

(19)



Europäisches Patentamt

European Patent Office

Office européen des brevets



(11)

EP 1 037 802 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:
13.08.2003 Bulletin 2003/33

(51) Int Cl.7: **B65B 11/58**, B65D 85/04,
B65H 54/20

(21) Application number: **98945675.1**

(86) International application number:
PCT/SE98/01560

(22) Date of filing: **02.09.1998**

(87) International publication number:
WO 99/015409 (01.04.1999 Gazette 1999/13)

(54) **Method and device for coiling flexible elongated elements into fractional coils arranged in a line and wrapping these with a protective film of flexible material, and packing of wrapped coils**

Verfahren und Vorrichtung zum Aufwickeln von flexiblen länglichen Elementen auf in Reihen aufgestellten Teilrollen und zum Umhüllen derselben mit flexibler Schutzfolie, und Verpacken von umhüllten Teilrollen

Procédé et dispositif permettant d'embobiner des éléments allongés et flexibles en bobines fractionnelles disposées en ligne et d'emballer ces dernières à l'aide d'un film protecteur fait d'un matériau flexible, et empaquetage de bobines emballées

(84) Designated Contracting States:
AT BE CH DE DK ES FI FR GB GR IT LI NL PT

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(30) Priority: **25.09.1997 SE 9703463**

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(43) Date of publication of application:
27.09.2000 Bulletin 2000/39

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EP 1 037 802 B1

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Description

[0001] The present invention concerns a procedure and an arrangement for winding flexible, elongated elements onto partial reels arranged in a row and wrapping these with protecting film of elastic material. The invention also concerns a packaging with wrapped reels.

[0002] Different types of arrangements for winding elongated flexible elements such as hoses or cables onto reels and wrapping these in a protective film are already known and commercially available. These can in principle be divided into two main types, namely arrangements where the winding takes place on a rotating drum or core, and arrangements where the winding takes place on a rotating spool-head, is then provided with a wrapping of preferably plastic film or similar, and where the assembly thereby formed is removed from the said spool-head when the cable is primarily held together by means of the externally arranged wrapping. For the latter method, a core is attached to the rotating spool-head, where the core preferably includes a drum provided with a flange on which the cable is wound and possibly, but not necessarily, provided with a protective and unifying wrapping of plastic film. The assembly formed by this means is thereafter pulled off the spool-head in its entirety, i.e. accompanied by the core.

[0003] The problem of withdrawing a pre-determined length of wound cable or reeled flexible element can, for example, arise in that the user may on one occasion wish to withdraw only a part of the element whose length differs significantly from the length of the element that is wound on one continuous reel and wrapped in plastic film. Regarding lines that are wound on spools, the solution to this problem is already known through, for example, US 2 912 102. According to this document, which does in fact refer to fishing lines, the problem is solved in that a comparatively long line with no breaks is wound on several spools arranged following one another. These spools are subsequently arranged in a row with a coinciding centre axis and are packaged so that they are connected by being provided with a wrapping of elastic transparent material, preferably plastic film, that by elastic shrinkage tightly wraps and fixes the said spools, and thereby even the line on each one of them, in position. The desired length of line in the form of a chosen number of spools can then be simply removed from the package in a conventional way by the wrapping being split peripherally at a suitable place and the line being cut, whereby the plastic film tightly wrapping the spools keeps the line remaining on the respective separated spool sections.

[0004] While comparatively very flexible elongated elements and primarily lines must without exception be wound around an accompanying supporting core, stiffer elements such as hoses, cables and electrical conductors have shown that it is possible to wind these as so-called core-free reels kept together by a belt, rope or a wrap-around plastic film. A further reason as to why nu-

merous manufacturers are striving to avoid the use of an accompanying drum or spool is that the cost of production and transport of both of these increases the cost of the product, and that the drum or spool is usually discarded by the user, which is, of course, not favourable from an environmental point of view.

[0005] The problem is that so far there have been no efficient and workable methods for winding a single elongated continuous flexible element onto several partial reels or segments arranged after one another in a row and then wrapping these with elastic film so that a pre-determined length of the element in the form of a specified number of partial reels can be simply removed from the packaging without the removed partial segment/segments needing to be repackaged.

[0006] One objective of the present invention is therefore to achieve a procedure that makes this possible and, more specifically, allows the production of core-free "multi-reels", i.e., a number of reels arranged after one another as segments and wrapped in an elastic film. A second objective of the invention is to achieve an arrangement for performing this procedure, and a third objective is to achieve a packaging of an elongated flexible element wound onto partial reels and wrapped with elastic film that is designed so that by means of a peripheral sectioning of the wrapping that is common to all of the reels, a pre-determined length of the element in the form of a specified number of partial reels can be simply removed from the packaging without the removed section/sections needing to be repackaged.

[0007] These objectives are achieved by the procedure, arrangement and packaging having the features specified in the characteristics of the claims.

[0008] According to a further development of the invention specified in claim 2, the wrapping of elastic film on every partial reel can be further improved if the partial reel that is to be provided with a wrapping is at a distance from a reel that has been provided with a wrapping in a previous step so that this partial reel does not constitute a hinder for the wrapping sequence of the partial reel that is to be provided with a wrapping.

[0009] The invention is described in greater detail below with reference to the following drawings where; **fig. 1** shows a perspective view of an arrangement for winding flexible elongated elements onto continuous reels and wrapping these with a protective film of elastic material according to the invention, **fig. 2** shows a frontal view of the arrangement according to **fig. 1**, **fig. 3** shows a longitudinal view of a part of the arrangement in **fig. 1** and **2** to clarify the mechanism for manoeuvring the arrangement's device for moving the wound element on the drum, **fig. 4** shows a cross-sectional view according to IIII - IIII in **fig. 3**, **fig. 5** shows a cross-sectional view according to V - V in **fig. 3**, **fig. 6** shows a longitudinal view of a device for adjusting the diameter of the drum, **fig. 7** shows a beam included in the drum in cross-section, **fig. 8A - 8I** illustrate the measures taken according to the invention when it is used to wind flexible elements

onto partial reels and wrap these in a cover of elastic film, and **fig. 9** shows a package of the partial reels produced with the procedure according to the invention.

[0010] In figures 1 and 2, the reference number 1 designates the base mounting plate or frame of the arrangement according to the invention, on which a drum 2 is attached in an overhanging, cantilever manner for rotational movement so that when operated by a driving unit in the form of an electric motor (not shown) with gearing where the number of revolutions per minute can be adjusted, it can be brought to rotate at a chosen speed around an essentially horizontal axis. The speed of rotation of the drum 2 is registered, for example, by a pulse transducer attached to the axis of rotation and communicated to a control unit not shown in detail on the drawings. On one side of the rotating drum (the right-hand side seen in fig. 2) a feeding mechanism 4 is arranged that includes a number of rollers between which an elongated element designated 5 runs prior to it being wound onto drum 2. Since the feeding mechanism 4 synchronised with the speed of rotation of the drum 2 performs a continuous forwards and return movement parallel with the main axis of the drum, the element 5 passes through feeding mechanism and is applied onto the drum 2 with overlapping, evenly spaced turns along the length of the drum.

[0011] Adjacent to the rotating drum 2, a unit 6 for wrapping the element 5 wound on the drum with elastic film 7, preferably in the form of plastic film, is arranged on one side of the drum. This unit 6 includes a rotating housing and a replaceable cylinder 8 equipped with a braking device and arranged to carry a roll of plastic film 9 that, as a consequence of the rotation of the drum and its passage over two cylinders 10, 10', allows the film to be continuously fed out from the roll and wrapped around the element 5 wound on the drum 2. To efficiently distribute the elastic film 7 over at least two partial reels lying in a row on the drum or along the whole periphery of a single partial reel, the unit 6 is arranged to be moveable in an axial direction so that it can travel backwards and forwards in parallel with the main axis 3 of the drum 2. As an alternative to the backwards and forwards motion of unit 6, it could be considered that the cylinders in a per se known manner can be designed so that the film 7 is stretched in a sideways direction as it passes over the cylinders. The arrangement also includes an arm 11 housed so that it can be pivoted on the frame 1 via the axis of rotation 3 of the drum 2 and arranged to perform an oscillating movement about the drum 2 in a first direction by the interaction of a piston and cylinder device (not shown in the figure) between the arm 11 and the frame 1, and a return movement in a second, opposite direction by a turning plate arranged on the pivoting axis 3 of the drum and a braking device acting on this, by means of which the arm 11, through fixed braking, is rapidly returned to its starting position by the drum (not shown in the figure).

