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

(11) EP 1 378 300 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
07.01.2004 Bulletin 2004/02

(51) Int Cl.[7]: **B21F 23/00**, B21C 51/00

(21) Application number: **03001870.9**

(22) Date of filing: **29.01.2003**

(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 PT SE SI SK TR
Designated Extension States:
AL LT LV MK RO

(30) Priority: **17.05.2002 IT VI20020098**

(71) Applicant: **LAC SPA**
36060 Romano d'Ezzelino (VI) (IT)

(72) Inventor: **Disegna, Giuseppe**
31010 Fonte (TV) (IT)

(74) Representative: **Bonini, Ercole**
c/o STUDIO ING. E. BONINI SRL
Corso Fogazzaro 8
36100 Vicenza (IT)

(54) Feeding assembly for machines treating multicolour wire-like elements and product obtained by said machines

(57) A feeding assembly (10) for machines (M) treating multicolor endless wire-like elements (21) is disclosed, comprising a frame (11) supporting a bobbin (12) on which the wire-like element (21) is wound, a driving unit (13) for the bobbin (12) to cause rotation of the wire-like element (21) around its longitudinal axis (X) and a detection unit (14) of the rotation of the wire-like element (21) around its axis (X). The detection unit is arranged downstream of the bobbin (12) and emits as an output (14a) a logic signal. A central unit (15) operatively connected to the detection unit (14) acquires and processes the logic signal and controls the driving unit (13). The detection unit (14) comprises an optical detector (30) with adjustable sensitivity for reading one of the colors.

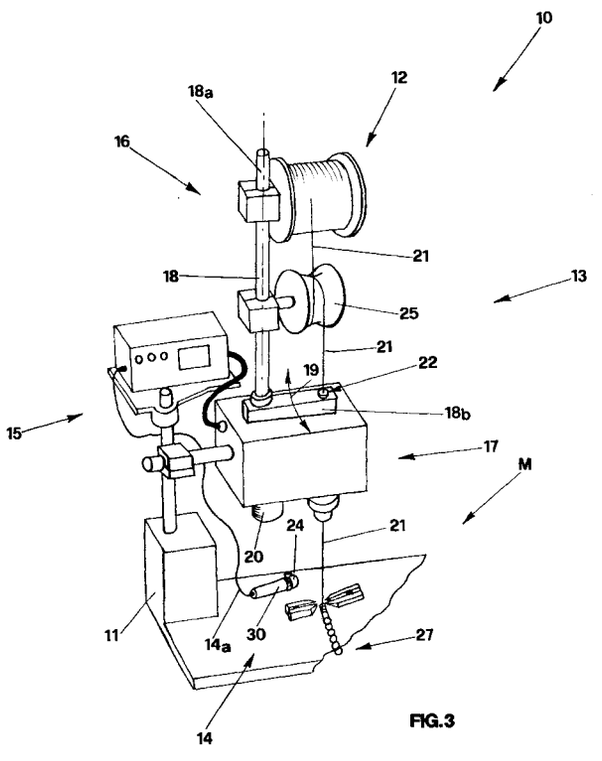


FIG.3

EP 1 378 300 A2

Description

[0001] The present invention relates to a feeding assembly for machines treating multicolor endless wire-like elements and the product obtained by said machines, particularly adapted to be used in the jewelry field for making ornamental items such as necklaces, armlets and the like.

[0002] In the goldsmith field feeding assemblies are known, applied to machines that make the desired ornamental item starting from endless wire-like elements of precious material.

[0003] The wire-like elements generally consist of wires with a circular section or straps wound on proper bobbins associated to the feeding assembly.

[0004] In particular applications, the feeding assembly in addition to unwinding the wire from the bobbin, warrants to keep the wire along a precise alignment direction relative to the longitudinal axis of its development.

[0005] A similar arrangement is for instance used in making gourmette-type chains using internally hollow wire-like elements.

[0006] Said chains are made starting from a wire 1 of precious material as shown in FIG. 1, having the core 2 made of a different material, generally iron, involving also a stretch 3 of the outer lateral surface of the wire 1.

