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(54) **Method and apparatus for wrapping round articles, particularly soaps, in an extensible plastic film**

(57) A method for wrapping articles (S), particularly soaps or similar, having a rotational axis of symmetry (A), and particularly a substantially round, spherical or circular shape, in an extensible plastic film. The method provides that a continuous and substantially horizontal tape (1), formed by the extensible plastic film, is fed in its longitudinal direction (5) while being held by its longitudinal lateral edges, in such a way as to keep such edges at a substantially unchanging transverse distance, and the articles (S) are sequentially pushed - with their rotational axes of symmetry (A) in a substantially vertical orientation - each one progressively downwards against

said extensible tape (1), thereby deforming it and forming substantially funnel-shaped housings (16) therein, each one holding on its bottom one article (S), whereupon each article (S) is rotated about its axis of symmetry (A), together with its funnel-shaped housing (16), in such a way as to close said housing directly above the article (S) by a spiral choke (T), and then the extensible film is cut a little above this spiral choke (T) thus causing the wrapped article (S') to be separated from the continuous extensible tape (1).

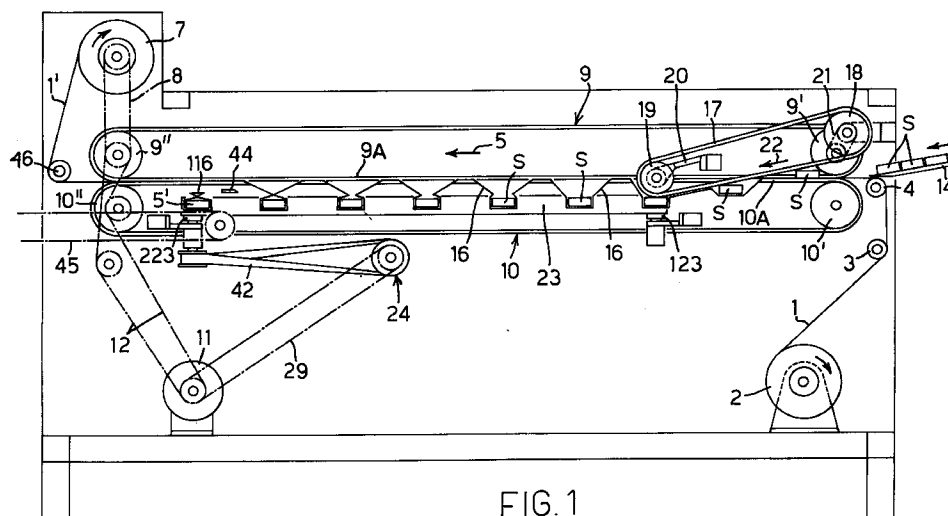


FIG. 1

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Description

The invention relates to a method and an apparatus for wrapping articles, particularly soaps or similar, having a rotational axis of symmetry, and especially a round or substantially circular shape, in an extensible plastic film.

The invention has the object to have said articles wrapped in the extensible film using a continuous tape of such a film, without cutting single foils from said tape, and also recovering the scrap in the form of continuous tape. At the same time, the invention aims at closing the extensible film envelope in a secure way and without welding, and obtaining a flat closure, which allows an easy application of a further overlapping label, or similar. The method according to the invention should be able to be implemented on a linear machine, with no sizing units, and having a simple and cheap construction, as well as a reliable operation, removing or at least considerably reducing the risks that the extensible plastic film may be broken (burst) or torn.

Said problems are solved by the invention thanks to a method, wherein a continuous and substantially horizontal tape, formed by an extensible plastic film, is fed in its longitudinal direction, while being held at its longitudinal side edges, in such a way as to keep such edges at a substantially unchanging transverse distance. The articles to be wrapped are sequentially pushed - with their rotational axes of symmetry in a substantially vertical orientation - each one progressively downwards against said extensible tape, thereby deforming it and forming substantially funnel-shaped housings therein, each one holding on its bottom one article. Thereafter, each article is rotated about its axis of symmetry, together with its housing of extensible film, in such a way as to close said housing directly above the article by a spiral choke. Then, the extensible film is cut a little above this closing spiral choke thereby causing the wrapped article to be separated from the rest of the extensible tape.

It has further been found, according to the invention, that the number of turns made by the article and by its funnel-shaped housing of extensible film about the rotational axis of symmetry of the article, to obtain the closing spiral choke, and the distance between the cut made to separate the wrapped article and this closing spiral choke, may be chosen in such a way that the rest of the funnel-shaped housing, attached to the closing spiral choke, is automatically flattened and stretched, by adhesion on the corresponding surface of the wrapped article, probably thanks to internal stress in the extensible film and/or to electrostatic forces.

Preferably, according to another characteristic of the invention, the continuous tape formed by the extensible plastic film, is unwound from a corresponding feeding coil, whereas the scrap tape, also continuous and provided with apertures formed by those cuts which were made to separate the wrapped articles, is rolled on

a winding coil.

The forward longitudinal motion of the continuous tape, may be an intermittent motion, in synchronism with the pacing feed of the articles to be wrapped, and in this case at least some of the single operations involved in the method may be executed in specific stations during the stop intervals between the forward steps of the tape. However, preferably, according to an advantageous embodiment of the invention, the continuous extensible tape is moved forward in a continuous and uniform motion and at least some of the single operations involved in the method are executed during such a continuous forward motion of the extensible tape, while benefiting of said forward motion of the tape.

The method according to the invention may be implemented with any mechanical means fit for the purpose. However, the invention provides, for the implementation of the method, a preferred apparatus, comprising:

- a) means for guiding and feeding a continuous extensible plastic tape in its longitudinal direction and in a substantially horizontal plane, preferably while uncoiling it from a feeding coil,
- b) tape stretching means for guiding and holding the longitudinal side edges of the extensible tape during its forward movement, in such a way as to keep the transverse distance between these edges substantially unchanging,
- c) means for sequentially feeding the articles to be wrapped, preferably in paced succession, on the extensible tape, the rotational axis of symmetry of these articles being oriented substantially perpendicular to said tape,
- d) pushers, for progressively pushing each article downwards against the extensible tape, so as to sink the article in this tape, i.e. in such a way as to deform the tape, thereby forming a substantially funnel-shaped housing, holding the article on its bottom,
- e) article-rotating means, for rotating the article about its rotational axis of symmetry, together with its funnel-shaped housing, formed in the extensible tape, thereby closing this housing by a spiral choke directly above the article,
- f) cutting means, for cutting the extensible film at a certain distance above the closing spiral choke, thereby separating the wrapped article from the rest of the extensible tape, and
- g) preferably, means for winding the remaining scrap tape, with apertures therein, on a winding coil.