[0012] At its free end, arm 11 supports a clamping de-

vice 12 that, when the arm is in its starting position as shown in fig. 1, is positioned between the two cylinders 10, 10'. This clamping device 12, which is not described in greater detail, is designed so that the elastic film 7 is always taken up by it. The said clamping device can in general be said to include a "claw" in the form of interacting arm parts of which one is housed so that it can be pivoted and its manoeuvrability affected by a piston and cylinder device (not shown in the figures). During its active movement, the task of arm 11 is to utilise the clamping device 12 to grip hold of the plastic film 7 and draw it out from the roll 9 and, by oscillating in the first direction about the drum 2, initially apply the said film to a reel wound onto the drum so that it attaches to it. When the active movement of the arm 11 has reached its end position, the piston and cylinder device is deactivated and the braking device for the plate is activated so that the arm 11, and thereby also the clamping device, accompanying the drum, rapidly return to their starting position whereby the remaining main part of the elastic film 7 is drawn out and applied to a reel of a wound element during the rotation of the drum. In this respect, it should be pointed out that the elastic film 7 runs freely through the clamping device, and that there is no need to take fresh hold of the film. After the elastic film has been wound around the wound reel for a pre-determined number of turns, the pair of cylinders 10, 10' are slowed down at the same time as the clamping device grips the film so that this breaks off.

[0013] Drum 2 has a periphery or a surface circumference that is formed from a number of beams 13 that are essentially U-shaped and oriented with their open end facing inwards towards the centre of the drum 2. The beams 13 are equally distributed at preferably the same distance from one another around the circumference of the drum 2 and at preferably the same radial distance from the axis of rotation. To allow the active diameter of the drum 2 to be varied, the beams are arranged in a displaceable manner at the drum by a holding and guiding device 14 that consists of guide rails 15 extending radially outwards from a hub at one end of the drum 2 and, at the other end and as evident from fig. 1, a linear adjusting mechanism 16 that extends between the free ends of two opposing beams. To displace the beams 13 in a radial direction along the said guide rails 15, there is, according to the present embodiment of the invention, a travelling screw 17 arranged at the free end of the rails 15 that acts on a displaceable housed body 18 to which the end of the beam is attached by welding. The adjusting mechanism 16 that acts between the free ends of the beams 13 includes a manoeuvring handle 19 that, by means of turning a gearing not described in greater detail, causes the beams to move in a radial direction towards or away from one another. To allow the wound reels of flexible element 5 to be removed simply from the drum 2, the shape of the drum can quickly be changed so that a slimmer form is obtained towards its free end. To bring about this sudden adjustment, a pis-

ton and cylinder device 20 is arranged at the adjusting mechanism 16 and is active between the said gearing and the free ends of the beams, as is best evident from fig. 1.

[0014] For the flexible elements 5 wound on the drum 2 to be received in a gentle and accommodating manner, a convex sheeted element 21 is, as shown in fig. 7, fixed to the end section of beam 13 and turned to face outwards from drum 2 and with dimensions chosen so that it extends significantly out from the edges of the beam.

[0015] In the space between the beams 13 that form the drum 2 there are a number of guiding devices 22, 22' whose task during the sequence of winding events is to guide the flexible element 5 so that it remains within an axially limited area on the drum. According to the invention, guiding devices 22, 22' are arranged in a first and second arrangement or ring and are distributed uniformly along the circumference of the drum where each and every one is arranged to selectively and synchronously with the rotation of the drum, move in a continuous cyclical track that is primarily oriented parallel with the axis of rotation 3 of the drum 2. The arrangements of guiding devices 22, 22' are arranged on the drum so that when in their respective active positions they extend above the peripheral surface of the drum 2 and, in this position, form two rings facing outwards from the drum and located in two radial planes separated from one another along the drum. The guiding devices 22 in one of the rings move in common so that they can alternately exchange places with the guiding devices 22' in the other ring by momentarily moving along the outside of the drum at the same time as the guiding devices 22 in the other ring are withdrawn into the drum 2 and move inside it. To achieve this cyclical movement of the guiding devices 22, 22', they are steered in a displaceable manner by a first direction and guiding means 23 arranged at the drum that, in the described embodiment, consists of a number of comparatively elongated elements in the form of U-shaped guide rails 24 that are uniformly distributed along the circumference of the drum 2 in the spaces between the beams 13 that define the peripheral surface of the drum. The guiding rails 24 are arranged parallel with the main axis 3 of the drum and each one supports its respective said guiding device 22, 22' that, via a sliding body 25, are guided by being displaced axially in guide rail 24. The first and second rings of guiding devices 22, 22' are further arranged so that they can independently of one another but in common in each ring, be displaced radially in relation to the drum 2, in other words, in and out of the drum. This movement of the guiding devices 22, 22' is achieved by the guide rails 24 being freely supported by arms 26 that extend radially from the hub of the drum 2 and that are evenly distributed along its circumference, and that second direction and guiding means 27 are active between the arms 26 and the guide rails 24 so that these can move along the arms. Because of the relatively large bending mo-

mentum that occurs at the attachment point between each guide rail 24 and arm 26, there is a requirement that only very small forces of friction occur between the relative movements of these parts. For this reason, every similar direction and guiding means 27 is preferably designed as a twin-axle trolley 28 with two rollers 29 arranged on each axle 30, and whose rollers have a diameter greater than the largest width of the body of the trolley. Each arm 26 is in this case essentially designed as a U-shaped guide rail 31 in which the trolley 28 is arranged to move and where the guide rail's rib and flange sections form, together with the trolley 28, the interacting guide and running surfaces.

[0016] The end of the guide rail 24 that supports the guiding devices 22, 22' is welded to the running trolley 28 and can move along the U-shaped rail's 31 longitudinal opening. The manoeuvring of the running trolley 28 along the U-shaped guide rail 31 and the manoeuvring of the sliding body 25 along guide rail 24 can take place independently of one another and in this case by means of pneumatically activated piston and cylinder 32 and 33 devices located in the said guide rails where the pressurised medium is transferred from a pressurised medium source to the said manoeuvring device 32, 33 via a per se known swivel function arranged at the hub of the drum 2.

[0017] The procedure according to the invention is explained in the sequence of drawings in fig. 8A - 8I with regard to the winding of elongated flexible elements onto partial reels and wrapping these partial reels with a covering of elastic film. As is evident from fig. 8A, the guiding devices 22, 22' are arranged in the form of a first and a second ring, 34 and 35 respectively, with three guiding devices included in each one of the said rings and arranged to move in common and simultaneously in a continuous cyclical path, i.e. both radially and axially in relation to the drum as shown in fig. 8C. The guiding devices 22, 22' in each ring 34, 35 are evenly distributed along the circumference of the drum 2 and are found within respective radial planes that, in the guiding device's active position, are found at their greatest distance from one another along the drum, as is shown in fig. 8B. In the example of the embodiment shown here, and as should be realised due to the chosen number of guiding devices over the circumference of the drum, the guiding device 22 of the first ring 34 is set-up at an angle of 45 degrees to the guiding device in the second ring's 35 guiding device 22', which is evident if fig. 8A is studied more closely. For the sake of simplicity, each arrangement of the guiding devices illustrated and described below has a common longitudinal section taken according to the lines X - X and Y - Y respectively in fig. 8A.

[0018] Step 1 (fig. 8D) shows the guiding devices 22, 22' in their respective active positions so that a flexible element fed through feeding mechanism 4 is wound onto a first reel on the first ring 34 by guiding device 22, i.e., the ring seen on the left in the figure. The second ring

35 of guiding device 22', i.e., the ring seen on the right in the figure, is not used and rotates freely in this position.

[0019] Step 2 (fig. 8E) shows a position where guiding device 22 of the first ring 34 has exchanged places with the guiding device 22' of the second ring 35 after the first reel on the guiding device of the first ring has been completed. The said exchange of positions has in this case taken place earlier by the second ring's 35 guiding device 22' being withdrawn into the drum 2 and moving within the drum 2 to the starting position for the guiding device 22 of the first ring 34, at the same time as the guiding device for the first ring, moving along the outside of the drum, has been transferred to the starting point for the guiding device of the second ring.