[0007] In this way the wire 1 has along its outer surface a rib 4 of different color and material developed along its entire length.

[0008] The wire is then divided into pieces that are then wound and linked together to obtain the desired chain.

[0009] The chain so obtained undergoes an erosion process that starting from the rib 4 etches the iron core 2 of each link to obtain the desired tubular structure.

[0010] In making the chain link it is advantageous as shown in FIG. 2, to keep the rib 4 facing the link inside not to spoil the esthetic outlook of the chain when the rib 4 after erosion causes generation of a slit.

[0011] In order to keep the slit inside the link, for this purpose when winding the wire 1 a proper feeding assembly is used in which the bobbin cooperates with a driving unit that during the unwinding operation causes its rotation and therefore rotation of the wire around its own longitudinal axis to keep it always in the desired correct position.

[0012] The control of bobbin rotation is carried out by a central unit connected to a detection unit of the wire rotation arranged downstream of the bobbin that during the unwinding operation detects the presence of the rib 4 relative to a fixed position through a sensor.

[0013] The sensor produces a corresponding logic presence signal that is acquired and processed by the central unit so as to properly guide the driving unit to keep the desired position of the rib 4 relative to the sensor detection point during the wire unwinding operation and then allowing the correct linkage.

[0014] The sensors used for this purpose generally consist of feeling photocells whose operation is based on the light reflection by the intercepted object thus discriminating reflecting surfaces of the precious material from less reflecting surfaces or surfaces of darker color such as ferrous materials.

[0015] The above mentioned alignment technique using driving and detection units however cannot be used for making chains using multicolor wire-like elements.

[0016] More particularly wires or straps of two or more color of precious material are known and used to obtain ornamental items with multicolor surface.

[0017] The manufacture of chains for instance of the gourmette-type, encountered limitations due to the need of a correct alignment on winding and linking the wire to make the chain links.

[0018] Indeed feeders of the above mentioned kind cannot be used for such multicolor wire because the alignment is based on the detection of the different reflection properties of the different wire surfaces.

[0019] As a matter of fact the outer surfaces of precious materials such as gold and silver, have a similar reflection degree so that it is impossible with sensors of the above described type, to detect and distinguish the different zones into which the outer surface of the wire-like element is divided.

[0020] Therefore object of the present invention is to overcome said drawbacks.

[0021] Indeed the main object of the invention is to provide a feeding assembly allowing to keep the correct position of the multicolor wire-like element with which it is equipped, during its unwinding operation from the bobbin.

[0022] Such an object is attained by a feeding assembly for machines treating multicolor endless wire-like elements that according to the contents of the main claim, is of the kind comprising a frame supporting:

- a bobbin on which said wire-like element is wound;
- a driving unit for said bobbin to cause the rotation of said wire-like element around the longitudinal axis defined by it;
- a detection unit of the rotation of said wire-like element around said longitudinal axis, said detection unit being arranged downstream of said bobbin and adapted to emit as an output a logic signal;
- a central unit operatively connected to said detection unit for acquiring and processing said logic signal and controlling said driving unit as a function of said logic signal, and is characterized in that said detection unit comprises an optical detector with adjustable sensitivity to read one of said colors.

[0023] Advantageously the feeding assembly may be equipped with wire-like elements whose outer surface has various zones with different color and/or material.

[0024] The foregoing objects and advantages will be better understood by reading the description of a pre-

ferred embodiment of the invention given as an illustrative but not limiting example with reference to the accompanying sheets of drawings in which:

- FIGs. 1 and 2 show elements used for making ornamental items of the prior art;
- FIG. 3 is an isometric view of the feeding assembly of the invention;
- FIG. 4 is an enlarged view of a detail of FIG. 3;
- FIG. 5 is a sectioned isometric view of a multicolor wire-like element used by the feeding assembly of the invention;
- FIG. 6 shows a product obtained from the wire-like element of FIG. 5;
- FIGs. 7 and 8 show the detail of FIG. 4 in different operative phases of the feeding assembly of the invention.

[0025] The feeding assembly of the invention is shown in FIG. 3 where it is generally indicated with 10.

