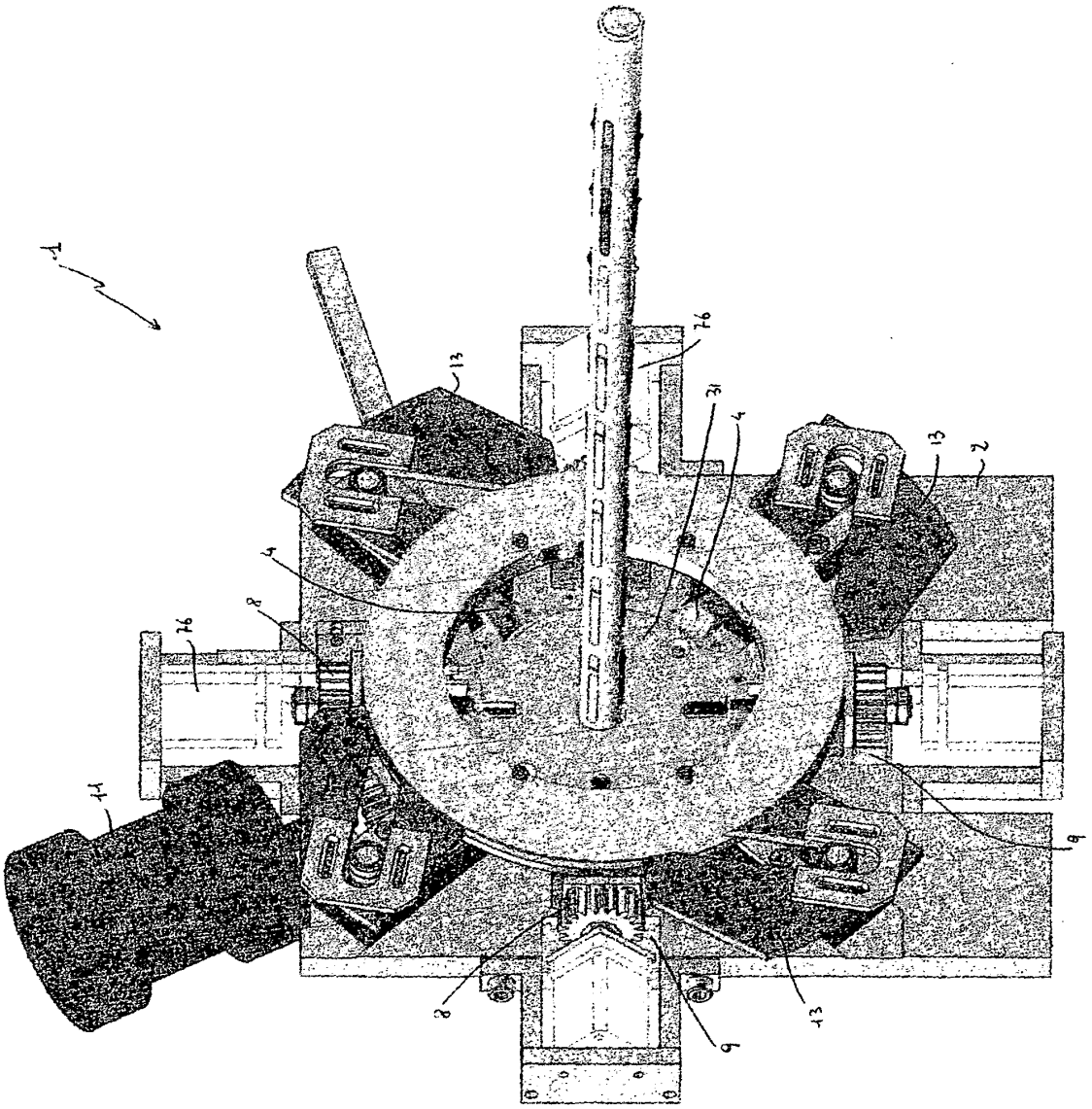