In this apparatus, the operational and functional means may have many different constructions fit for the purpose. One embodiment of said means, as well as the peculiar characteristics of the invention and the advantages derived therefrom, will be apparent from the

following description of a preferred example, schematically shown in the accompanying drawings, in which:

Fig. 1 is a longitudinal vertical sectional view of an automatic apparatus according to the invention.

Fig. 2 is a partial top view thereof.

Figs. 3 and 4 show - in a larger scale and in a vertical section transverse to the extensible tape - two successive steps of the method for wrapping an article in the extensible film.

Fig. 5 is a top view of the singularizing and pacing device for feeding the articles to be wrapped.

Fig. 6 is an axial sectional view of a differential speed variator, provided in the driving system of the apparatus.

Fig. 7 is a perspective view of an article wrapped in an extensible film.

The illustrated apparatus is designed to automatically wrap in an extensible plastic film, for example in an extensible polyethylene film having a thickness of 17 to 30 μ , articles having a rotational axis of symmetry A, for example round articles, which may particularly have a circular cylindrical shape, with plane or more or less convex end surfaces. The apparatus according to the invention is particularly designed to automatically wrap, in an extensible film, relatively delicate articles, such as especially soaps S or similar, but may be obviously used for any other article or product.

The apparatus operates with a continuous tape 1, formed by the extensible plastic film. This extensible tape 1 is unwound from a feeding coil 2 and, after passing around return rollers 3, 4, is guided along a straight and substantially horizontal path, sliding, in the illustrated embodiment, with a continuous and uniform motion in its longitudinal direction, following arrow 5. At the end of such a straight and substantially horizontal path, the extensible tape 1 has apertures 6, caused - as described hereafter - by the separation of the soaps S' wrapped in the extensible film, and becomes a scrap tape 1', also continuous, which after passing around a return roller 46, is wound on a winding coil 7, appropriately rotatably driven by a belt or chain drive 8.

All along its straight and substantially horizontal path between the return rollers 4 and 46, the two longitudinal side edges of the extensible tape 1 are guided and held at the same transverse distance by tape-stretching means which lead the extensible tape 1, sliding therewith in the direction of arrow 5. In the illustrated embodiment, these transverse tape-stretching means consist of a pair of superposed endless tape-stretching belts 9 and 10 for each longitudinal side edge of the extensible tape, each stretched between two associated return pulleys 9', 9" and 10', 10", which are close to the two ends of the straight horizontal path of the extensible tape 1, and whose axes of rotation have a horizontal and transverse orientation with respect to the extensible tape 1. The return pulleys 9" and 10" at one end of the

straight horizontal path of the extensible tape 1, are driven by a motor 11, through a belt or chain transmission 12, so that the two so-called tape-grasping branches 9A and 10A, directly superposed and cooperating with each other, of each pair of associated tape-stretching belts 9 and 10, run at the same speed as the extensible tape 1, and following the same direction 5 as that tape 1. The winding coil 7 for the scrap tape 1' may be driven, through the transmission 8, by the return pulley 9" of a tape-stretching belt 9.

The two belts of each pair of tape-stretching belts 9 and 10 are provided, at their outer side, with longitudinal teeth, preferably having a triangular profile, or similar. All along the straight and substantially horizontal path of the extensible tape 1, the longitudinal teeth of the two directly superposed and cooperating tape-grasping branches 9A and 10A of each lateral pair of tape-stretching belts 9 and 10, are engaged with each other by their longitudinal teeth and scarf therebetween the corresponding longitudinal edge of the extensible tape 1, as shown in figs. 3 and 4.

All along the straight horizontal path of the extensible tape 1, the two tape-grasping branches 9A, 10A, mutually engaged by their longitudinal teeth, of each pair of tape-stretching belts 9, 10, are slidably guided in a corresponding stationary longitudinal guide 13, having a C-profile and being open towards the extensible tape 1. One of these tape-grasping branches of each pair of tape-stretching belts 9, 10, and for example the tape-grasping branch 9A of the upper belts 9, is guided in its respective stationary longitudinal C-shaped guide 13, by means of a rim 113, transverse to the end of the corresponding wing of the C profile, in such a way that it cannot be moved transverse to the longitudinal direction of the extensible tape 1, whereas the other tape-grasping branch of each pair of tape-stretching belts 9, 10, and for example the tape-grasping branch 10A of the lower tape-stretching belts 10 is guided so as to be able to move freely transverse to its longitudinal extension, and therefore transverse to the longitudinal direction of the extensible tape 1. In this way, when transverse forces are applied on the extensible tape 1, for example due to pressure exerted on the tape 1 perpendicular to its plane, whereby the two longitudinal side edges of the extensible tape 1 tend to be approached, the transversely movable tape-grasping branches 10A of the two directly superposed and mutually engaged tape-grasping branches 9A, 10A of the two pairs of tape-stretching belts 9, 10, associated to the two longitudinal edges of the extensible tape 1, are pulled and slightly moved transverse to the extensible tape 1, scarfed between the longitudinal teeth of said tape 1, thus pressing the inner sides of their longitudinal triangular teeth against the facing outer sides of the longitudinal triangular teeth of the associated transversely unmovable tape-grasping branch 9A. Thereby, the longitudinal edges of the extensible tape 1 are grasped between the mutually pressed sides of the longitudinal teeth of the two cooperating

tape-grasping branches 9A and 10A of the two lateral pairs of tape-stretching belts 9 and 10, and therefore are held firmly and securely against any transverse motion, by a force which is proportional to the transverse stress applied on the extensible tape 1, as is apparent from figs. 3 and 4, where fig. 3 over-emphasizes the reciprocal positions of the two cooperating tape-grasping branches 9A and 10A, in a condition of no transverse stress applied on the extensible tape 1, and fig. 4 over-emphasizes the relative position of the two cooperating tape-grasping branches 9A and 10A, when the extensible tape 1 is loaded and transversely stretched, showing the transverse movement of the transversely slidable tape-grasping branch 10A of the two pairs of lateral tape-stretching belts 9, 10.