[0026] The assembly generally comprises a frame 11 supporting a bobbin 12 connected to a driving unit generally indicated with 13 and a detection unit generally indicated with 14, operatively connected to a central unit 15 which is in its turn connected to the driving unit 13.

[0027] The feeding assembly 10 of the invention in the described embodiment is applied to a machine M for treating wire-like elements, that can be advantageously associated to a machine for making gourmette-type chains.

[0028] It is obvious that in different applications and for different treatments, such a machine may be different, where it is obviously provided use of wire-like elements and the need of their alignment.

[0029] As to the driving unit 13, it comprises mechanisms 16 associated to the bobbin 12 and a motorization group generally indicated with 17 cooperating with the mechanisms 16.

[0030] Said mechanisms 16 consist of an arm 18 connected at one end 18a to the bobbin body 12 and at the opposite end 18b to the motorization group 17. The arm 18 has advantageously a shape generally in the form of an L.

[0031] Such configuration allows, as it will be better explained hereinafter, orientation of the bobbin 12 in the space through rotation of the arm 18 along the direction indicated by arrow 19.

[0032] Such a rotation is carried out by the motorization group 17 by a reversing motor 20 mechanically connected to the arm 18 possibly with interposition of a mechanical reduction gear not shown in the drawings for sake of simplicity.

[0033] The motor 20 indeed consists advantageously but not necessarily of a reversing stepping motor that as it is known, develops a high number of revolutions per minute so that it is necessary to interpose the reduction gear to obtain the desired revolving speed of the arm 18.

[0034] The value of this speed and the direction of rotation of the stepping motor 20 are determined by the control signals coming from the central unit 15 controlling in this way orientation of the arm 18 and therefore of the bobbin 12.

[0035] Around the bobbin 12 the wire 21 is wound that from said bobbin 12 runs through a hole 22 made in the end 18b of the arm 18 and in the motorization group 17 to reach the first stage of the machine M making the chain 27.

[0036] In proximity of the machine M and near the wire 21 there is the detection unit 14 delivering as an output 14a a logic signal of the on-off type for the central unit 15.

[0037] According to the invention, the detection unit 14 comprises an optical detector 30 with adjustable sensitivity for reading one of the colors of the outer surface of the wire 21.

[0038] To make easier the description it is assumed that the wire 21 is of two colors as shown in FIG. 5, wherein the outer surface has two different colors 21a and 21b developed according to symmetric endless strips along the direction defined by the axis X of said wire 21.

[0039] As above mentioned, the optical detector 30 allows to read one of the colors constituting the outer surface of the wire 21 and to this purpose it comprises calibration means allowing to set the color of the outer surface of the wire-like element 21 that it is desired to read.

[0040] To carry out reading of different colors, optical detectors of known type are used, and more particularly optical detectors provided with a light source with three components, for instance red, green and blue in case of fundamental components or magenta, cyan and yellow in case of complementary components.

[0041] The on-off logic signal being the output 14a of the detection unit 14 will correspond to the detection or absence of the color of the wire 21 set in the calibration phase at a fixed detection window 23 defined by the optical detector 30.

[0042] In order to allow a more precise reading of the color of the surface of the wire 21, the detection unit 14 comprises optical magnification means 24 allowing to decrease the dimension of the detection window 23, the distance of wire 21 from the optical detector 30 being equal.

[0043] Such magnification means 24 generally consists of a lens generally included in the mounting kit for the optical detector 30.

[0044] It is also to be seen in FIG. 3 that between the detection unit 14 and the bobbin 12 there is a tension roller 25 on whose outer surface a groove 26 is provided where the wire 21 is properly wound for one or more turns.

[0045] In this way such a friction is generated as to allow an adequate tensioning of said wire 21 when it undergoes the traction force by the first stage of the machine M.

[0046] The operation of the feeding assembly will be described with reference to the two colored wire 21 for making the chain 27 as shown in FIG. 6.

[0047] This kind of treatment is made by a machine M of the type known per se, in which the wire 21 undergoes the operations of cutting, winding, and link closure according to the traditional configuration of a gourmette-type chain.

