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

(11) Publication number: **0 445 705 A1**

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **91103239.9**

(22) Date of filing: **04.03.91**

(51) Int. Cl.5: **B65B 51/16**, B65B 51/18, B65B 53/02

(30) Priority: **07.03.90 IL 93671**

(43) Date of publication of application:
11.09.91 Bulletin 91/37

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

(71) Applicant: **SYFAN**
Kibbutz Sa'ad
Doar Na HaNegev, 85140(IL)

(72) Inventor: **Sarid, Israel**
Kibbutz Sa'ad
Doar Na HaNegev 85140(IL)
Inventor: **Ginsberg, Moshe**
Kibbutz Sa'ad
Doar Na HaNegev 85140(IL)
Inventor: **Ben-Ishai, Ofer**
Kibbutz Sa'ad
Doar Na HaNegev 85140(IL)

(74) Representative: **Michelotti, Giuliano**
c/o SAIC BREVETTI S.r.l. Viale Bianca Maria 15
I-20122 Milano(IT)

(54) Method and apparatus for tightly wrapping an article with a synthetic film.

(57) Articles of good external appearance and of good wrapping quality are obtained by tightly wrapping by sealing and shrinking an article or part thereof with a sheet of shrink film, by wrapping the surface of the article with a sheet of the shrink film, leaving at least two extremities of the sheet at least in partial overlap, and thereafter applying heat at least to the overlapping portions of the sheet, the temperature of the heated portion of the sheet being kept below the meltin point of the film.

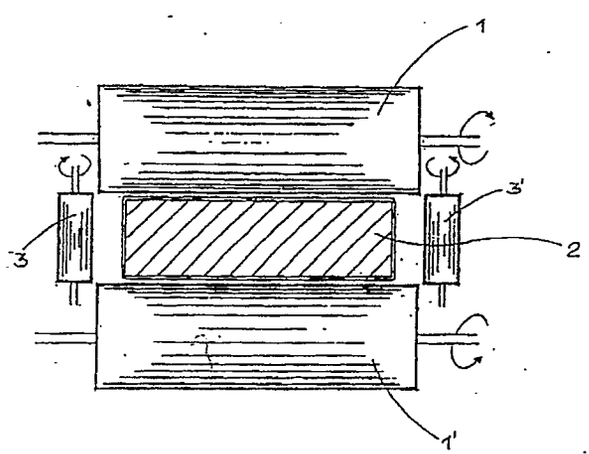


FIG. 1

EP 0 445 705 A1

The present invention relates to a method and apparatus for tightly wrapping an article with a synthetic film. More particularly the invention relates to the use of shrink films for wrapping, labeling and the like purposes.

The use of paper or plastic films for labeling purposes and for wrapping articles is known in the art. For instance, polystyrene, polypropylene and PVC films are used as labeling material for bottles.

Additionally, PVC and polyethylene shrink or non-shrink films are normally employed in wrapping both substantially two dimensional articles, such as magazines, and three-dimensional articles. However, the use of these films has been very limited for the following reasons.

When wrapping substantially two dimensional articles no substantial amount of shrink retraction is permitted, because it may lead to the deformation of thin articles.

Furthermore, sealing of the overlapping portions of the film is done by a variety of techniques, such as ionization, high-voltage and heat-seals, some of which require the melting of the film along the line of overlap. These techniques resul in connections which are relatively weak, and the appearance of which is bad due to the non uniform welding of the material.

Threee dimensional or rigid objects, on the other hand, can normally withstand relatively high shrink forces, and thus shrink films can be used. However, the resulting wrappings are not free from the need to provide a welding made along the overlapping part of the wrapping.

It is an object of the present invention to provide a method and apparatus by means of which shrink films which exert a cling and shrink action can be employed as labeling material for deformable containers.

Is is another object of the invention to provide a method and apparatus by means of which substantially deformable and thin two dimensional objects can be wrapped using shrink films, to provide a tightly fitting wrapping without deformation.