The articles to be wrapped in the extensible plastic film, for example consisting in circular soaps S, having a rotational axis of symmetry A, are fed to the input end of the apparatus, and sequentially laid on the extensible tape 1 at regular predetermined intervals, for example by means of a chute feeder 14 and with the help of an anchor-operated singularizer and pacer 15, as shown in fig. 5. The soaps are laid on the extensible tape 1, with their rotational axes of symmetry in vertical orientation, i.e. substantially perpendicular to the plane of the extensible tape 1, as particularly shown in fig. 3. While further conveying the soaps S, by the extensible tape 1, in the forward direction 5 thereof, each soap S is progressively pushed downwards against the extensible tape 1, progressively deforming it (due to its longitudinal edges being retained, as described above, by the pairs of tape-stretching belts 9, 10) in such a way as to form, in the extensible tape 1, substantially funnel-shaped respective housings, holding on their bottom the soap S, as shown in fig. 1 and, in larger scale, in fig. 4.

In the illustrated embodiment, said progressive pushing action on each soap S downwards against the extensible tape 1, and the subsequent progressive sinking movement of the soap S in a housing 16 formed thereby in said tape 1, are obtained by means of an endless slanting soap-pushing belt 17, particularly shown in figs. 1 and 4. This soap-pushing belt 17 is disposed above the extensible tape 1, and extends in the longitudinal direction thereof, passing around two return pulleys 18 and 19, having horizontal axes transverse to the extensible tape 1. The rear return pulley 18 (with respect to the forward direction 5 of the extensible tape 1) is mounted on the casing of the apparatus in such a position that, thereat, the lower branch of the soap-pushing belt 17 is higher than the upper surface of the soaps S, fed to and laid on the extensible tape 1. The fore return pulley 19 of the soap-pushing belt 17 is lower than the rear pulley 18, and is carried, for example, by a projecting support 20 (fig. 1), which may be also made to be angularly movable, so that the level of the fore pulley 19 may be adjusted. The soap-pushing belt 17 is driven - for example by means of its rear return pulley 18 and of a chain or belt drive 21 whose movement is

derived from the return pulley 9' of one of the upper tape-stretching belts 9 - in such a way that its lower branch, downwardly slanting with respect to the forward direction 5 of the extensible tape 1, runs following arrow 22, i.e. in the same direction as the forward direction 5 of the extensible tape 1, and at the same speed as that tape.

Instead of being driven, said soap-pushing belt 17 may be also idle, and pulled by the soaps S in contact therewith. Furthermore, if less delicate articles, which can resist to some rubbing, are to be wrapped in the extensible plastic film instead of soaps, the belt 17 may be replaced by a stationary article-pushing plane, having the same slant as the lower branch of said belt 17, and on whose lower surface the articles to be wrapped slide, and are laid on the extensible tape 1 and dragged thereby.

Anyway, thanks to the above described progressiveness wherewith the extensible tape 1 is deformed by the soap S, in the form of a funnel-shaped housing 16, due to the slanting soap-pushing belt 17, and thanks to the corresponding progressiveness wherewith the extensible tape 1, held at its longitudinal edges by the pairs of tape-stretching belts 9 and 10, is stretched, any risk that the extensible tape 1 may be broken (burst) is prevented, in spite of the considerable depth of the housings 16, formed in the tape 1.

When the soap S has been completely lowered by the slanting soap-pushing belt 17, and particularly at the fore return pulley 19 of this belt 17, it is inserted and engaged between the facing and parallel inner branches of two endless soap-rotating belts 23, extending in the longitudinal direction of the extensible tape 1, at a certain distance therefrom, which substantially corresponds to the depth of the funnel-shaped housings 16 formed in the extensible tape 1. Each of these soap-rotating belts 23 is led around return pulleys 123, 223, having substantially vertical axes. The two soap-rotating belts 27 are driven in such a way, that their facing inner branches, adhering from opposite sides against the soap S inserted therebetween, there being interposed the film of the corresponding housing 16 formed in the extensible tape 1, run in the same forward direction 5 as the extensible tape 1, at different speeds, so as to cause - while the tape 1 is further fed - the soap S to be rotated together with its respective funnel-shaped housing 16 of extensible film, about the vertical rotational axis of symmetry A of the soap S. Hence, for example, one of the soap-rotating belts 23 may be driven at the same speed as the extensible tape 1, whereas the other soap-rotating belt is driven at a slightly lower or higher speed, thus causing said rotation of the soap S together with its funnel-shaped housing 16 of extensible film.

Said differential drive of the two soap-rotating belts 23 may be obtained by any suitable means. In the illustrated example, the invention provides a differential speed variator 24 of the mechanical and friction-operated type, and particularly a variator with wedge-

shaped wheels, as shown in fig. 6. This variator 24 comprises a tubular shaft 25, which is mounted in such a way as to rotate by means of bearings 26 in two lateral supports 27. On the shaft 25, a driving pulley 28 is attached, which is driven by the motor 11 through a belt 29. The variator 24 also comprises two coaxial and adjacent wedge-shaped wheels, one of which consists of a conical half-wheel 30, fixed on the shaft 25, and of a biconical half-wheel 31, which is common to both coaxial wedge-shaped wheels and is mounted in such a way as to be able to slide axially on the shaft 25. The other wedge-shaped wheel consists of the biconical half-wheel 31 and of another conical half-wheel 32, which is provided on the side of the biconical half-wheel 31, opposite to the conical half-wheel 30, and is also mounted in such a way as to be able to slide axially on the shaft 25. Hence, the differential variator 24 consists of a median biconical half-wheel 31, interposed between two lateral conical half-wheels 30 and 32. The median biconical half-wheel 31 is rotatably coupled to the shaft 25 by means of a diametrical pin 33, which is passed through two diametrically opposite longitudinal slits 34 of the tubular shaft 25 so as to be able to slide axially, and is engaged in corresponding lateral notches 131 of the median biconical half-wheel 31. The slidable conical half-wheel 32 is also rotatably coupled to the shaft 25 by means of a diametrical pin 35, which is fixed to the hub of said conical half-wheel 32 and passes through two diametrically opposite longitudinal slits 36, provided in the tubular shaft 25, in such a way as to be able to slide axially. Inside the tubular shaft 25, between the coupling diametrical pins 33 and 35, the one integral with the biconical half-wheel 31 and the other integral with the conical wheel 32, a helical pressure spring 37 is interposed. Thanks to this spring 37, the median biconical half-wheel 31 axially rests - by means of its coupling diametrical pin 33 and of a prop 38, which is housed in the tubular shaft 25, so as to be able to slide axially - against an adjustment screw 39, which is screwed through the support 27 on the side of the driving pulley 28, coaxial to the tubular shaft 25, and is inserted in this shaft through its respective open end. Likewise, by the spring 37, the slidable conical half-wheel 32 axially rests - by means of its coupling diametrical pin 35 and of a prop 40, which is housed in the tubular shaft 25, so as to be able to slide axially - against an adjustment screw 41, which is screwed through the other support 27, coaxial to the tubular shaft 25, and is inserted in this shaft through its respective open end. The mechanical support contacts between the adjustment screws 39, 41 and their respective axial props 38, 40 and/or between these props and the associated coupling diametrical pins 33, 35 are of a substantially dot-like shape or are limited to small areas, thanks to a corresponding conformation of the ends of the screws 39 and of the props 38, 40.