[0048] In carrying out the winding and linking operation of the wire length as shown in FIG. 6, it is necessary that said wire keeps a fixed direction relative to its longitudinal axis so that at the end of the winding operation, the precise alignment of the zones with different color is obtained for each link.

[0049] This alignment is indeed warranted by the feeding assembly 10 of the invention through the continuous orientation of the bobbin 12 during the unwinding operation of the wire 21. In operation before starting the machine M, a calibration procedure is conducted, consisting in reading one of the colors, such as the color 21a, positioning the wire 21 facing the optical detector 30.

[0050] It is obvious that this calibration operation may be carried out for the color 21b as well and in different embodiments for anyone of the colors constituting the outer surface of the wire.

[0051] During operation, the machine M carries out traction of wire 21 which is caused to be unwound from bobbin 12 running on the tension roller 25.

[0052] At the same time the arm 18 swings by alternately rotating clockwise and anti-clockwise with speed and duration set by the central unit 15.

[0053] More particularly with reference to FIGs. 7 and 8, the rotation of the bobbin 12 and therefore of wire 21 is determined by the logic signal at the output 14a of the detection unit 14.

[0054] As shown in FIG. 7, reading of the color 21a may be associated to the logic level 1 at the output 14a while the bobbin 12 is being rotated clockwise.

[0055] In such a way also the wire 21 is being rotated clockwise relative to its longitudinal axis and the zone 21b is moved to the detection window 23 defined by the light source of the optical detector 30 which is arranged in a fixed position as already stated.

[0056] Following such rotation and in the condition of FIG. 8, the detection window 23 arrives on the surface of different color 21b and at the output 14a the logic level 0 is associated so that the bobbin 12 is being rotated anti-clockwise.

[0057] In this way one returns to the condition of FIG. 7 where as already stated, the wire 21 will undergo a further clockwise rotation.

[0058] The procedure will then go on through subsequent and continuous changes of rotation by keeping the boundary zone between the two colors 21a and 21b near the detection window 23 of the optical detector 30.

[0059] From the foregoing it is clear that the clockwise rotation of the wire 21 is associated to the logic value 1 as output 14a or the detection unit 14 and conversely its anti-clockwise rotation is associated to the logic value 0.

[0060] It is clear that the same operation may be carried out by making the calibration on the color 21b as well as with a different logic and processing of the logic signal at the output 14a of the detection unit 14. The acquisition and processing of the signal output 14a by the logic unit 15 uses techniques known per se as well as the guide and control of motor 20.

[0061] It is to be noted that the precision of alignment by the feeding assembly 10 of the invention will be the greater, the more reduced is the detection window 23 and the greater is the velocity of response of the motor 20 to the change of logic state of the detector 30.

[0062] From the foregoing it is clear that the feeding assembly of the invention attains the above mention objects and advantages.

[0063] Many variations neither described nor illustrated may be made in the constructional stage to the feeding assembly of the invention.

[0064] Such variation may for instance consist of a different embodiment of the driving means either for the mechanisms or for the motorization group.

[0065] It is to be understood that these and further variations neither shown nor described in the present specification, when falling within the inventive conception stated in the appended claims, should be considered all protected by the present patent.

Claims

1. A feeding assembly (10) for machines (M) treating multicolor endless wire-like elements (21), of the type comprising a frame (11) supporting:

   - a bobbin (12) on which said wire-like element (21) is wound;
   - a driving unit (13) for said bobbin (12) to carry out rotation of said wire-like element (21) around the longitudinal axis (X) defined by it;
   - a detection unit (14) of the rotation of said wire-like element (21) around said longitudinal axis (X), said detection unit (14) being arranged downstream of said bobbin (12) and adapted to emit as an output (14a) a logic signal;
   - a central unit (15) operatively connected to said detection unit (14) for acquiring and processing said logic signal and controlling said driving unit (13) as a function of said logic signal, **characterized in that** said detection unit (14) comprises an optical detector (30) with adjustable sensitivity for reading one of said colors.