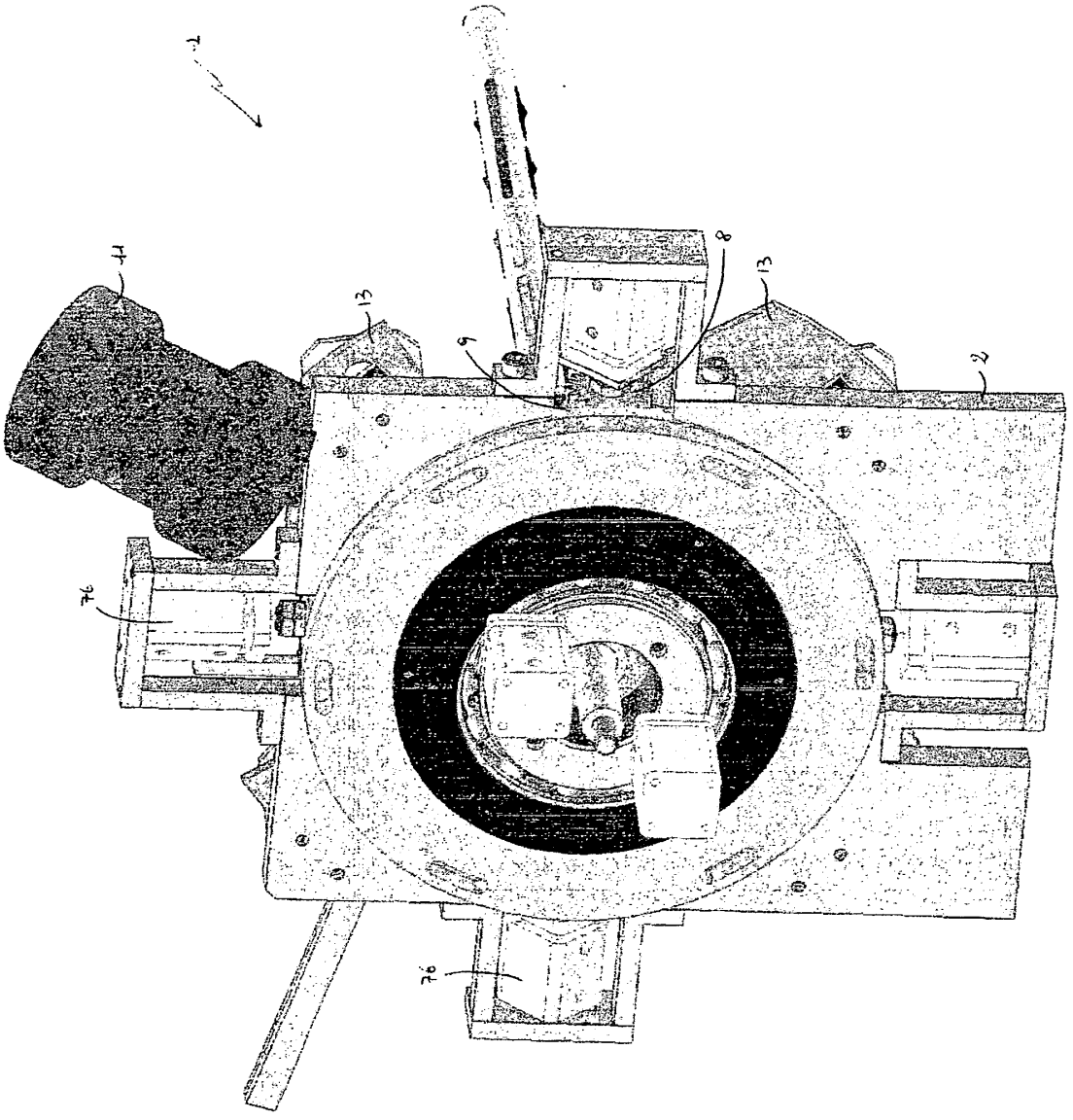