The wedge-shaped wheel, consisting of the conical half-wheel 30 fixed to the shaft 25 and of its respective

half of the biconical half-wheel 31, axially slidable on the shaft 25, is associated to one of the soap-rotating belts 23 and is coupled, for example, to the return pulley 223 thereof, by means of a trapezoidal driving belt 42. The other wedge-shaped wheel, consisting of the conical half-wheel, axially sliding on the shaft 25 and of its respective half of the biconical half-wheel 31, is associated to the other soap-rotating belt 23 and is coupled to one of its return pulleys by means of its respective trapezoidal driving belt 43.

Fig. 6 clearly shows that, by axially moving the intermediate biconical half-wheel 31 and/or the conical half-wheel 32 on the shaft 25 by means of the adjustment wheels 39, 41, it is possible to independently vary the distances between the two lateral conical half-wheels 30, 32 and the biconical half-wheel 31 interposed therebetween, by correspondingly varying the diameters on which the trapezoidal belts 42, 43 are engaged with their respective wedge-shaped wheels 30-31 and 32-31, and thus by correspondingly varying the driving and sliding speeds of the associated soap-rotating belts 23. In this way, thanks to the above differential speed variator shown in fig. 6, it is possible both to adapt the speed of the two soap-rotating belt; 23 to the progression speed of the extensible tape 1, and to establish and adjust the desired difference between the speeds of these two soap-rotating belts 23, in order to obtain the above described rotation of the soap S and of its respective funnel-shaped housing, formed in the extensible tape 1.

The rotation of the soap S, together with its funnel-shaped housing 16, about the axis of symmetry A of the soap, causes the funnel-shaped housing 16 to close progressively by means of a spiral choke T (fig. 7) directly above the soap S, stretching and pulling at the same time the film of said funnel-shaped housing 16 around the soap S, which is thus closely enveloped and wrapped in the extensible plastic film forming the tape 1. In fig. 2, the formation of the funnel-shaped housing 16 in the extensible tape 1 is symbolically indicated with some radial lines around the soap 3, in the right part of said figure (start of the straight horizontal path of the extensible tape 1), whereas the rotation of the soap S and of said housing 16, and the progressive formation of the closing spiral T are symbolically shown by lines tangent to a circle which is concentric to the soap S, and gets smaller and smaller.

About at the end of the straight and substantially horizontal portion of the extensible tape 1, under such a tape, there is provided a cutting device, which is schematically indicated by a stationary blade 44 in fig. 1, for separating the housing 16, already closed by the spiral choke T and containing the soap S wrapped therein, from the rest of the extensible tape 1 by means of a substantially horizontal cut, made a little above the closing spiral choke T. The rest 116 of the funnel-shaped housing 16, which - after said cut - is still attached to the closing spiral choke T above said spiral T, is automatically

flattened and adheres to the upper surface of the soap S, by the action of electrostatic forces and/or of residual stress in the extensible plastic film, as schematically shown in fig. 7, thereby allowing the further application of a label, or similar, on the soap S' wrapped in the extensible film.

At the output of the pair of soap-rotating belts 23, the wrapped soap S' is appropriately discharged and, for example, is laid on an underlying discharge conveyor belt 45, indicated by dashed and dotted lines in fig. 1. The continuous scrap tape 1', made of the extensible film and provided with the apertures 6, produced by the cuts made to separate the housings 16, formed in the original extensible tape 1, is wound, as described, on the winding coil 7.

Naturally, the invention is not limited to the embodiment described and illustrated herein. Firstly, the invention may be used not only with round, spherical or circular articles, but also for articles, and particularly soaps, only having a substantially round, circular or spherical shape, such as a more or less oval or ovoidal shape, or even a polygonal shape, with a sufficiently large number of angles. Moreover, the different operating devices of the apparatus, and particularly the different driving and adjusting means which cause the movement of the individual parts of the apparatus, may be made in any suitable manner, different from the one illustrated and described by way of example, provided that they have equal or similar functions. On the other hand, the speed variator described with reference to fig. 6 may be advantageously applied to other machines, having equal or similar drive conditions, therefore it is intended to be also protected as such independently. The invention may be greatly varied and modified, especially as regards construction, and within the range of mechanical and functional equivalents, without departure from the guiding principle disclosed above and claimed below.