2. The feeding assembly (10) according to claim 1) **characterized in that** said detection unit (14) comprises calibration means adapted to set the color to

be read on the outer surface of said wire-like element (21).

3. The feeding assembly (10) according to claim 1) **characterized in that** said detection unit (14) comprises optical magnification means (24) adapted to increase the precision of said reading.

4. The feeding assembly (10) according to claim 3) **characterized in that** said optical magnification means (24) consist of a lens.

5. The feeding assembly (10) according to claim 1) **characterized in that** said optical detector (30) comprises a light source with three components.

6. The feeding assembly (10) according to claim 5) **characterized in that** said three components consist of the colors red, green and blue.

7. The feeding assembly (10) according to claim 5) **characterized in that** said three components consist of the colors magenta, cyan and yellow.

8. The feeding assembly (10) according to claim 1) **characterized in that** said driving unit (13) comprises mechanisms (16) associated to said bobbin (12) and a motorization group (17) operatively connected to said mechanisms (16).

9. The feeding assembly (10) according to claim 8) **characterized in that** said mechanisms (16) comprise an arm (18) connected at one end (18a) to the body of said bobbin (12) and, at the opposite end (18b), to said motorization group (17).

10. The feeding assembly (10) according to claim 9) **characterized in that** said arm (18) has a shape generally in the form an L.

11. The feeding assembly (10) according to claim 8) **characterized in that** said motorization group (17) comprises a reversing motor (20).

12. The feeding assembly (10) according to claim 11) **characterized in that** said reversing motor (20) is a stepping motor.

13. The feeding assembly (10) according to claim 11) **characterized in that** said reversing motor (20) is connected to said mechanisms (16) through a reduction unit.

14. The feeding assembly (10) according to claim 1) **characterized in that** it comprises a tension roller (25) around which said wire-like element (21) is wound, interposed between said bobbin (12) and said detection unit (14), said roller being adapted to keep said wire-like element (21) under tension during its unwinding operation from said bobbin (12).

15. The feeding assembly (10) according to claim 1) **characterized in that** said wire-like element consists of a wire (21) whose outer surface has different colors developed along continuous strips along the direction defined by the axis (X) of said wire (21).

16. The feeding assembly (10) according to claim 15) **characterized in that** said strips are two, symmetrically arranged on said outer surface.

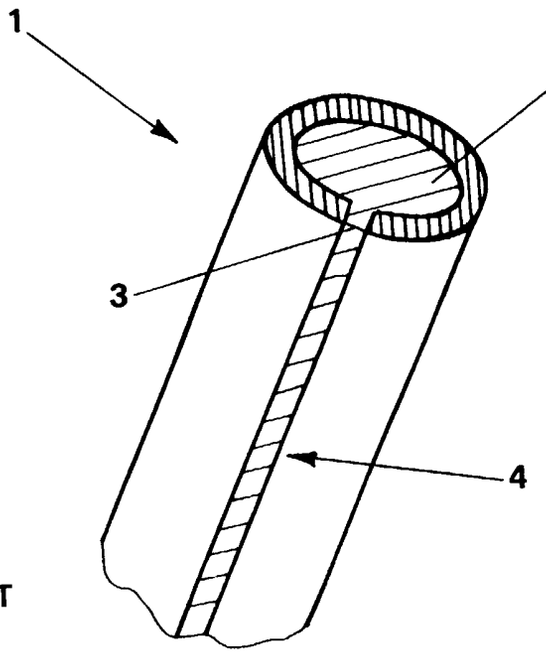
17. A machine (M) for treating multicolor endless wire-like elements (21) to produce jewelry items comprising:

- a cutting unit for cutting said wire-like elements (21),
- a winding and linking unit to link together said cut elements to realize a gourmette-type chain,

characterized in that said machine (M) further comprises a feeding assembly (10) according to claim 1.