FIG.1

FIG.2



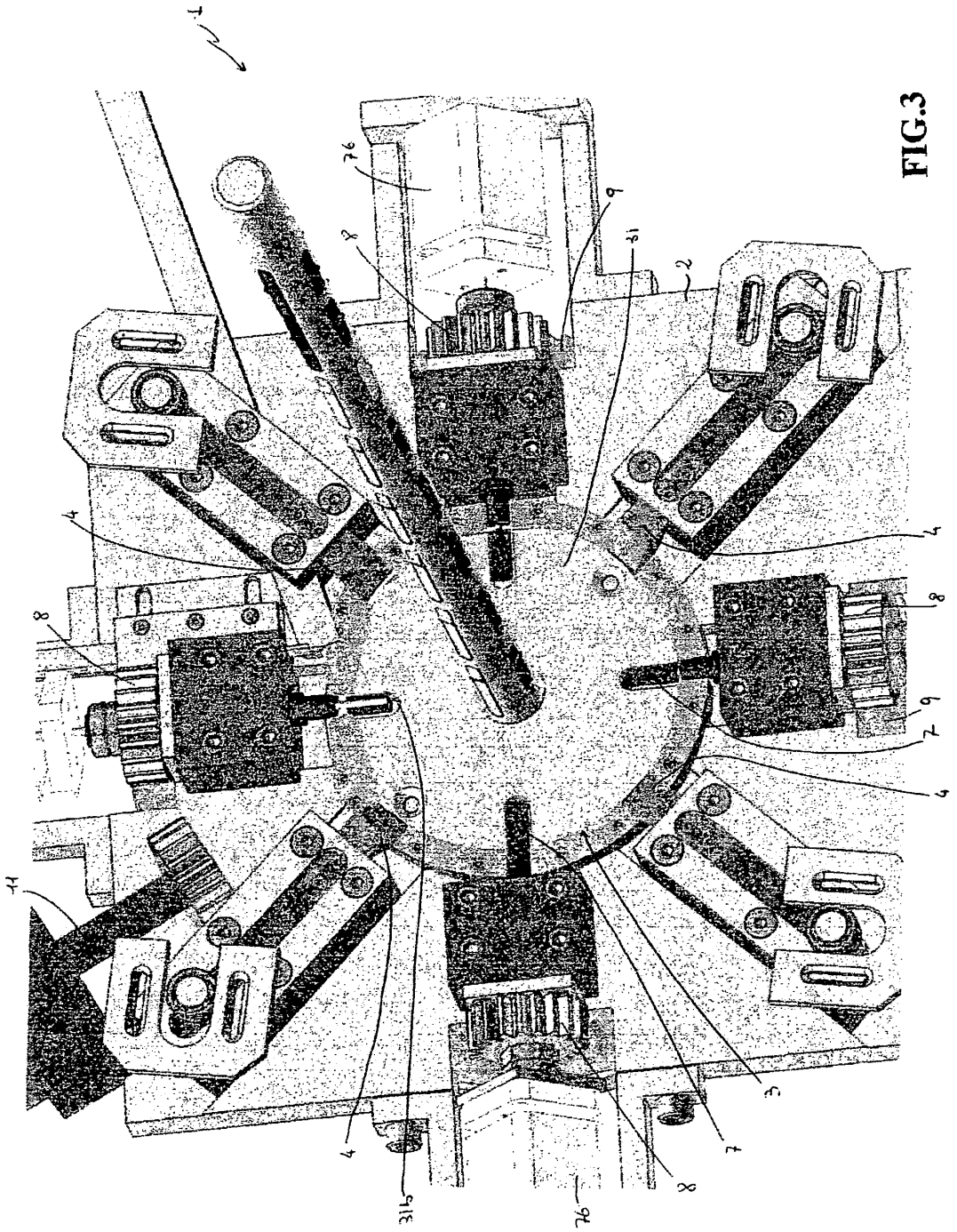