Claims

1. A method for wrapping articles (S), particularly soaps or similar, having a rotational axis of symmetry (A), and particularly a substantially round, spherical or circular shape, in an extensible plastic film, characterized in that a continuous and substantially horizontal tape (1), formed by the extensible plastic film, is fed in its longitudinal direction (5) while being held by its longitudinal lateral edges, in such a way as to keep such edges at a substantially unchanging transverse distance, and the articles (S) are sequentially pushed - with their rotational axes of symmetry (A) in a substantially vertical orientation - each one progressively downwards against said extensible tape (1), thereby deforming it and forming substantially funnel-shaped housings (16) therein, each one holding on its bottom one article (S), whereupon each article (S) is rotated about its axis of symmetry (A), together with its funnel-shaped housing (16), in such a way as to close said housing directly above the article (S) by a spiral choke (T), and then the extensible film is cut a little above this spiral choke (T) thus causing the wrapped article (S') to be separated from the rest of the continuous extensible tape (1).
2. A method as claimed in claim 1, characterized in that the number of turns made by the article (S) and by its funnel-shaped housing (16) about the rotational axis of symmetry (A) of the article, to obtain the closing spiral choke (T), and the distance between the separation cut and this closing spiral choke (T), are chosen in such a way that the rest (116) of the funnel-shaped housing (16), attached to the closing spiral choke (T), is automatically flattened and stretched, and adheres on the corresponding surface of the wrapped article (S'), probably thanks to internal stress in the extensible film and/or to electrostatic forces.
3. A method as claimed in claims 1 or 2, characterized in that the continuous extensible tape (1) is unwound from a feeding coil (2), whereas the scrap tape (1'), also continuous and provided with apertures (6) formed by those cuts which were made to separate the wrapped articles (S'), is rolled on a winding coil (7).
4. A method as claimed in one or more of the preceding claims, characterized in that the extensible tape (1) is fed in its longitudinal direction (5) in a continuous and uniform motion and at least some of the operations involved in the method are executed during such a motion, while benefiting of said motion.
5. A method as claimed in one or more of claims 1 to 3, characterized in that the extensible tape (1) is fed in its longitudinal direction (5) in an intermittent motion, in synchronism with the pacing feed of the articles (S), and at least some of the operations involved in the method are executed in specific stations during the stop intervals between the forward steps of the tape (1).
6. An apparatus for implementing the method as claimed in one or more of the preceding claims, characterized in that it comprises:
 - a) means for guiding and feeding a continuous tape (1) of extensible plastic film in its longitudinal direction (5) and in a substantially horizontal plane, preferably while uncoiling it from a feeding coil,
 - b) tape stretching means (9, 10, 13, 113) for holding the longitudinal side edges of said

extensible tape (1) during its forward movement, in such a way as to keep the transverse distance between these edges substantially unchanging,

c) means (14, 15) for sequentially feeding the articles (S) to be wrapped, preferably in paced succession, on the extensible tape (1), the rotational axis of symmetry (A) of these articles (S) being oriented substantially perpendicular to the plane of the tape (1),

d) article-pushing means (17, 18, 19, 20), for progressively pushing each article (S) downwards against the extensible tape (1), so as to sink it in this tape, i.e. in such a way as to deform the extensible tape (1), thereby forming a substantially funnel-shaped housing (16), holding the article (S) on its bottom,

e) article-rotating means (23), for rotating the article (S) about its rotational axis of symmetry (A), together with its funnel-shaped housing (16), formed in the extensible tape (1), thereby closing this housing (16) by a spiral choke (T) directly above the article (S),

f) cutting means (44), for cutting the extensible film at a certain distance above the closing spiral choke (T), thereby separating the wrapped article (S') from the continuous extensible tape, and

21g) preferably, means for winding the continuous extensible scrap tape (1'), provided with apertures (6), produced by the cuts made to separate the wrapped articles (S'), on a winding coil (7).

7. An apparatus as claimed in claim 6, characterized in that the tape-stretching means consist of a pair of endless tape-stretching belts (9, 10) for each longitudinal side edge of the extensible tape (1), extending in the longitudinal direction of the extensible tape (1) and superposing in the same substantially vertical plane, as well as being provided, on their outer side, with longitudinal teeth whose cross section preferably has a substantially triangular profile, or similar, each longitudinal side edge of the extensible tape (1) being scarfed between the longitudinal mutually engaged outer teeth, of the two tape-grasping branches (9A, 10A), directly superposed and cooperating with each other, of each pair of tape-stretching belts (9, 10), and said belts (9, 10) being driven in such a way, that their cooperating tape-grasping branches (9A, 10A) run in the feed direction (5) of the extensible tape (1) at the same speed as this tape (1).

8. An apparatus as claimed in claim 7, characterized in that one (9A) of the tape-grasping branches (9A, 10A), superposed and engaged with each other, of each pair of tape-stretching belts (9, 10), is guided

in such a way as to be able to slide longitudinally but not to be moved transversely, whereas the other (10A) of said tape-grasping branches is guided so as to be able both to slide longitudinally and to be moved, to a limited degree, in the transverse direction, particularly yielding transversely towards the longitudinal center line of the extensible tape (1).

9. An apparatus as claimed in one or more of claims 6 to 8, characterized in that the means for progressively pushing each article (S) downwards against the extensible tape (1), in such a way as to form a funnel-shaped housing (16) in this extensible tape (1), consist of an endless article-pushing belt (17), which extends above the extensible tape (1), in the longitudinal direction thereof, and whose lower branch, designed to contact the articles (S), is downwardly slanted with respect to the feed direction (5) of the extensible tape (1), from a level which is higher than the upper surface of the article (S), fed to and laid on the extensible tape (1), and dragged thereby, to a level which is adjusted on the desired depth of the funnel-shaped housings (16), formed in the extensible tape (1), said article-pushing belt (17) being idle and driven by the articles (S) in contact therewith, or driven in such a way that its lower branch, in contact with the articles (S), runs in the feed direction (5) of the extensible tape (1) and at the same speed as that tape.

10. An apparatus as claimed in one or more of claims 6 to 9, characterized in that the article-rotating means consist of two endless article-rotating belts (23), extending, parallel and spaced, under the extensible tape (1), in the longitudinal direction thereof and parallel thereto, at the level of the article (S), contained in the funnel-shaped envelope (16), formed in the extensible tape (1), adhering from opposite sides against said article (S), there being interposed the extensible film forming the funnel-shaped housing (16), said article-rotating belts (23) being driven in such a way that their facing inner branches, cooperating with the article (S) and with its funnel-shaped housing (16), run in the feed direction (5) of the extensible tape (1), at speeds adjusted to the feed speed of the extensible tape (1), but different from each other.

11. An apparatus as claimed in claim 10, characterized in that the two article-rotating belts (23) are driven by a single motor (11) by means of a differential speed variator (24), which allows to vary both the running speed of each article-rotating belt (23), independently from the other, and the difference between the speeds of these article-rotating belts (23).