It is still another object of the present invention to provide a method and apparatus by means of which the connection of the overlapping parts of the enveloping film can be effected to result in envelopes of good appearance and strenght.

It is a further object of the invention to provide a method and apparatus by means of which it is possible to provide an excellent sealing of the overlapping part of the enveloping film.

Films employed with the method and apparatus of the invention must have specific properties, which will become apparent as the present specification proceeds, and which will be apparent to the man of the art. For instance, films employed for labeling purposes on deformable containers, such as PET bottles, must have relatively low shrink forces, and preferably good adhesion properties, while adhesion is not desired when enveloping, e.g., sheets of paper. Suitable shrink films are described, for instance, in copending Israeli Patent Application No. 92868, filed December 25, 1989, by the same applicant, the specification of which is incorporated herein by reference. Again, it is important to control the shrink force of the films, as one will like to provide low shrink tensions when enveloping a deformable object, while higher shrink tensions may be allowed when the object is substantially non-deformable.

As said, when enveloping an article, either to provide a label or to completely wrap it up, a sheet of film is provided, and care is taken that two extremities of the film will overlap to some extent, to provide what will be termed hereinafter an "area of overlap". It should be noted that when the area of overlap is sealed, according to methods known in the art, only a small with of this area is welded, and a large part of the area of overlap is not connected. The two separated layers resulting, of course, are not a very strong connection.

Furthermore, as stated above, weldings provided for sealing together the two layers which form the area of overlap result in a line having a bad appearance and unsatisfactory optical, sealing and strength properties.

It has now been surprisingly found that it is possible to seal together the two layers of an area of overlap, by incorporating one layer into the other to form what will be called hereinafter a "self-sealing" of the film, to provide an area which retains excellent appearance and optical properties, which forms a single body and therefore a very strong connection, and that this can be effected by using temperatures below the melting temperature of the film. All these advantages are exploited in the method of the invention that will be described in detail below.

The method for tightly wrapping an article or part thereof with a film comprises:

A. providing a shrink film;

B. wrapping the surface of the article with a sheet of the said shrink film, at least two extremities of the said sheet being at least in partial overlap; and

C. applying heat at least to the overlapping portion of the said sheet, the temperature of the heated portion of the sheet being kept below he melting point of the film.

Preferably, to obtain an effective self-sealing of the film, heat is applied together with pressure. Heat may be applied by a variety of techniques, and preferred techniques are contact heat-exchange, forced convection and radiation.

When it is desired to employ films with adhe-

sion properties, such as in the case in which labeling is effected, it may be desirable to heat the surface of the object to be wrapped before applying the shrink film, which in most cases will improve the adhesion of the film to the surface of the object. It should be noted that adhesive films such as those described in Israeli Patent Application No. 92868 have excellent self-adhesion properties, so that the two ends of the sheet will adhere to one another to form the area of overlap quite easily. It should be noted, however, that heating the contact surfaces will result in a temporarily enhanced adhesion of the film, simillarly to what is obtained by ionization techniques, but then sealing of the area of overlap must be effected to obtain a durable connection.

Thus, the invention, in another aspect, comprises a method for labeling a substantially tubular article, which method comprises providing a label made of a film as hereinbefore defined, wrapping the label around the tubular object and heating the label at least at the area of overlap, to obtain self-sealing thereof and shrink of the label. Shrink of the label is desirable, of course, as will be understood by the skilled person, to obtain a firm grip on the article. Here, again, pressure can be applied to the area of overlap to promote self-sealing. This labeling method is particularly convenient when the article to be labeled is a bottle or a food or beverage can, particularly when these are made of deformable material, such as PET, as the shrink force can be controlled.

In another aspect of the invention a method is provided for wrapping a substantially two-dimensional object, which method comprises providing a sheet made of a film as hereinbefore defined, enveloping the object providing an area of overlap therein, heat-sealing the open ends of the sheet and pressure-heating, at least at the area of the overlap, to obtain self-sealing thereof and, optionally, shrink of the envelope.