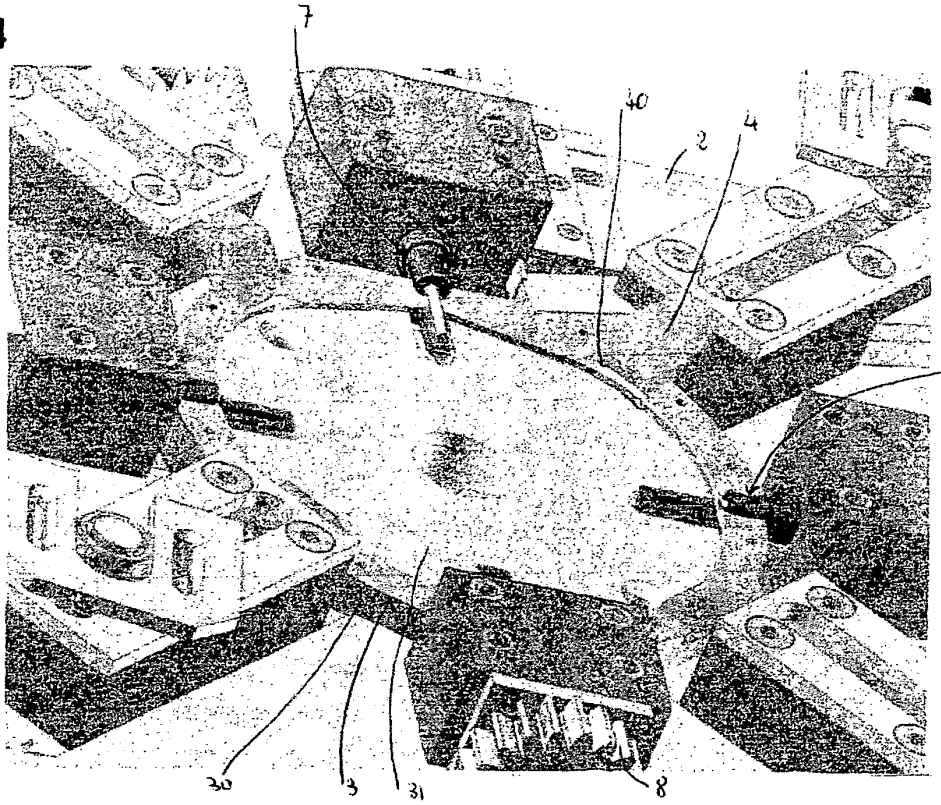