12. An apparatus as claimed in claim 11, characterized

in that the differential speed variator (24) consists of two wedge-shaped coaxial wheels (30-31 and 32-31), each associated to an article-rotating belt (23), and each coupled to a pulley for returning and driving its respective article-rotating belt (23), by means 5 of a trapezoidal belt (42, 43), these two wedge-shaped belts (30-31 and 32-31) being mounted so as to be rotatably coupled on the same shaft (25), driven by the motor (11), and at least one half-wheel of each wedge-shaped wheel being axially 10 movable with respect to the other half-wheel, thereby varying the diameter on which the corresponding trapezoidal belt (42, 43) is engaged.

13. An apparatus as claimed in claim 12, characterized 15 in that on said driven shaft (25) a median biconical half-wheel (31), interposed between two lateral conical half-wheels (30, 32), each forming a wedge-shaped wheel (30-31 and 32-31) with the associated half of the median biconical half-wheel (31) are 20 mounted so as to be rotatably coupled, the median biconical half-wheel (31) and one lateral conical half-wheel (32) being axially movable and adjustable on the shaft (25), by means of corresponding opposite axially pushing members (38, 39 and 40, 25 412) and in cooperation with interposed elastic pressure means (37).

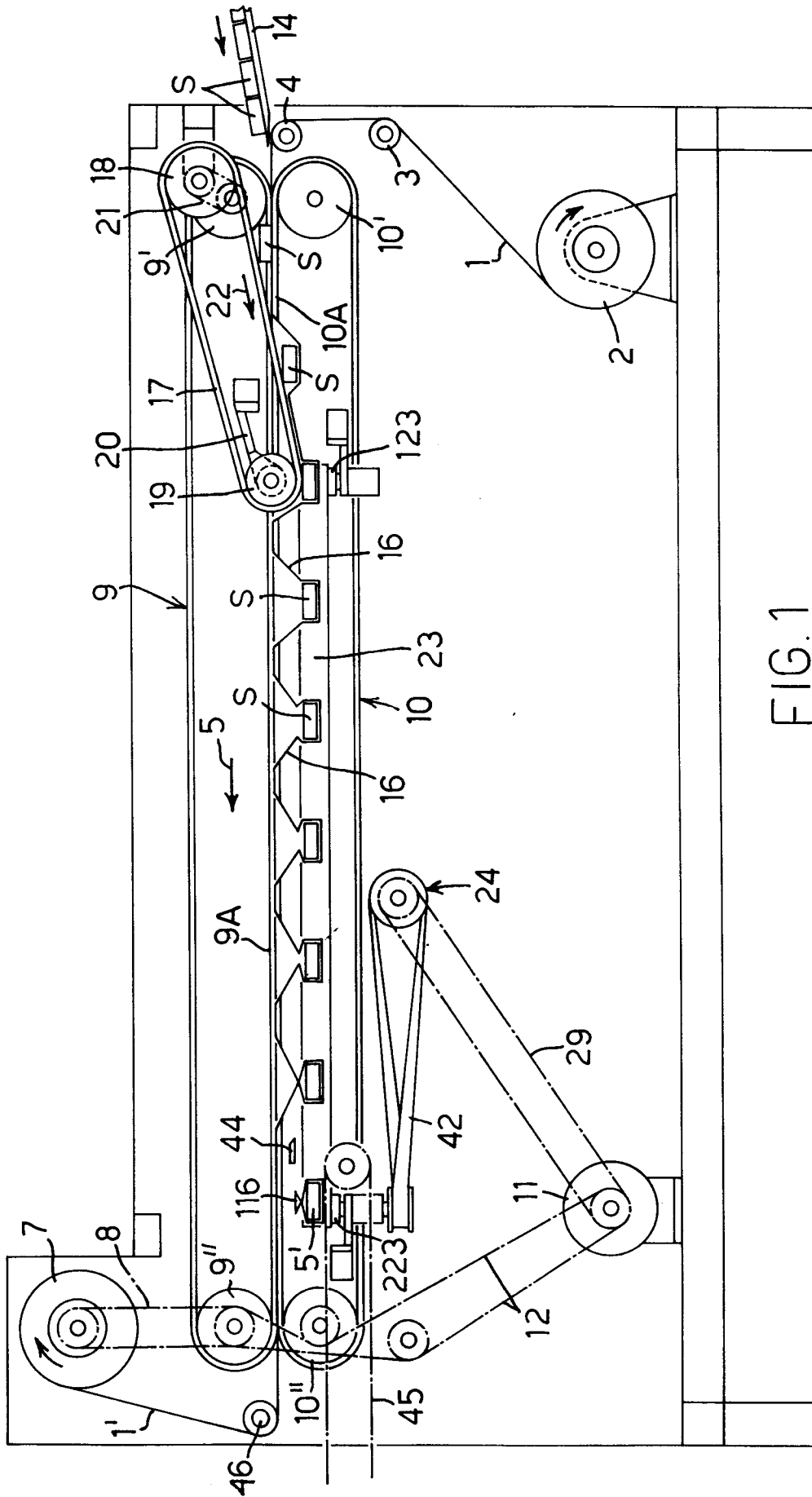
14. An apparatus as claimed in one or more of claims 6 to 13, characterized in that, in combination with the 30 cutting means (44) for separating the wrapped articles (S') from the rest of the extensible tape (1) and/or downstream from these cutting means (44) in the feed direction (5) of the extensible tape (1), there are provided means (45) for discharging the 35 wrapped articles (S').

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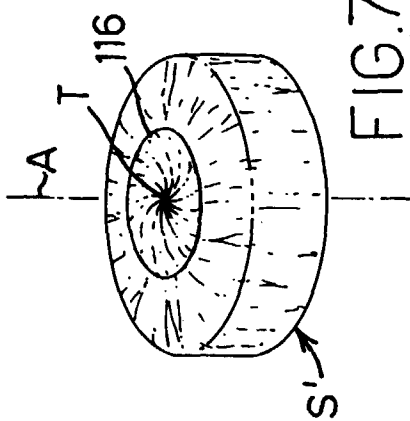