[0020] In step 3 (fig. 8F), the unit 6 for wrapping the wound element has been activated to wrap the finished reel with elastic film at the same time as a second reel is being wound on the ring guiding device seen on the left in the figure. When the wrapping process has been completed, the film is stretched so that it breaks off.

[0021] Step 4 (fig. 8G) shows a position where the first and second guiding devices 34 and 35 respectively have once more exchanged places just like in step 2 and where the reel wrapped earlier has simply been pushed or knocked outwards towards the free end of the drum 2 by the second, following reel.

[0022] Step 5 (fig. 8H) shows how the second reel is being provided with a wrapping film, while the first reel is located furthest out on the drum and a new reel is being wound by the guiding device of the inner ring.

[0023] To further improve accessibility during wrapping, it is preferable, but not essential, that the guiding device for the outer ring, as indicated in step 5 (fig. 8H), moves a short distance in towards the hub so that the finished reel pushed out on the drum 2 does not hamper the wrapping process.

[0024] In step 6 (fig. 8I) the second reel provided with a wrapping of film is moved to lie against the first reel so that both of these can be provided with a wrapping of film. When the wrapping process has been completed for both reels, the film is stretched so that it breaks off.

[0025] It should be pointed out that the whole process proceeds without interruption when the winding and wrapping with film can take place directly adjacent to the equipment that produces the flexible element, e.g. in cases when the equipment constitutes plastic injection equipment and the flexible element constitutes a plastic tube. The drum does not accelerate or brake during the winding and wrapping processes, which offers the advantage that the speed of production of the device according to the invention can be synchronised with the speed of the equipment in the preceding manufacturing step. The flexible element is not cut until a pre-determined number of partial reels or segments has been obtained. The final segment is, however, not provided with a film but is simply left on the drum. By employing the manufacturing process described above, a package of

the type shown in fig. 9 can be obtained that includes one continuous flexible element wound on a row of arranged partial reels or segments that are separated from one another by a wrapping of elastic film enclosing each one and that each one of the said partial reels is held together by a wrapping of plastic film that is common for all of them. By peripherally separating the wrapping common for all the reels, for example with a knife, and cutting the flexible element at a suitable place, a pre-determined length of element in the form of a pre-determined number of partial reels or segments can be simply removed from the package without the part or parts removed needing to be repackaged.

[0026] The present invention is not limited to that described above and shown in the illustrations but can be changed and modified in a number of ways within the scope of the following claims that describe the idea of the invention. For example, with the scope for this, it is possible to achieve the guiding device's continuous cyclical movements parallel with the main axis of the drum by a means different to that described and shown here, e.g. by means of a continuous chain, belt or similar passing over a wheel.

Claims

1. Procedure for winding flexible, elongated elements (5) onto reels and wrapping these with a protective film of elastic material, whereby the element is wound around a drum (2) turning around an axis (3) where the number of rotations is guided by details of the pre-determined length on the reel, the flexible element is arranged to run through a feeding mechanism (4) that via its displacement relative to the drum, guides the flexible element so that it is taken up onto the drum with evenly spaced turns, the element during winding is guided to keep its position for forming the reel within an axially limited area by means of a set of guiding devices (22, 22') projecting radially and in the same radial plane out from the drum and separated at a distance from one another along the periphery of the drum, so that in this way, the element wound on a reel is provided with a wrapping of elastic film (7) **characterised in that** in order to continuously carry out the process for winding the flexible element onto a pre-determined number of partial reels or segments arranged in a row along the drum and wrapping these with elastic film, a first and second set or ring (34, 35) of guiding devices (22, 22') are selectively arranged to move in synchrony with the rotation of the drum (2) in a continuous cyclical track that is primarily oriented to run parallel with the axis of rotation (3) of the drum including the steps; that the first and second ring of guiding devices (22, 22') are located in their respective working axial positions whereby the said guiding devices are momentarily located at an axial

distance from one another along the drum with the guiding devices' working parts extending radially out from the periphery of the drum where the wound element (5) is guided by the first ring of guiding devices (22) and the second ring of guiding devices (22') holds in place a previously formed partial reel while this is provided with a wrapping of elastic film (7); that after the winding of the partial reel on the first ring (34) of guiding devices (22) and the wrapping of the wound partial reel on the second ring (35) of guiding devices (22') have been completed the first and second rings (34, 35) of guiding devices (22, 22') exchange axial positions with one another by the second ring's guiding devices (22') withdrawing into the drum and moving within the drum to the working axial position of the first ring of guiding devices (22) at the same time as first ring's guiding devices (22), moving along the outside of the drum, move to the working axial position of the second ring of guiding devices (22'), whereby the wrapped partial reel is pushed out along the drum (2).

2. Procedure according to claim 1 **characterised in that** the wound partial reel, after moving along the outside of the drum (2) and pushing out the previously wrapped partial reel, is displaced somewhat back in a direction opposite to the direction of movement of the guiding devices (22, 22') along the outside of the drum (2) by a distance chosen so that the partial reel wrapped in the previous step does not hamper the wrapping process for this partial reel; and that the partial reel wrapped in the preceding stage is moved in the direction of movement of the guiding devices (22, 22') along the outside of the drum to lie against the reel wrapped previously, whereby both of these partial reels are provided with a common wrapping of elastic film (7).
3. Procedure according to any of the previous claims **characterised in** the use of a drum (2) supported in an overhanging, cantilever manner at one end and able to rotate, and that the partial reels wound and wrapped with elastic film (7) are pulled off from the drum after the working process has been completed.
4. Arrangement for carrying out the procedure according to any of the previous claims 1-3, the arrangement comprising a drum (2) turnable around an axis (3) and onto which drum the element is wound wherein the number of rotations is guided by details of the determined length on the reel, a feeding mechanism (4) through which the flexible element is fed and which guides the element to be taken up onto the drum with evenly spaced turns, a set of guiding devices (22, 22') which guides the flexible element onto the drum during winding for forming

the reel within an axially limited area, and a wrapping unit (6) for wrapping the wounded element with an elastic film, **characterised in that** it comprises first and second sets or rings (34, 35) of guiding devices (22, 22') that in synchrony with the rotation of the drum (2) are selectively arranged to move in common in a continuous cyclical track running primarily parallel with the pivoting axis (3) of the drum, the guiding devices (22, 22') being supported by several comparatively elongated elements (24) running parallel with the main axis of the drum and being evenly distributed along the periphery of the drum, first directional and guiding means (23) by which the guiding devices (22, 22') are displaceable to move in an axial direction along the elongated elements, second directional and guiding means (23) by which the elongated elements and at this the guiding devices (22, 22') are displaceable in a radial direction relative to the drum, the first and second rings of guiding devices (22, 22') are arranged on the elongated elements (24) so that they form two radial planes separated from one another between which the guiding devices (22, 22') are axially movable, whereby starting from a first axial position in which the first and second rings of guiding devices (22, 22') are located in a working position at an axial distance from one another along the drum with the guiding devices' working parts extending radially beyond the periphery of the drum, the first and second rings of guiding devices are arranged to exchange axial positions with one another under the influence of the said directional and guiding means (23, 27) manoeuvring mechanisms pulling the second ring of guiding devices (22') into the drum and thereby releasing a previously formed and wrapped partial reel, plus movement within the drum of the said second ring of guiding devices to the working axial position of the first ring's guiding devices (22) at the same time as the first ring's guiding devices (22), moving along the outside of the drum (2), are moved to the working axial position of the second ring of guiding devices (22'), pushing the wrapped partial reel out along the drum (2).

5. Arrangement according to claim 4 **characterised in that** the elongated elements (24) are freely supported by several arms (26) extending radially from the main axis at one end of the drum (2), and that the second directional and guiding means (27) is made up of guides arranged in the arms as well as a double-axle trolley (28) that interacts with opposite guiding and running surfaces arranged in the respective arm (26), whereby the elongated element (24) is connected to the said trolley.
6. Arrangement according to claims 4-5 **characterised in that** the elongated elements (24) consists of guide rails and that the first directional and guid-

ing devices (23) comprise sliding bodies (25) set up to run back and forth in the said guide rails.