As will be apparent to a person skilled in the art, sufficient residence-time and temperature must be supplied, to obtain satisfactory results.

It has been found, however, that excellent results are obtained when the article is passed through two subsequent sealing stages. While not wishing to be bound by any specific theory, it is believed that the heating cycle, comprising a heating - cooling - heating - cooling sequence may be responsible for the improved results, particularly in the appearance of the final wrapping, which are better than those obtained when supplying the same amount of heat for the same time in a single step.

In still a further aspect of the invention, a method is provided for wrapping a three-dimensional object, which method comprises providing a sheet made of a film as hereinbefore defined, enveloping the object providing an area of overlap therein, heat-sealing the open ends of the sheet, pressure-heating the face of the object on which the area of overlap lies and heating one or more of the remaining surfaces of the object to obtain the shrinking of the film. This heating to obtain the shrinking of the film can be effected by a variety of methods, such as contact or convection or radiation heating, or by a combination of two or more of the said heating methods.

All the aforesaid and other characteristics and advantages of the invention will be better understood through the following illustrative and non-limitative description of preferred embodiments, with reference to the appended drawings, wherein:

- Fig. 1 is a schematic view of a sealing apparatus according to a preferred embodiment of the invention;
- Fig. 2 shows a substantially two-dimensional article, such as a sheet of paper, wrapped by the apparatus fo Fig. 1 according to the invention;
- Fig. 3 shows the same article of Fig. 2, but wrapped by a method of the art;
- Fig. 4 shows an apparatus for enveloping tubular objects;
- Fig. 5 shows an apparatus for partially enveloping an object which departs from the tubular shape at the edges; and
- Fig. 6 shows a labeling apparatus according to another embodiment of the invention.

With reference now to Fig. 1, the apparatus coprises two rotating cylinders, 1 and 1'. These cylinders are heated, by internal heating means or any other appropriate means, and they rotate to move an object, schematically indicated by 2, at the same time heating it and applying a pressure. When this is done, two results will be obtained, viz., the self-sealing of the area of overlap and the shrinking of the shrink film. It shoul be noted that it is a novel feature of the invention that shrinking and sealing can be effected at the same time. In apparatus of the known art, sealing is done by one technique at one time, and shrinking is effected at a later time by entirely different methods.

Thus, as will be aparent to the skilled person, the method of the invention not only provides better results, but is further convenient and economic.

As stated above, two or more sets of cylinder couples, 1 and 1', may be provided in sequence, to effect different heating cycles. The cylinders themselves can be made of, or coated with, different materials, such as stainless steel, silicone, etc., and the skilled engineer will be able to provide appropriate building materials for the desired heating conditions.

If the article 2 is substantially three-dimen-

sional, additional rotating cylinders 3 and 3' can be provided, which are shown in Fig. 1 in a detached position. The two cylinders 3 and 3' will be brought into contact with the sides of article 2 and will also be heated, thus contributing to the shrinking fo the film which envelopes article 2 throughout most of its surface. Cylinders 3 and 3' may contact the article 2 at the same time as cylinders 1 and 1', or may be positioned at a distance therefrom and act independently.

Turning now to Fig. 2, Fig. 2(a) is an elevated view of the article sealed by the technique shown in Fig. 1. This article will have two open ends 4 and 4' which resulted from the wrapping up of the article by the sheet of material, which edges can be sealed by any known technique, such as by hot cutting or the like technique. The area of overlap, 5, is clearly shown in the figure. This area results from the enveloping of the article by the sheet. In Fig. 2(b) this area is seen after self-sealing has been effected, as having a slightly thicker cross-section, indicated by numeral 6.