FIG. 7

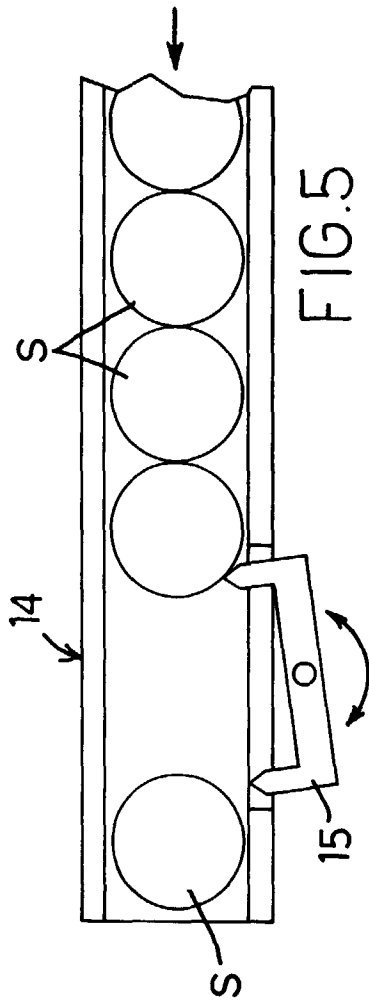


FIG. 5

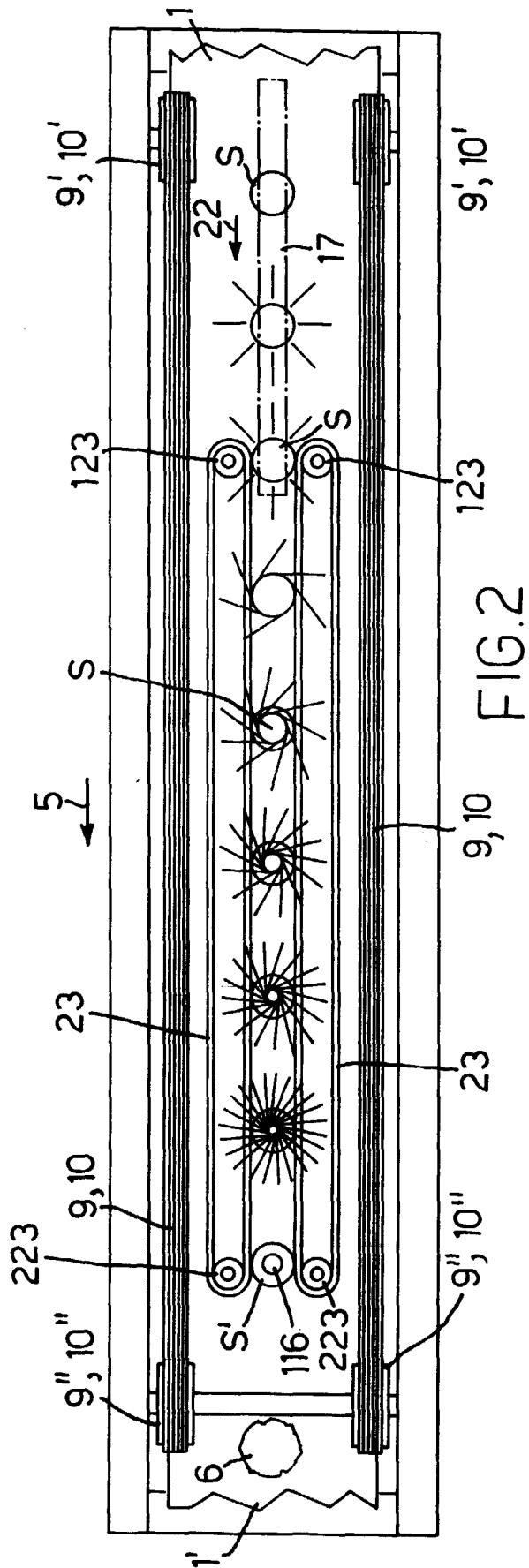
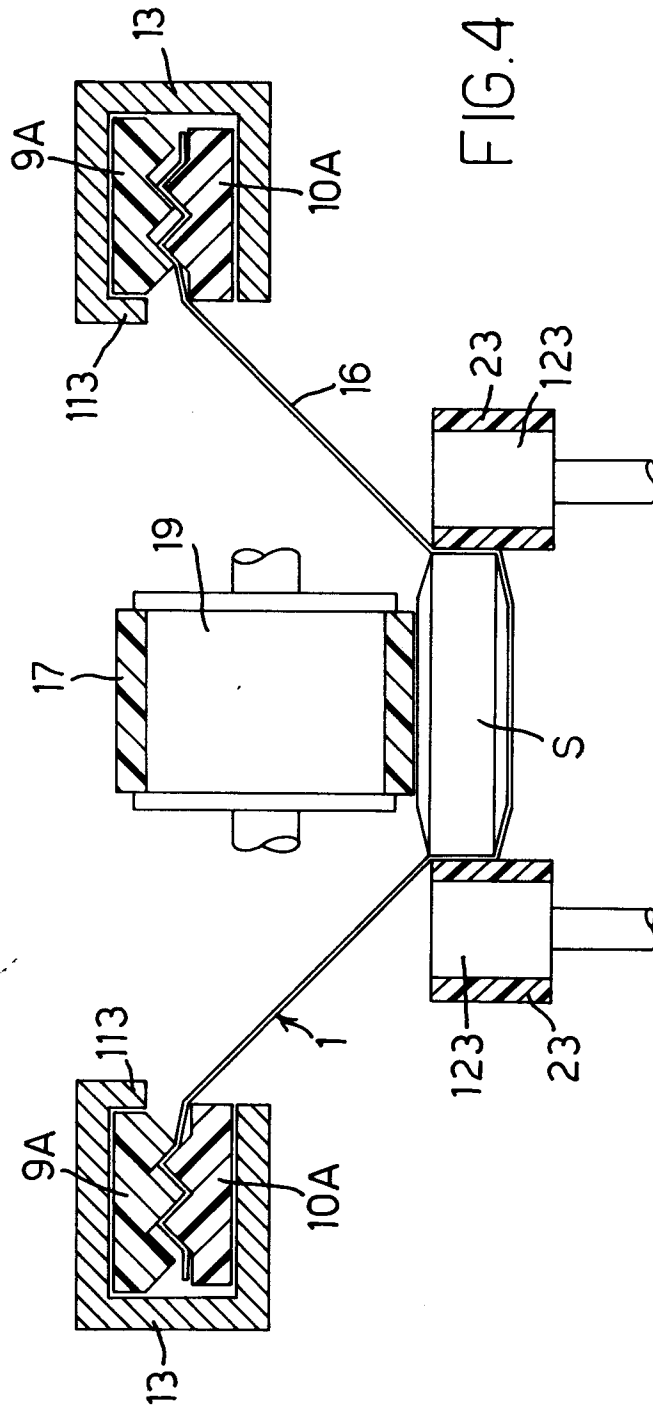
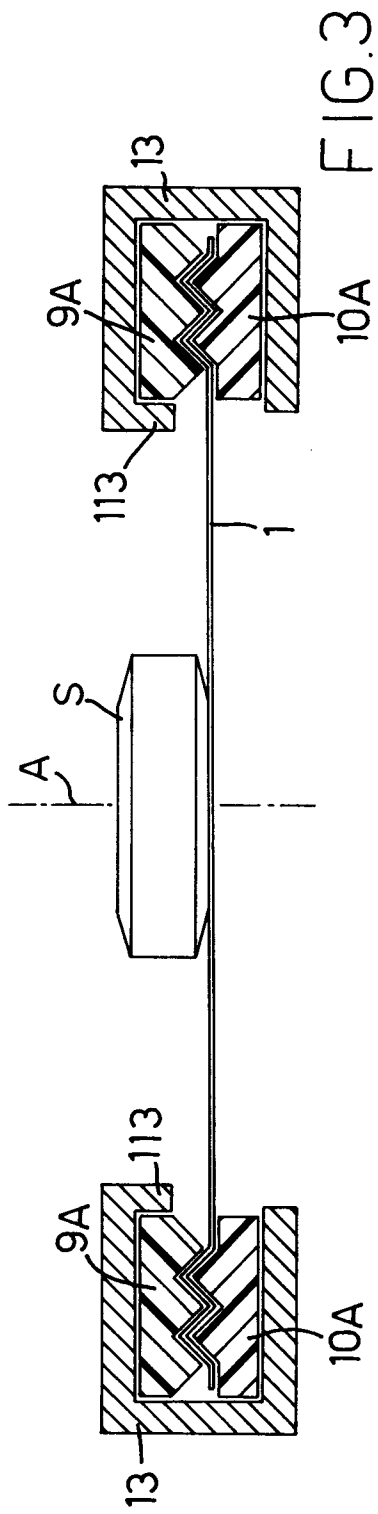