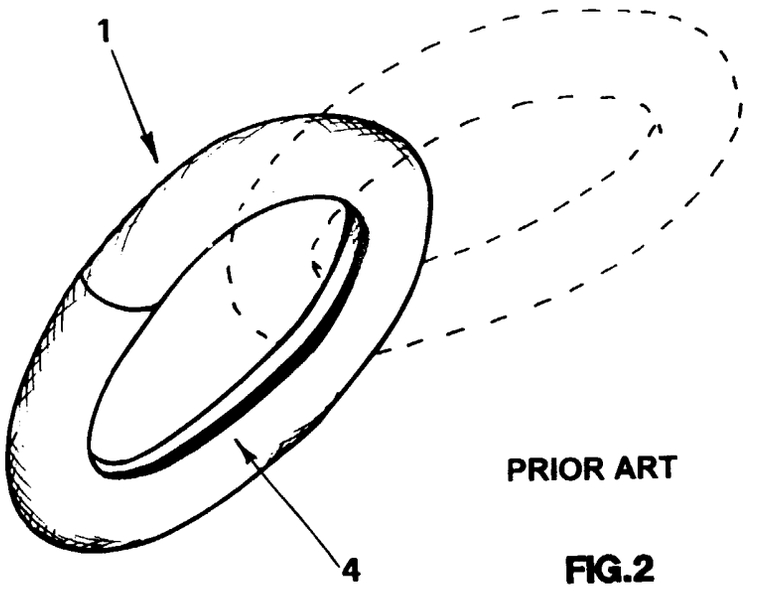
18. A product (27) made with a machine (M) adapted to produce jewelry items using a feeding assembly (10) according to claim 1.

19. The product (27) according to claim 18) **characterized in that** each element is joined to itself or to a subsequent element at the point having the same color.