FIG.3

FIG.4



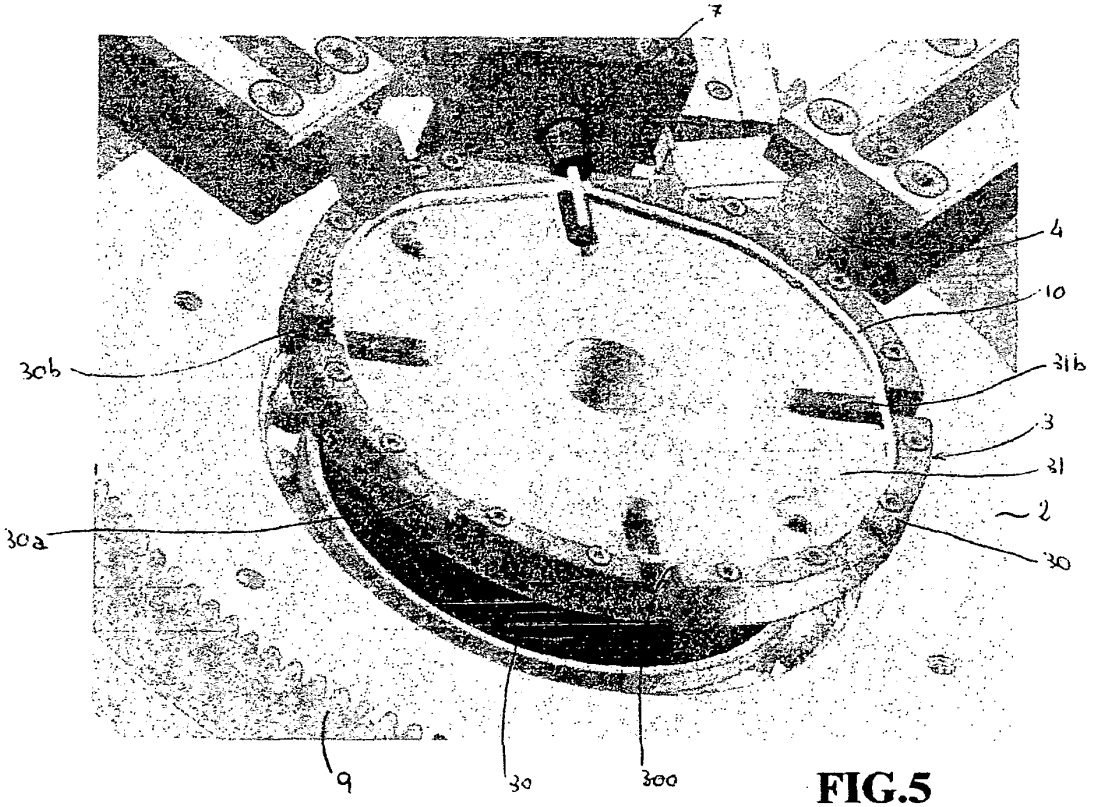
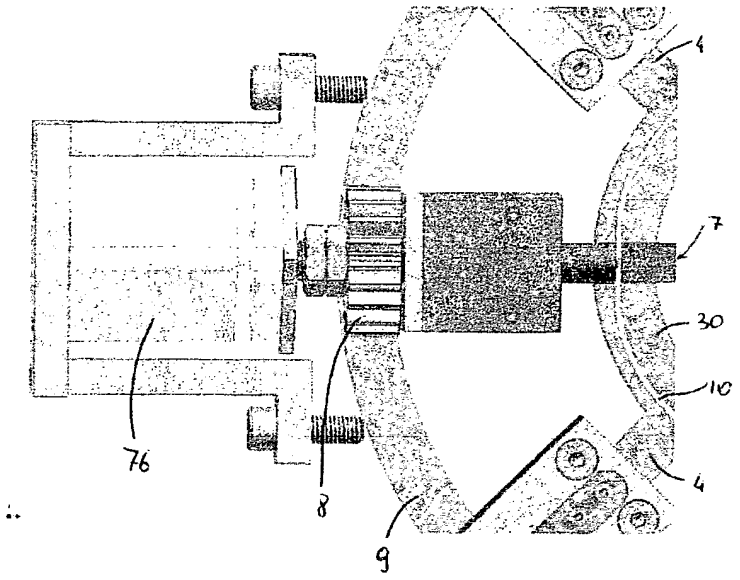