FIG. 2



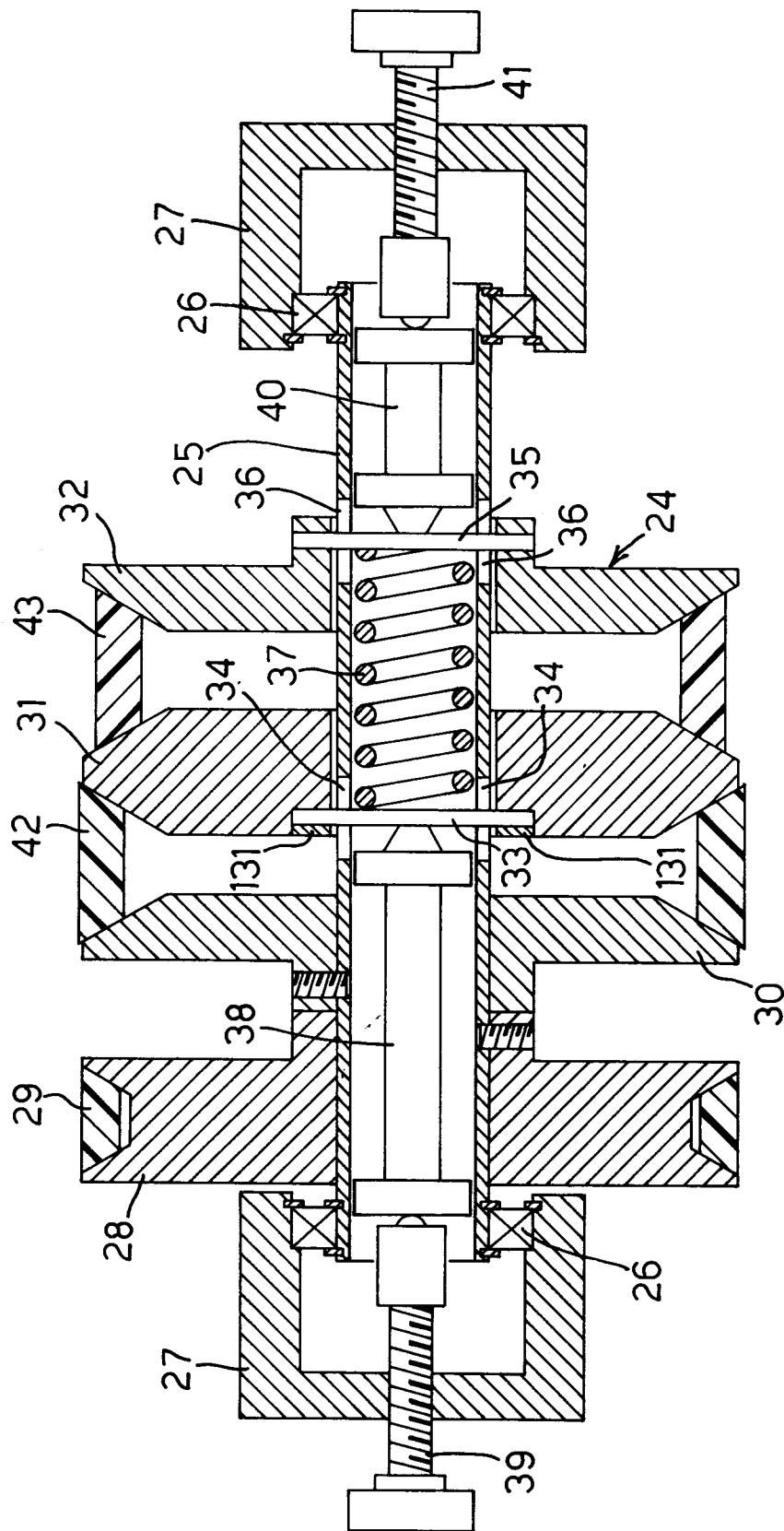


FIG.6



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 98 10 9509

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X A	US 2 312 049 A (PFEIFFER) 23 February 1943 * the whole document * -----	1,4,5 6	B65B11/54 B65B65/02
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			B65B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 8 September 1998	Examiner Claeys, H
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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