PRIOR ART

FIG.1



PRIOR ART

FIG.2

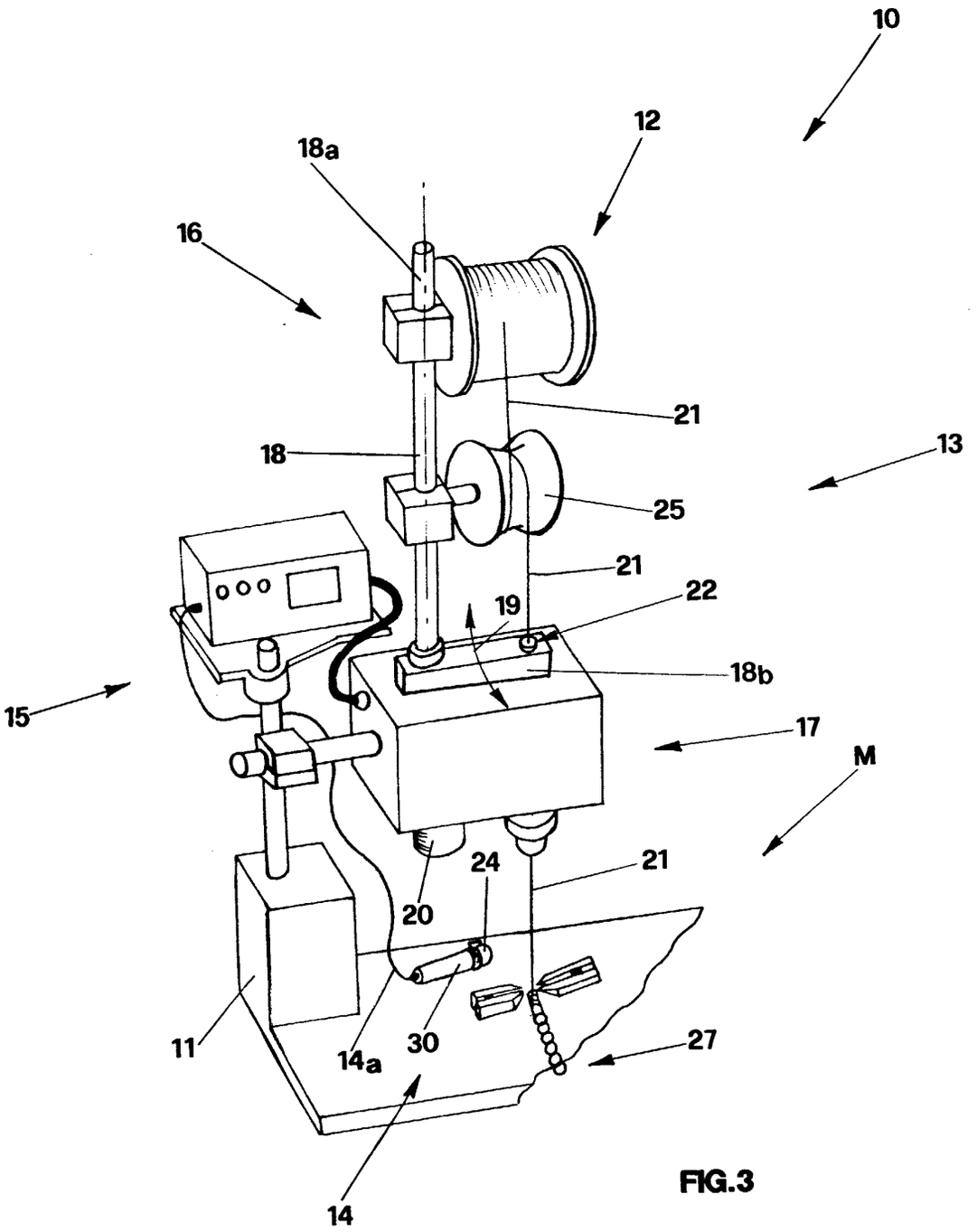


FIG.3

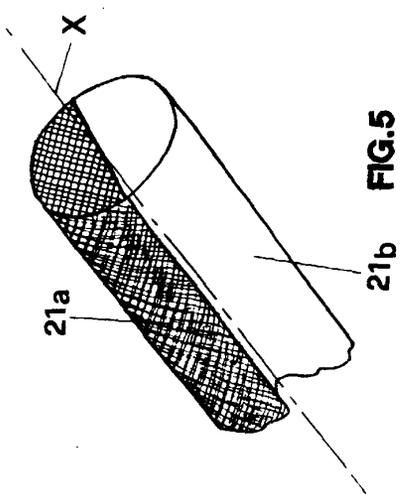


FIG.5

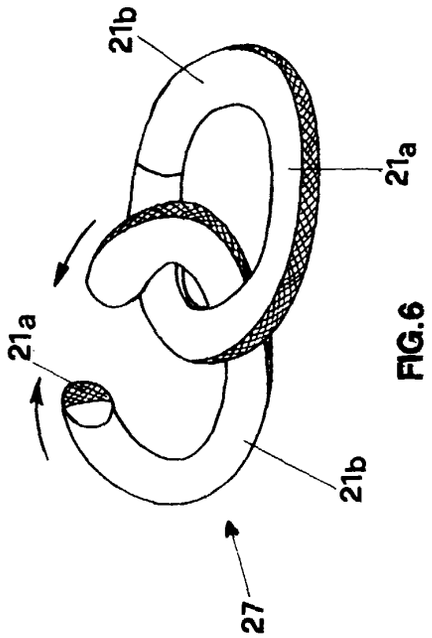