Although the cross-section is greater than that of the film in other locations, the overall apearance of the area of overlap after self-sealing has taken place will be almost identical, and in many instances it will be difficult to locate this area. It should also noted that, in contrast to sealing of the overlapping areas effected according to the art, which is a weak area, self-sealing according to the invention results in a thicker area which, in fact, is stronger than the film in any other position around the object. This is also illustrated in Fig. 3, in which the overlapping area, generally indicated by 7, has been sealed by known techniques and has two free flaps 8 and 8', which are connected by welding made only along a narrow strip, indicated by 9 in the figure.

Because the sealing of the film is complete, it may be desirable to provide in the film some small openings to permit escape of air during press-sealing. This may be achieved, e.., by positioning a toothed wheel or the like device on the wrapping apparatus, which contacts the film before the article reaches the pressure area, and makes small openings therein. If such openings are not provided, air will create an escape at an uncontrolled location during pressure sealing. While this will generally result in acceptable products, it is desirable to be able to control the location, size and number of openings that will exist in the film.

Fig. 4 shows a diffrent arrangement, in which conveyor belts or ribbons are used instead of rotating cylinders. In this figure two conveyor belts, 10 and 10', are shown, which amy be both heated, e.g., by plate 11 and 11', which can radiate heat toward the belt, or only one of the two belts can be heated. The belts can be rotated in different directions, to achieve different modes of movement of a tubular object, such as tubular object 12 schematically shown in Fig. 4. Turhtermore, if the tubular object is a cylinder of the like, it may be convenient to leave an extra with of film at the extremities, which may be caused to shrink, e.g. by heat provided by radiation or forced convection, strongly to grab the extremities of the cylinder. In such a case, after the film has shrunk at the extremities it will have the appearance shown in Fig. 4 in which a central hole remains and the film has shrunk along the outer surface of the end of the cylinder.

Another possible arrangement of the belt is schematically shown in cross-section in Fig. 5. In this figure a cross-section of a belt is shown which matches the shape of the article to be labeled, in this case a bottle.

Thus, if a label 13 (shown in broken lines in the figure) is heated by means of heated belt 14 having the same shape, shrinking of the label at the changing diameter of the bottle, e.g., at the positions indicated by 15 and 16, is then achieved, and a strong grasp of the label on the bottle is obtained.

A labeling apparatus according to another preferred embodiment of the invention is schematically shown in Fig. 6. The apparatus comprises a continuous lower conveyor belt 17, a first upper conveyor belt 18 and a second upper conveyor belt 19. A bottle 20 entering the apparatus moves in the direction of the arrow by the movement of belts 17 and 18.

Preheating of the bottle can be effected, if desired, by heating elements 21. A continuous labeling device (not shown) feeds labeling material 22 from a label roll 23, through nip rolls 24. The label is guided toward the bottle 20 by means known to the skilled engineer and not shown for the sake of simplicity, and envelopes around it. The continuous label 22 is then cut at the appropriate time by means known in the art (not shown), at a position between the bottle 20 and nip rolls 24.

The bottle on which the label is rolled is further moved on by the combined action of conveyor belts 17 and 19, and is heated while spinning by heating elements 21' of belt 17 and/or 25, of belt 19.

All the above description of preferred embodiments of the invention has been provided for the purpose of illustration only, and is not to be construed as constituting a limitation thereof. As will be apparent to the skilled person, many modifications can be effected in the method and apparatus of the invention. For instance, different shapes of heating surfaces, such as cylinders and belts can be provided, and heat may be applied by different methods, as well as pressure when required, and many different shapes of apparatus, types of objects to

be wrapped and films can be employed, all without exceeding the scope of the invention.

Claims

1. A method for tightly wrapping by sealing and shrinking an article or part therof with film, comprising:
   A. providing a shrink film;
   B. wrapping the surface of the article with a sheet of the said shrink film, at least two extremities of the said sheet being at least in partial overlap; and
   C. applying heat at least to the overlapping portions of the said sheet, the temperature of the heated portion of the sheet being kept below the melting point of the film.