7. Arrangement according to claim 6 **characterised in that** the drum (2) is formed from a number of elongated beams (13) that are supported by at least one hub housed to rotate around an axis and that are distributed along the periphery of the drum with an equal distance between them, and that the guide rails (24) for the guiding devices (22, 22') occupy the spaces between the said beams (13). 5 10
8. Arrangement according to claim 7 **characterised in that** the drum (2) is supported in an overhanging, cantilever manner on a frame (1) and is oriented to rotate around an essentially horizontal axis (3), and that the beams (13) that define the drum can be radially adjusted relative to the axis (3) to vary the diameter of the drum by means of direction and guiding devices (14) arranged at the ends of the drum. 15 20
9. Arrangement according to claim 8 **characterised in that** the direction and guiding devices (14) at one end of the drum (2) include several guide rails (15) extending radially from the hub and positioned with an equal distance between them along the periphery of the drum, and in which are arranged guiding and running surfaces set up for guides to run back and forth in the said rails and, at the other end of the drum, include a linear adjusting mechanism (16) extending between the free ends of two opposite beams (13). 25 30
10. Packaging including one continuous flexible element wound on a row of arranged partial reels or segments that are separated from one another by a wrapping of elastic film enclosing each one of the said reels and held together by a second wrapping of plastic film that is common for all of them, whereby by peripherally separating the wrapping common for all the reels, a pre-determined length of element in the form of a pre-determined number of partial reels can be simply removed from the package without the part or parts removed needing to be repackaged, and whereby the wounded partial reels or segments forming the packaging are core-free. 35 40 45

Patentansprüche

1. Verfahren zum Aufwickeln von flexiblen länglichen Elementen (5) auf Rollen und zum Umhüllen derselben mit einer Schutzfolie aus elastischem Material, bei dem das Element auf eine um eine Achse (3) drehende Trommel (2) aufgewickelt wird, wobei die Anzahl Umdrehungen von Einzelheiten der vorbestimmten Länge auf der Rolle abhängt, das flexible Element durch einen Zuführmechanismus (4) 50

geführt wird, welcher das flexible Element durch seine Verschiebung bezüglich der Trommel derart führt, dass es auf der Trommel in gleichmässig beabstandeten Windungen aufgewickelt wird und das Element beim Aufwickeln geführt ist, um seine Position zur Bildung der Rolle innerhalb eines axial begrenzten Bereichs zu halten, und zwar mittels einer Anzahl von Führungen (22, 22'), welche radial und in derselben radialen Ebene von der Trommel nach aussen weisen und entlang der Peripherie der Trommel voneinander beabstandet sind, so dass das auf einer Rolle aufgewickelte Element auf diese Weise mit einer Umhüllung aus elastischer Folie (7) versehen wird, **dadurch gekennzeichnet, dass** zur kontinuierlichen Durchführung des Verfahrens zum Aufwickeln des flexiblen Elements auf eine vorbestimmte Anzahl von in einer Reihe entlang der Trommel angeordneten Teilrollen bzw. Segmenten und zum Umhüllen derselben mit elastischer Folie ein erster und zweiter Satz oder Ring (34, 35) von Führungen (22, 22') synchron zur Drehung der Trommel (2) entlang einer kontinuierlichen, primär parallel zur Drehachse (3) der Trommel verlaufenden zyklischen Bahn wahlweise verschiebbar angeordnet sind, mit den Schritten, dass der erste und der zweite Ring von Führungen (22, 22') sich in ihrer jeweiligen axialen Arbeitsstellung befinden, wobei diese Führungen sich vorübergehend in axialem Abstand voneinander entlang der Trommel befinden und die Arbeitsteile der Führungen von der Peripherie der Trommel radial nach aussen weisen, wo das aufgewickelte Element (5) vom ersten Ring von Führungen (22) geführt wird und der zweite Ring von Führungen (22') eine zuvor gebildete Teilrolle festhält, während diese mit einer Umhüllung aus elastischer Folie (7) versehen wird; dass nach dem Aufwickeln der Teilrolle auf den ersten Ring (34) von Führungen (22) und dem Umhüllen der aufgewickelten Teilrolle auf dem zweiten Ring (35) von Führungen (22') die axiale Stellung des ersten und des zweiten Rings (34, 35) von Führungen (22, 22') vertauscht wird, indem die Führungen (22') des zweiten Rings in die Trommel zurückgezogen und innerhalb der Trommel zur axialen Arbeitsstellung des ersten Rings von Führungen (22) verschoben wird, während sich die Führungen (22) des ersten Rings gleichzeitig ausserhalb der Trommel zur axialen Arbeitsstellung des zweiten Rings von Führungen (22') bewegen, wodurch die umhüllte Teilrolle entlang der Trommel (2) nach aussen geschoben wird. 55

2. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** die aufgewickelte Teilrolle nach deren Verschiebung entlang der Aussenseite der Trommel (2) und dem Hinausschieben der zuvor umhüllten Teilrolle etwas entlang Aussenseite der Trommel (2) entgegen der Bewegungsrichtung der

Führungen (22, 22') zurückversetzt wird, um eine Strecke welche derart gewählt ist, dass die im vorangehenden Schritt umhüllte Teilrolle das Umhüllen dieser Teilrolle nicht stört; und dass die im vorangehenden Schritt umhüllte Teilrolle entlang der Aussenseite der Trommel in der Bewegungsrichtung der Führungen (22, 22') verschoben wird, um sie an die zuvor umhüllte Rolle anzulegen, wobei die beiden Teilrollen mit einer gemeinsamen Umhüllung aus elastischer Folie (7) versehen werden.

3. Verfahren nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** eine in überhängender, auslegerförmiger Art einseitig gelagerte, drehbare Trommel (2) verwendet wird, und dass die aufgewickelten und mit elastischer Folie (7) umhüllten Teilrollen nach Beendigung des Arbeitsvorgangs von der Trommel abgezogen werden.
4. Vorrichtung zur Durchführung des Verfahrens nach einem der vorangehenden Ansprüche 1 bis 3, mit einer Trommel (2), welche um eine Achse (3) drehbar ist und auf welche das Element aufgewickelt wird, wobei die Anzahl Umdrehungen von Einzelheiten der vorbestimmten Länge auf der Rolle abhängt, einer Zuführung (4), durch welche das flexible Element zugeführt wird, und welche das auf der Trommel mit gleichmässig beabstandeten Windungen aufzuwickelnde Element führt, einer Anzahl Führungen (22, 22'), welche das flexible Element während dem Aufwickeln auf der Trommel derart führt, dass die Rolle in einem axial begrenzten Bereich gebildet wird, und mit einer Verpackungseinheit (6) zum Umhüllen des aufgewickelten Elements mit einer elastischen Folie, **gekennzeichnet durch** einen ersten und zweiten Satz oder Ring (34, 35) von Führungen (22, 22'), welche gemeinsam synchron zur Drehung der Trommel (2) entlang einer kontinuierlichen, primär parallel zur Drehachse (3) der Trommel verlaufenden zyklischen Bahn wahlweise verschiebbar angeordnet sind, wobei die Führungen (22, 22') auf mehreren relativ länglichen Elementen (24) gelagert sind, welche parallel zur Hauptachse der Trommel verlaufen und gleichmässig über den Umfang der Trommel verteilt angeordnet sind, erste Richtungs- und Führungsmittel (23), **durch** welche die Führungen (22, 22') in axialer Richtung entlang den länglichen Elementen verschiebbar sind, zweite Richtungs- und Führungsmittel (23), **durch** welche die länglichen Elemente und damit die Führungen (22, 22') in radialer Richtung gegenüber der Trommel verschiebbar sind, wobei der erste und zweite Ring von Führungen (22, 22') derart auf den länglichen Elementen (24) angeordnet sind, dass sie zwei voneinander getrennte radiale Ebenen bilden, zwischen welchen die Führungen (22, 22') axial verschiebbar sind, und wobei ausgehend von einer ersten axialen Stellung,

in welcher sich der erste und der zweite Ring von Führungen (22, 22') in einer Arbeitsstellung in axialem Abstand voneinander entlang der Trommel befinden und die Arbeitsteile der Führungen radial über die Peripherie der Trommel hinausragen, der erste und der zweite Ring von Führungen in ihren axialen Stellungen miteinander vertauschbar angeordnet sind, und zwar unter der Einwirkung von Betätigungsmitteln der genannten Richtungs- und Führungsmittel (23, 27), welche den zweiten Ring von Führungen (22') in die Trommel ziehen und **dadurch** eine zuvor gebildete und umhüllte Teilrolle freigeben, zuzüglich einer Bewegung des genannten zweiten Rings von Führungen innerhalb der Trommel zur axialen Arbeitsstellung der Führungen (22) des ersten Rings, während die sich entlang der Aussenseite der Trommel (2) bewegendes Führungen (22) des ersten Rings gleichzeitig zur axialen Arbeitsstellung des zweiten Rings von Führungen (22') bewegt werden und die umhüllte Teilrolle auf der Trommel (2) nach aussen schieben.