FIG.6

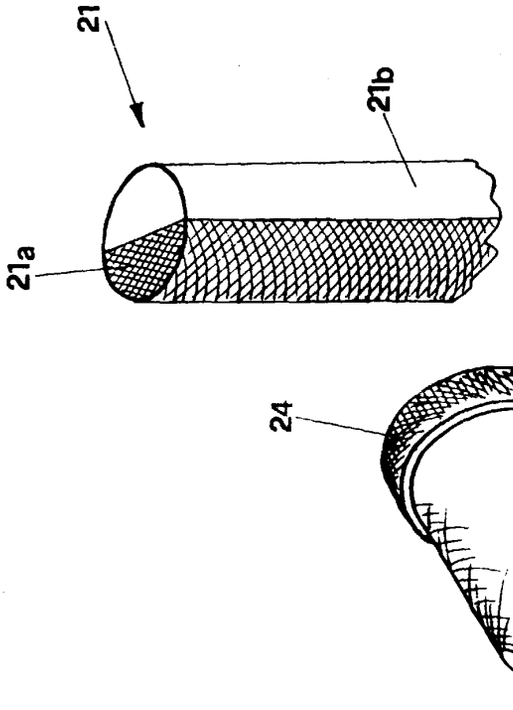


FIG.4

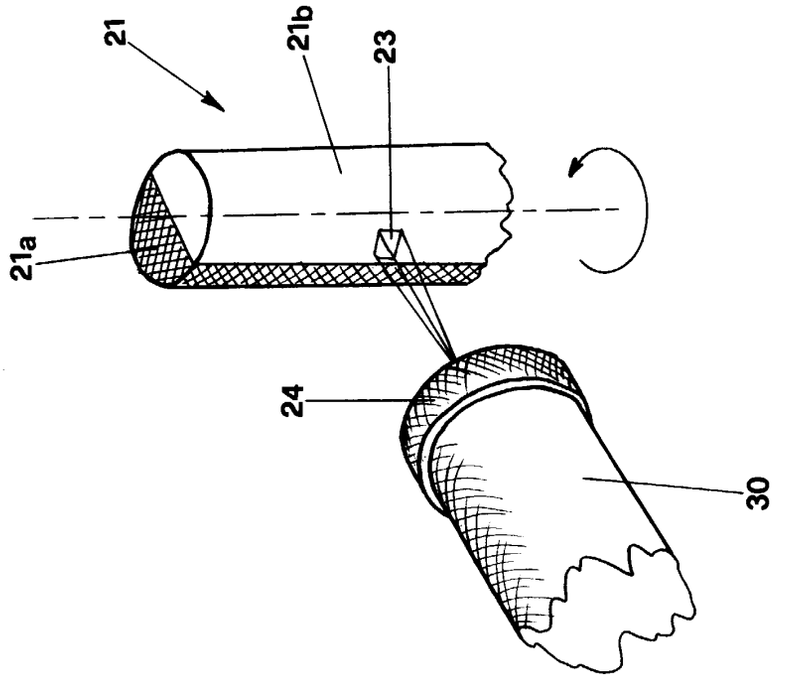


FIG.8

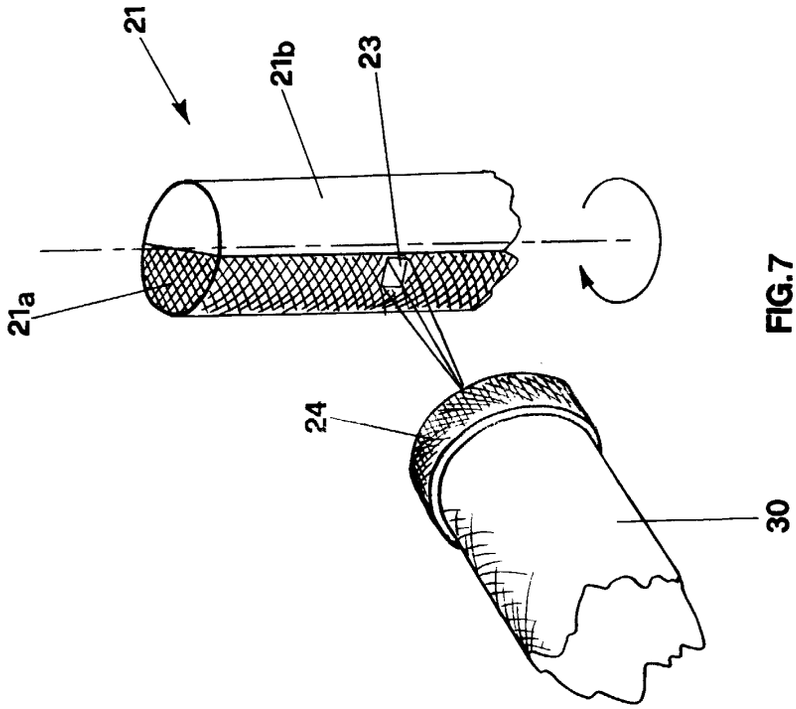


FIG.7