2. A method according to claim 1, wherein heat is applied by contact heat-exchange.

3. A method according to claim 1, wherein heat is applied by forced convection.

4. A method according to claim 1, wherein heat is applied by radiation.

5. A method according to any one of claims 2 to 4, comprising further applying a pressure at at least the area of overlap.

6. A method according to any one of claims 1 to 5, comprising further heating the object to be wrapped prior to applying the shrink film, to improve adhesion of the film to the surface of the object.

7. A method for labeling a substantially tubular article, comprising providing a label made of a film as defined in claim 1, wrapping the label around the tubular object and heating the label at least at the area of overlap to obtain self-sealing thereof and shrink of the label.

8. A method according to claim 7 further comprising applying pressure to the area of overlap.

9. A method according to claim 7 or 8, wherein the substantially tubular object is a container, particularly a bottle or a food or beverage can.

10. A method of wrapping a substantially two dimensional object, comprising providing a sheet made of a film as defined in claim 1, enveloping the object providing an area of overlap therein, heat-sealing the open ends of the sheet and pressure-heating at least at the area of overlap to obtain sefl-sealing thereof and, optionally, shrink of the envelope.

11. A method of wrapping a three-dimensional object, comprising providing a sheet made of a film as defined in claim 1, enveloping the object providing an area fo overlap therein, heat-sealing the open ends of the sheet, pressure-heating the face of the object on which the area of overlap lies and heating one or more of the remaining surfaces of the object ot obtain the shrinking of the film.

12. A method according to claim 10 or 11, wherein pressure-heating is effected in at least two stages, the surface of the object to be pressure heated being allowed at least partially to cool between two subsequent pressure-heating stages.

13. A method according to claim 11 or 12, wherein heating to obtain the shrinking of the film is effected by contact or convection or radiation heating, or by a combination of two or more heating methods.

14. A method according to any one of claims 1 to 13, wherein the shrink film is a film which exerts a cling-and-shrink action.

15. An apparatus for tightly enveloping by sealing and shrinking an article (2) or part thereof with a film, comprising two or more conveying and pressure elements (1,3) to convey the article (2) to be enveloped through the apparatus and to apply pressure and heat thereon, at least one of the said conveying and pressure elements (1,3) being provided with, or being coupled to, heating elements.

16. Apparatus according to claim 15, wherein the conveying and pressure elements comprise rotating cylinders (1,1';3,3').

17. Apparatus according to claim 15, wherein the conveying and pressure elements comprise conveyor belts or ribbons (10,10').

18. Apparatus according to claim 17, wherein the conveyor belt (10,10') has a cross-section substantially corresponding to the shape fo the surface to be covered by the film.

19. Apparatus for tightly enveloping by sealing and shrinking an article or part thereof with a film, essentially as described and illustrated.