5. Vorrichtung nach Anspruch 4, **dadurch gekennzeichnet, dass** die länglichen Elemente (24) frei auf einer Anzahl von Armen (26) abgestützt sind, welche an einem Ende der Trommel (2) radial von der Hauptachse nach aussen ragen, und dass die zweiten Richtungs- und Führungsmittel (27) aus in den Armen angeordneten Führungen sowie aus einem zweiachsigen Schlitten (28) bestehen, der mit einander gegenüberliegenden Führungs- und Laufflächen im jeweiligen Arm (26) zusammenwirkt, wobei das längliche Element (24) mit dem Schlitten verbunden ist.
6. Vorrichtung nach den Ansprüchen 4 bis 5, **dadurch gekennzeichnet, dass** die länglichen Elemente (24) aus Führungsschienen bestehen, und dass die ersten Richtungs- und Führungsvorrichtungen (23) Gleitkörper (25) aufweisen, welche in den Führungsschienen verschiebbar sind.
7. Vorrichtung nach Anspruch 6, **dadurch gekennzeichnet, dass** die Trommel (2) aus einer Anzahl länglicher Balken (13) besteht, welche an mindestens einer um eine Achse drehbar gelagerte Nabe befestigt und in gleichmässigen Abständen über den Umfang der Trommel verteilt sind, und dass die Führungsschienen (24) für die Führungen (22, 22') in den Zwischenräumen zwischen den Balken (13) angeordnet sind.
8. Vorrichtung nach Anspruch 7, **dadurch gekennzeichnet, dass** die Trommel (2) in der Art eines Auslegers überhängend an einem Gestell (1) angebracht und so ausgerichtet ist, dass sie um eine im wesentlichen horizontale Achse (3) drehbar ist, und dass die Balken (13), welche die Trommel bilden,

gegenüber der Achse (3) radial verstellbar sind, um den Durchmesser der Trommel über an den Enden der Trommel angeordnete Richtungs- und Führungsmittel (14) zu verändern.

9. Vorrichtung nach Anspruch 8, **dadurch gekennzeichnet, dass** die Richtungs- und Führungsmittel (14) am einen Ende der Trommel (2) eine Anzahl von Führungsschienen (15) aufweisen, welche radial von der Nabe abstehen und in gleichen Abständen voneinander am Umfang der Trommel angeordnet sind und Führungs- und Laufflächen für in den Schienen verschiebbare Führungen aufweisen, sowie am anderen Ende der Trommel eine zwischen den freien Enden zweier gegenüberliegender Balken (13) angeordnete lineare Verstellvorrichtung (16).
10. Verpackung mit einem zusammenhängenden flexiblen Element, welches auf eine Reihe von Teilrollen bzw. Segmenten aufgewickelt ist, die durch eine jede dieser Rollen umschliessende Umhüllung aus elastischer Folie voneinander getrennt sind und durch eine zweite, allen Rollen gemeinsame Umhüllung aus Plastikfolie zusammengehalten werden, wobei peripheres Teilen der allen Rollen gemeinsamen Umhüllung eine vorbestimmte Länge des Elements in Form einer vorbestimmten Anzahl von Teilrollen auf einfache Weise aus der Verpackung entnommen werden kann, ohne dass der entnommene Teil bzw. die entnommenen Teile neu verpackt werden müssen, und wobei die aufgewickelten Teilrollen oder Segmente, aus welchen die Verpackung besteht, keinen Kern aufweisen.

Revendications

1. Procédé permettant d'enrouler des éléments (5) allongés flexibles sur des bobines et d'envelopper ces dernières d'une feuille protectrice d'un matériau élastique, dans lequel l'élément est enroulé sur un tambour (2) tournant autour d'un axe (3), le nombre de tours étant fonction de détails de la longueur prédéterminée sur la bobine, l'élément flexible passant par un mécanisme d'alimentation (4) qui, par son déplacement par rapport au tambour, guide l'élément flexible de telle manière qu'il forme sur le tambour des enroulements à écarts réguliers, l'élément étant guidé pendant l'enroulement de manière à maintenir sa position pour former la bobine dans un domaine axial limité, à l'aide d'un ensemble de guidages (22, 22') s'étendant radialement du tambour dans un même plan radial et séparés l'un de l'autre par un intervalle le long de la périphérie du tambour, de sorte que l'élément enroulé sur une bobine est ainsi pourvu d'une enveloppe en feuille élastique (7), **caractérisé en ce que** pour une exécution con-

tinue du procédé permettant d'enrouler l'élément flexible sur un nombre prédéterminé de bobines partielles ou segments, arrangés dans une rangée le long du tambour, et d'envelopper ceux-ci d'une feuille élastique, un premier et un deuxième ensemble ou anneau (34, 35) de guidages (22, 22') sont sélectivement agencés de manière à se déplacer de façon synchrone avec la rotation du tambour (2) suivant un parcours cyclique continu évoluant essentiellement parallèle à l'axe de rotation (3) du tambour, comprenant les étapes: que le premier et le deuxième anneau de guidages (22, 22') se trouvent dans leurs positions axiales de travail respectives, lesdits guidages étant momentanément situés à un écart axial l'un de l'autre le long du tambour, les éléments de travail des guidages faisant saillie radialement de la périphérie du tambour, ou l'élément (5) enroulé est guidé par le premier anneau de guidages (22) et le deuxième anneau de guidages (22') retient en place une bobine partielle formée auparavant pendant qu'elle est pourvue d'une enveloppe en feuille élastique (7); que après avoir terminé l'enroulement de la première bobine partielle sur le premier anneau (34) de guidages (22) et l'enveloppement de la bobine partielle enroulée sur le deuxième anneau (35) de guidages (22'), le premier et le deuxième anneau (34, 35) de guidages (22, 22') échangent leurs positions axiales respectives par le retrait dans le tambour des guidages (22') du deuxième anneau et leur déplacement à l'intérieur du tambour vers la position axiale de travail du premier anneau de guidages (22) en même temps que les guidages (22) du premier anneau, se déplaçant le long de l'extérieur de tambour, passent à la position axiale de travail du deuxième anneau de guidages (22') en poussant la bobine partielle enveloppée le long du tambour (2) vers l'extérieur.

2. Procédé selon la revendication 1, **caractérisé en ce que** la bobine partielle enroulée, après son déplacement le long de l'extérieur du tambour (2) et ayant poussé la bobine partielle précédemment enveloppée vers l'extérieur, est quelque peu reculée dans une direction opposée à la direction de mouvement des guidages (22, 22') le long de l'extérieur du tambour (2) d'une distance choisie de telle manière que la bobine partielle enroulée au cours de l'étape précédente ne gêne pas l'enveloppement de cette bobine partielle; et que la bobine partielle enveloppée dans l'étape précédente est déplacée dans la direction de mouvement des guidages (22, 22') le long de l'extérieur du tambour pour venir s'appliquer contre la bobine précédemment enveloppée, les deux bobines partielles étant pourvues d'une enveloppe commune en feuille élastique (7).
3. Procédé selon l'une quelconque des revendications

précédentes, **caractérisé par** l'utilisation d'un tambour (2) supporté en surplomb à la manière d'un porte-à-faux à l'une de ses extrémités et rotatif, et en ce que les bobines partielles enroulées et enveloppées de feuille élastique (7) sont retirées du tambour lorsque l'opération est terminée.