FIG.5

FIG.6



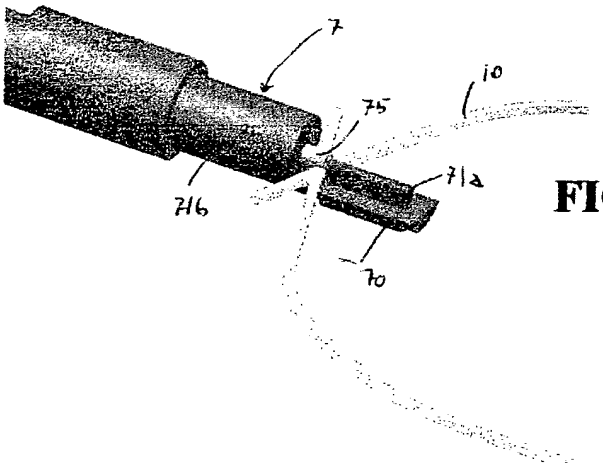


FIG.7

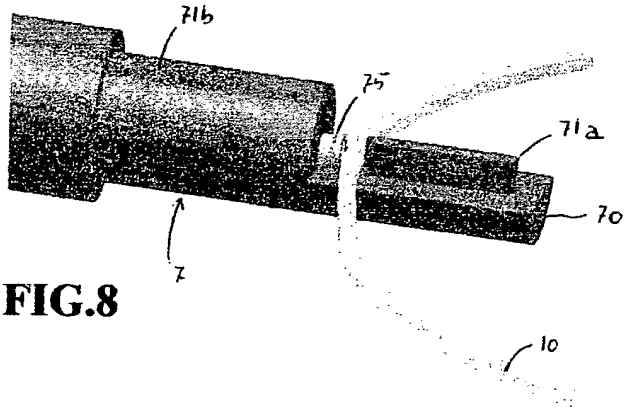


FIG.8

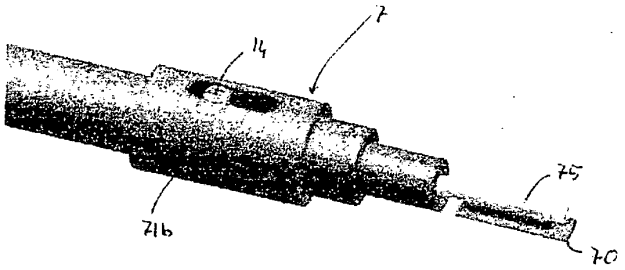


FIG.9

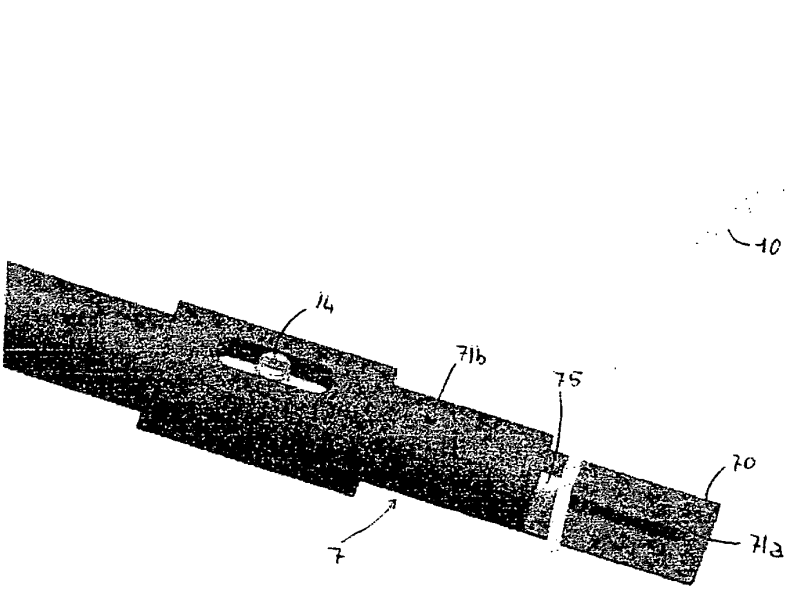


FIG.10

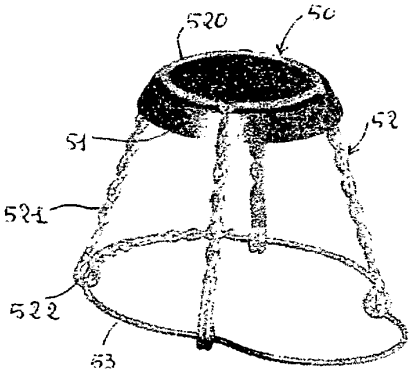


FIG.11

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- IT 1264109 **[0010]**
- FR 942540 **[0019]**