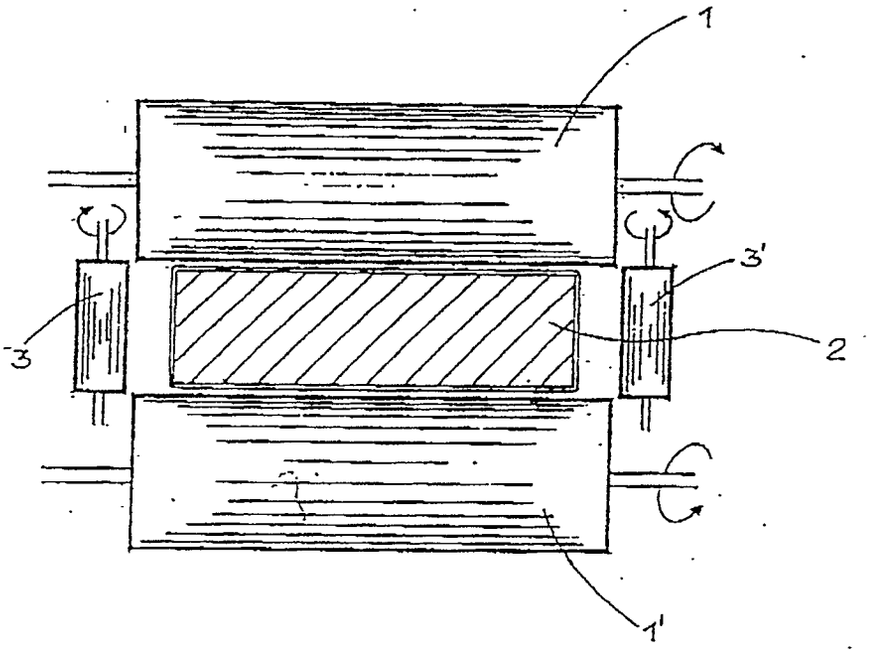
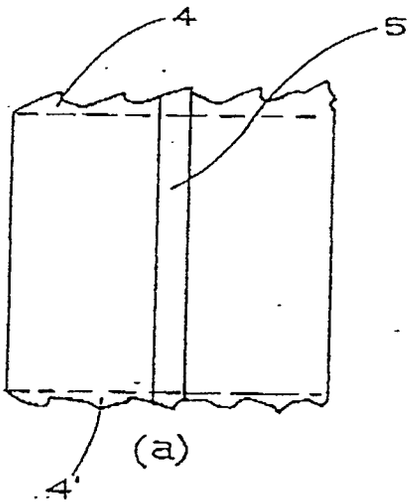