4. Dispositif pour la mise en oeuvre du procédé selon l'une quelconque des revendications précédentes 1 à 3, comprenant un tambour (2) rotatif autour d'un axe (3), sur lequel l'élément est enroulé, le nombre de tours étant fonction de détails de la longueur déterminée sur la bobine, un mécanisme d'alimentation (4) par lequel l'élément flexible est alimenté et qui guide l'élément destiné à être enroulé sur le tambour de manière à former des enroulements à écarts réguliers, un ensemble de guidages (22, 22') guidant l'élément flexible sur le tambour pendant l'enroulement de manière à former la bobine dans un domaine axial limité, et une unité d'enveloppement (6) permettant d'envelopper l'élément embobiné d'une feuille élastique, **caractérisé en ce qu'il** comporte un premier et un deuxième ensemble ou anneau (34, 35) de guidages (22, 22') qui, de façon synchrone avec la rotation du tambour (2), sont sélectivement agencés de manière à se déplacer conjointement suivant un parcours cyclique continu évoluant essentiellement parallèle à l'axe de rotation (3) du tambour, les guidages (22, 22') étant soutenus par plusieurs éléments relativement allongés (24), parallèles à l'axe principal du tambour et distribués régulièrement le long de la périphérie du tambour, des premiers moyens directionnels et de guidage (23) par lesquels les guidages (22, 22') sont déplaçables en direction axiale le long des éléments allongés, des deuxièmes moyens directionnels et de guidage (23) par lesquels les éléments allongés et donc les guidages (22, 22') sont déplaçables en direction radiale par rapport au tambour, le premier et le deuxième anneau de guidages (22, 22') étant disposés sur les éléments allongés (24) de manière à former deux plans radiaux séparés l'un de l'autre, entre lesquels les guidages (22, 22') sont axialement déplaçables, et partant d'une première position axiale dans laquelle le premier et le deuxième anneau de guidages (22, 22') se trouvent dans une position de travail à un intervalle axial le long du tambour et les éléments de travail des guidages dépassent radialement la périphérie du tambour, le premier et le deuxième anneau de guidages étant disposés de manière à pouvoir échanger leurs positions axiales respectives sous l'action de mécanismes d'actionnement desdits moyens directionnels et de guidage (23, 27), qui retirent le deuxième anneau de guidages (22') dans le tambour, libérant ainsi une bobine partielle précédemment formée et enveloppée, plus le déplacement du deuxième anneau de guidages à l'intérieur du

tambour à la position axiale de travail des guidages (22) du premier anneau en même temps que les guidages (22) du premier anneau, se déplaçant le long de l'extérieur du tambour (2), passent à la position axiale de travail du deuxième anneau de guidages (22') en poussant la bobine partielle enveloppée vers l'extérieur le long du tambour (2).

5. Dispositif selon la revendication 4, **caractérisé en ce que** les éléments allongés (24) sont librement soutenus par plusieurs bras (26) s'étendant radialement de l'axe principal à l'une des extrémités du tambour (2), et que les deuxièmes moyens directionnels et de guidages (27) sont composés de guidages agencés dans les bras et d'un chariot (28) à axe double coopérant avec des surfaces de guidage et de roulement opposées, agencées dans le bras (26) correspondant, l'élément allongé (24) étant relié audit chariot.
6. Dispositif selon les revendications 4 à 5, **caractérisé en ce que** les éléments allongés (24) sont des rails de guidage, et que les premiers moyens directionnels et de guidage (23) comprennent des éléments coulissants (25) adaptés à se déplacer dans lesdits rails de guidage.
7. Dispositif selon la revendication 6, **caractérisé en ce que** le tambour (2) est composé d'un nombre de poutres (13) allongées, soutenues par au moins un moyeu logé de manière rotative autour d'un axe et distribuées sur la périphérie du tambour à des intervalles égaux, et que les rails de guidage (24) pour les guidages (22, 22') occupent les espaces entre lesdites poutres (13).
8. Dispositif selon la revendication 7, **caractérisé en ce que** le tambour (2) est monté en surplomb et en porte-à-faux sur un bâti (1) et orienté pour tourner autour d'un axe (3) essentiellement horizontal, et que les poutres (13) formant le tambour sont réglables radialement par rapport à l'axe (3) afin de varier le diamètre du tambour au moyen de dispositifs de direction et de guidage (14) agencés aux extrémités du tambour.
9. Dispositif selon la revendication 8, **caractérisé en ce que** les dispositifs de direction et de guidage (14) à l'une des extrémités du tambour (2) présentent plusieurs rails de guidage (15) s'étendant radialement du moyeu et disposés à des intervalles égaux le long de la périphérie du tambour, et dans lesquels sont agencées des surfaces de guidage et de roulement destinées à des guidages déplaçables dans lesdits rails, et que lesdits dispositifs à l'autre extrémité du tambour comprennent un mécanisme de réglage (16) linéaire s'étendant entre les extrémités libres de deux poutres (13) opposées.

10. Emballage contenant un élément flexible continu, enroulé sur une série de bobines partielles ou segments arrangés, séparés l'un de l'autre par une enveloppe en feuille élastique qui enveloppe chacune desdites bobines, et réunis par une deuxième enveloppe en feuille plastique commune à tous les segments, de sorte qu'en séparant à la périphérie l'enveloppe commune de toutes les bobines une longueur prédéterminée de l'élément sous forme d'un nombre prédéterminé de bobines partielles peut être retiré de l'emballage simplement, sans que la ou les partie(s) retirées doivent être emballées à nouveau; les bobines partielles ou segments formant l'emballage étant libres de noyaux.

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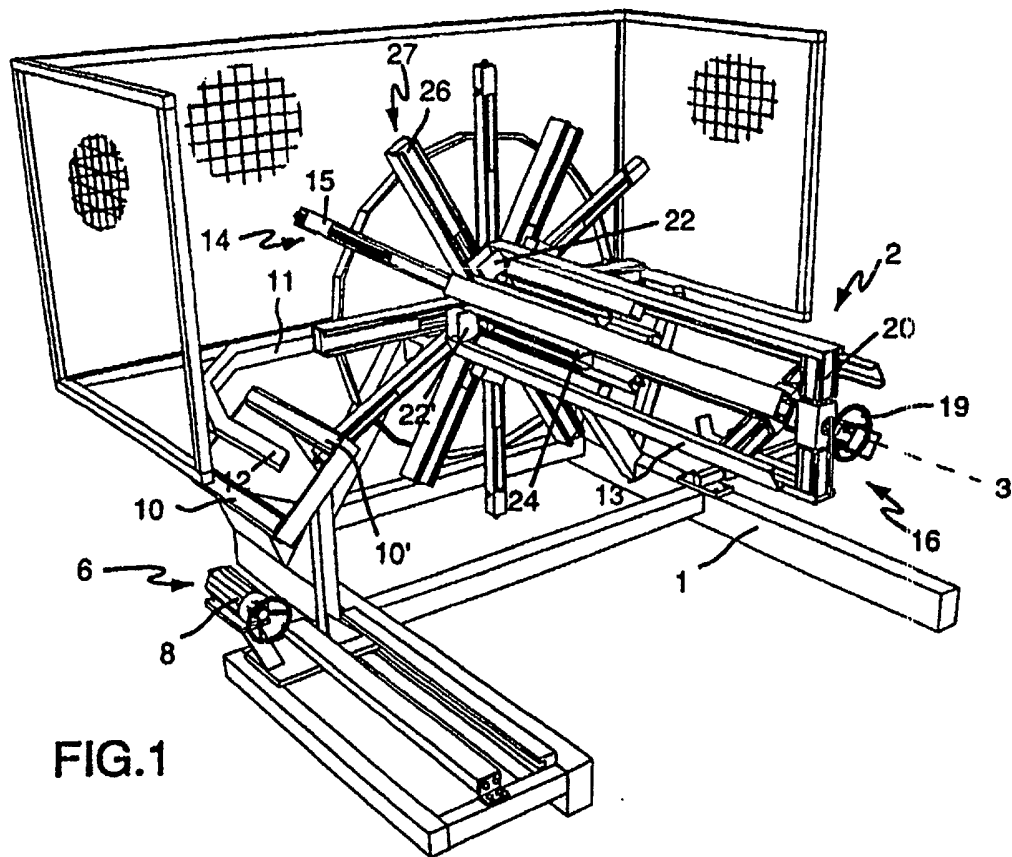


FIG. 1

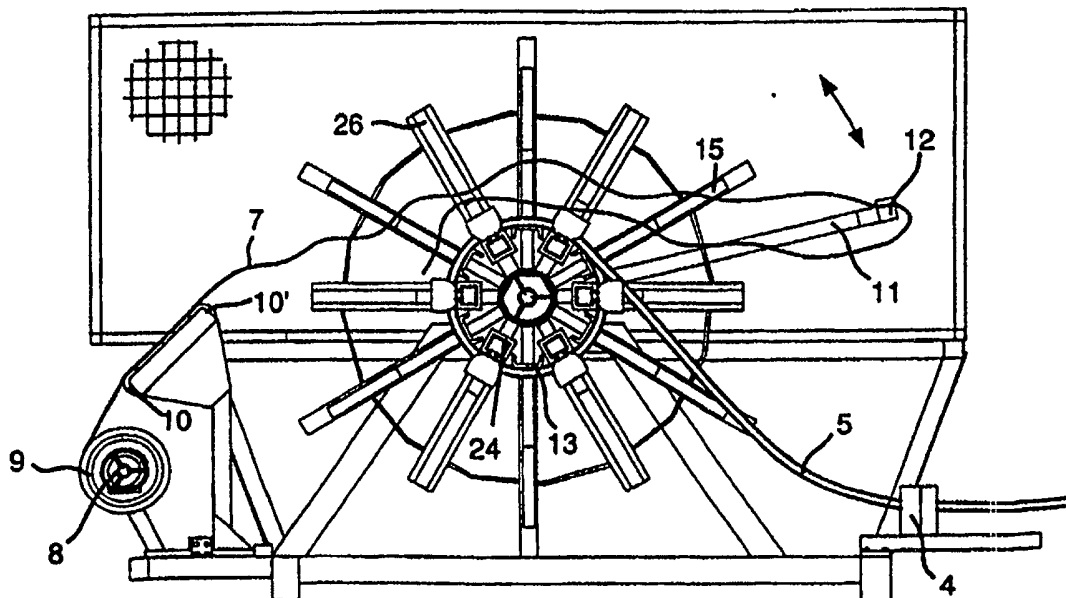
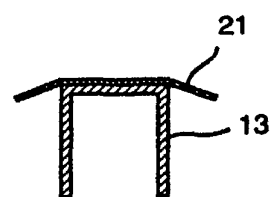
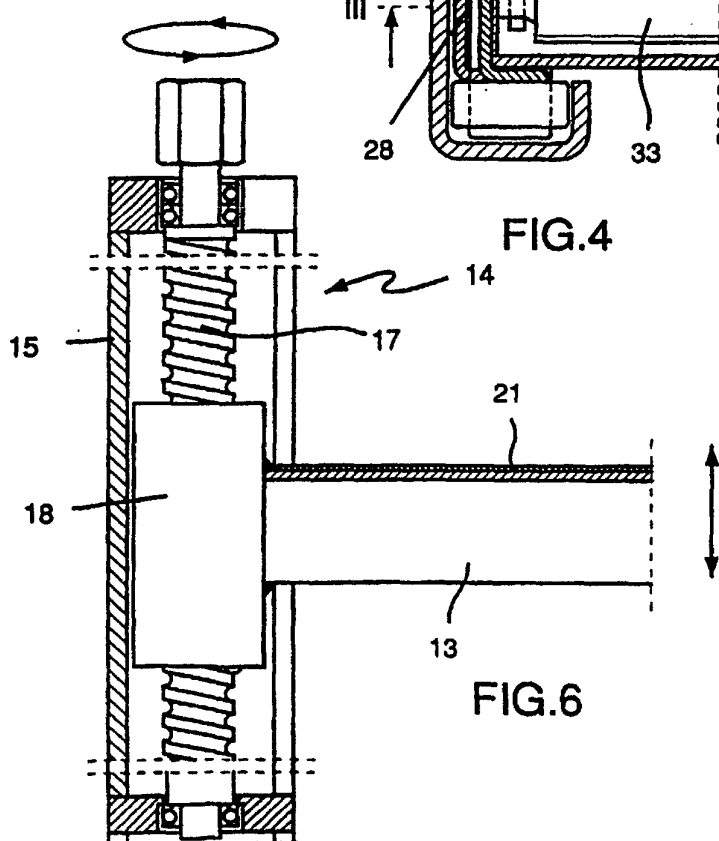
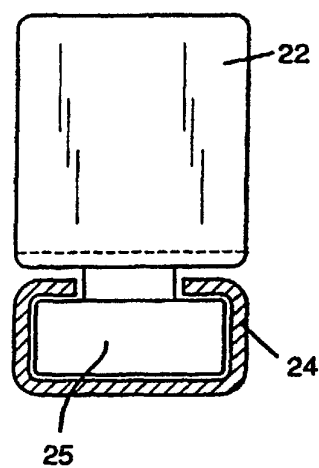
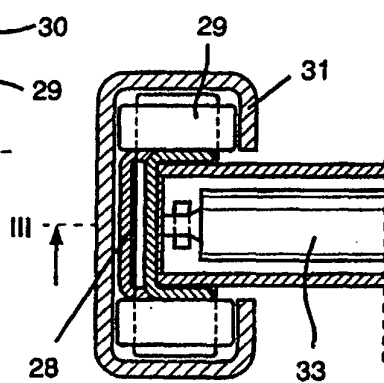
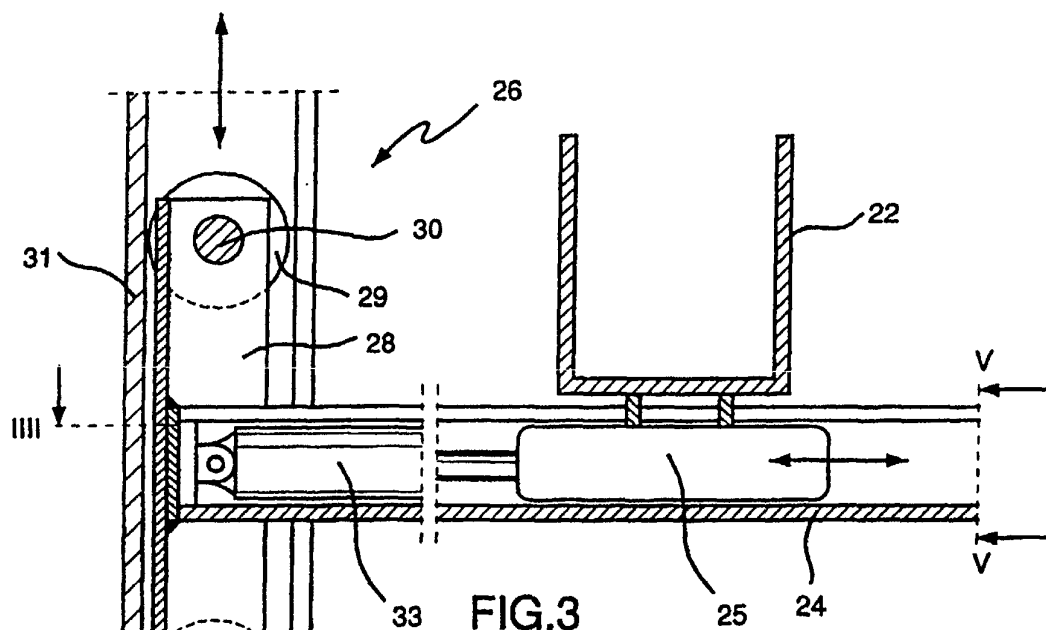