FIG. 1



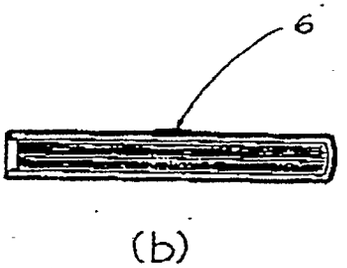


FIG. 2

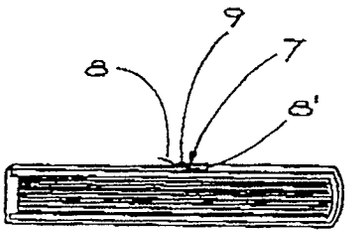


FIG. 3

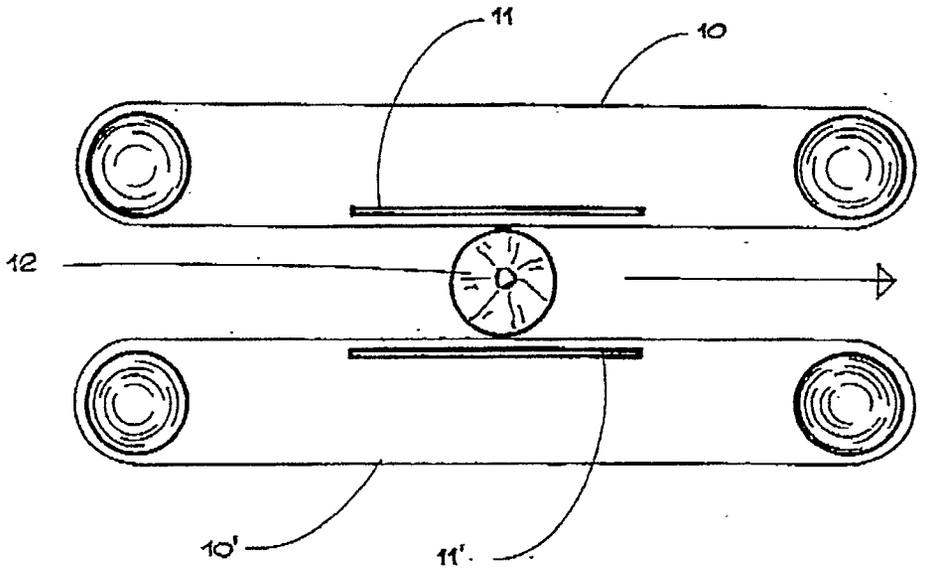


FIG. 4

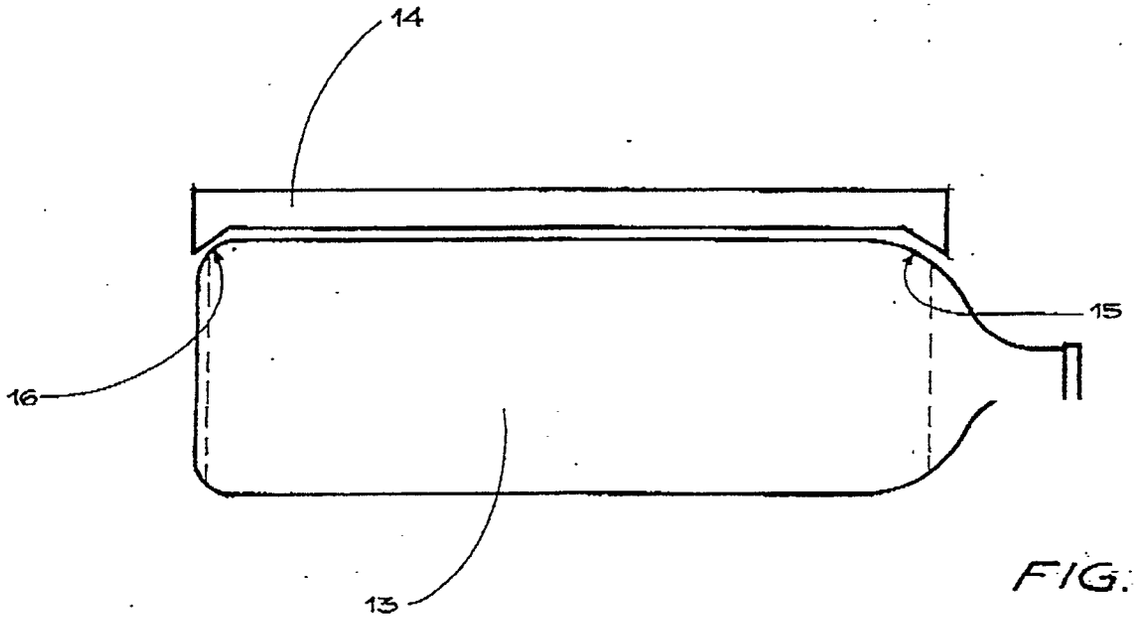


FIG. 5

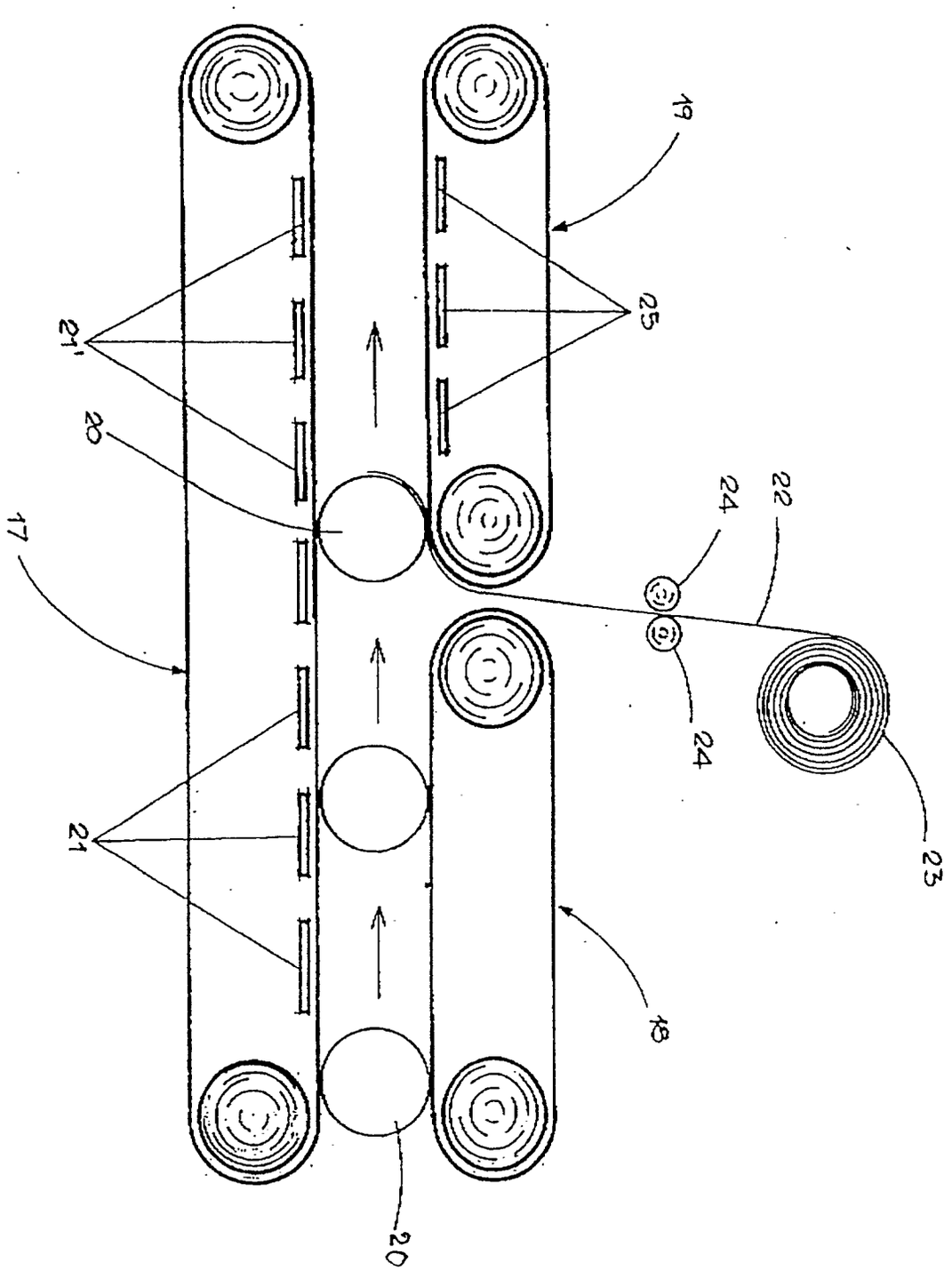


FIG. 6

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 91 10 3239

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.5)
X	EP-A-0 245 817 (FUJI) * Column 4, line 51 - column 6, line 27; figure *	1,2,11,13, 14	B 65 B 51/16 B 65 B 51/18 B 65 B 53/02
X	US-A-4 715 166 (HIROSHI KAMEDA) * Column 4, line 19 - line 68; claims 1,3; figure *	1,2,5	
Y		3,4,15,17, 18,19	
Y	US-A-3 385 028 (E.PIERCE) * Column 3, line 1 - line 34; figure *	3,4	
Y	GB-A-2 015 423 (TOYO SYOKUHIN KIKAI) * Page 2, line 115 - page 3, line 21; figure *	15,17,18, 19	
A		1,2,5	
X	DE-A-1 800 529 (W. GRACE) * Page 6, line 15 - page 9, line 7; page 10, line 6 - page 11, line 1; figure *	7	
Y		8,9	
A		13	
Y	DE-B-1 177 067 (H. STRUNCK) * Column 19, line 17 - column 22, line 34; figure *	8,9	TECHNICAL FIELDS SEARCHED (Int. Cl.5) B 65 B
A	GB-A-7 525 68 (CELANESE) * Page 3, line 17 - page 4, line 40; figure *	1,2,5,15, 17,18,19	

The present search report has been drawn up for all claims

Place of search	Date of completion of search	Examiner
The Hague	28 May 91	JAGUSIAK A.H.G.

CATEGORY OF CITED DOCUMENTS

- X: particularly relevant if taken alone
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