FIG. 2



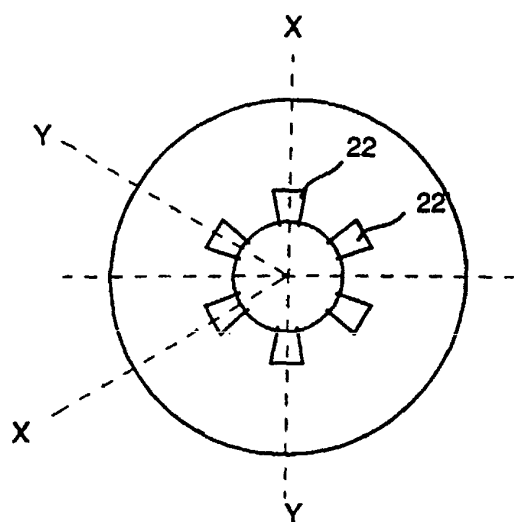


FIG. 8A

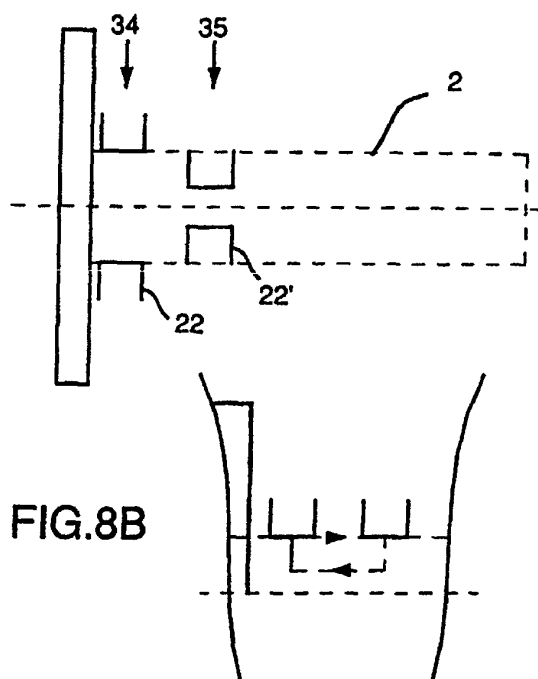


FIG. 8B

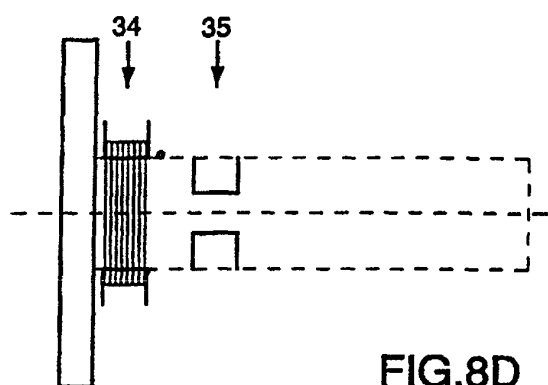


FIG. 8D

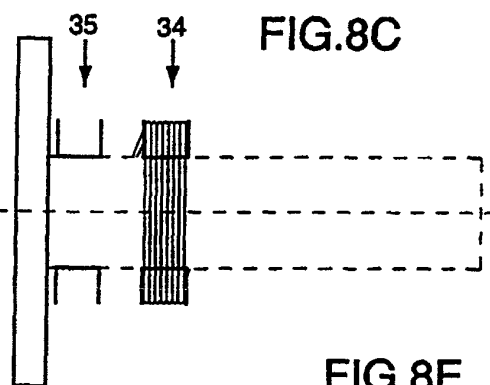


FIG. 8E

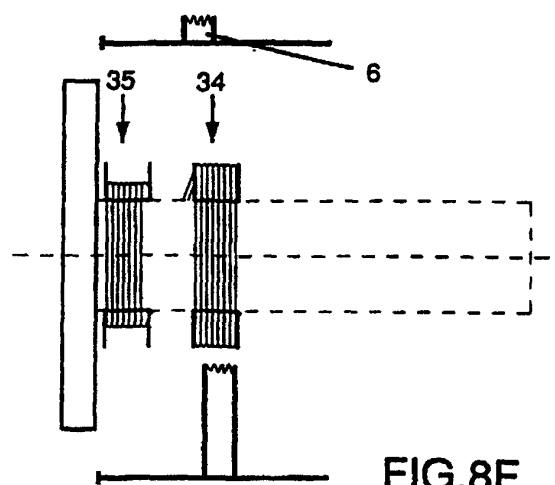


FIG. 8F

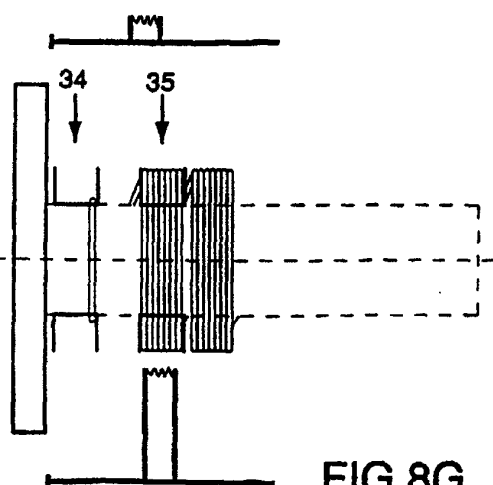


FIG. 8G

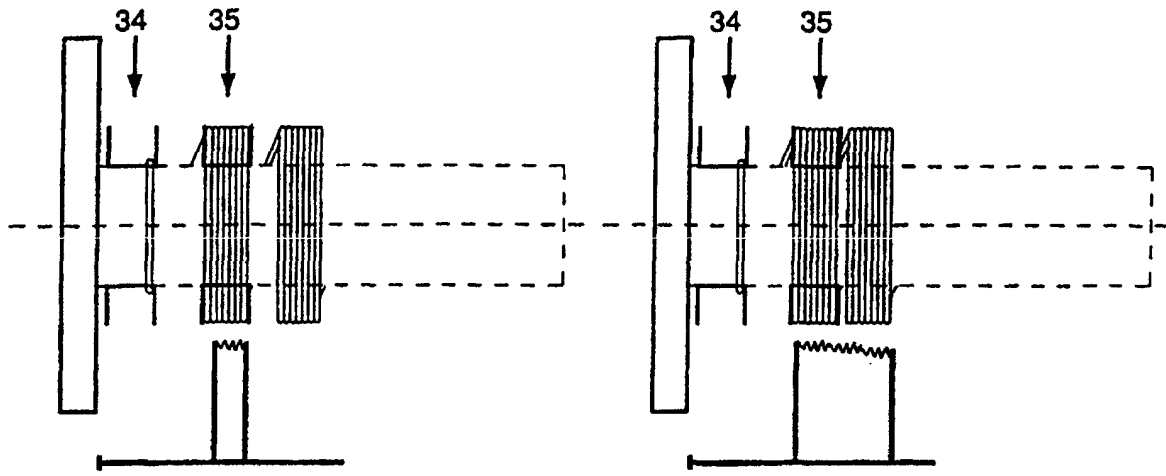


FIG. 8H

FIG. 8I

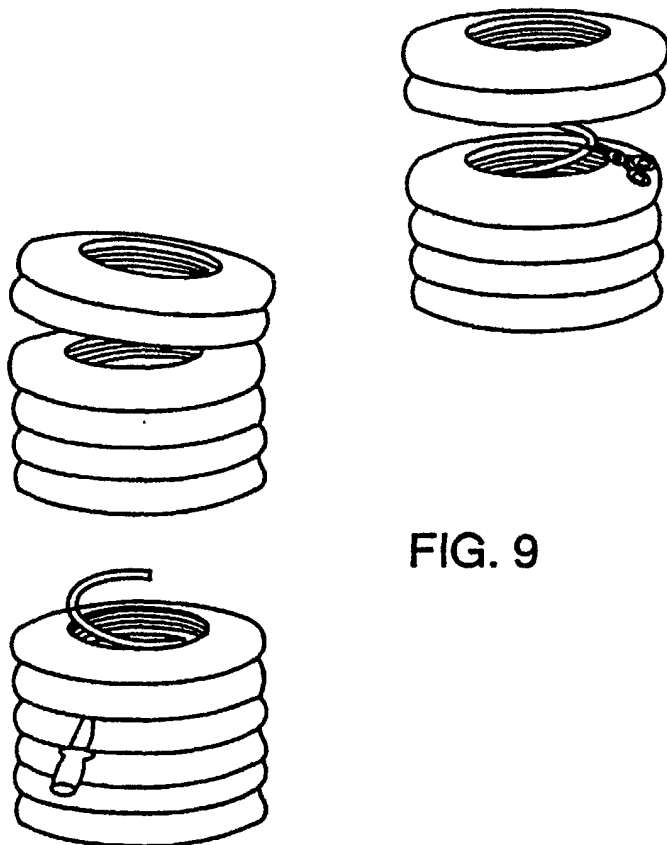


FIG. 9