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(71) Applicant: **AETNA GROUP S.p.A.**
47827 Villa Verucchio (Rimini) (IT)

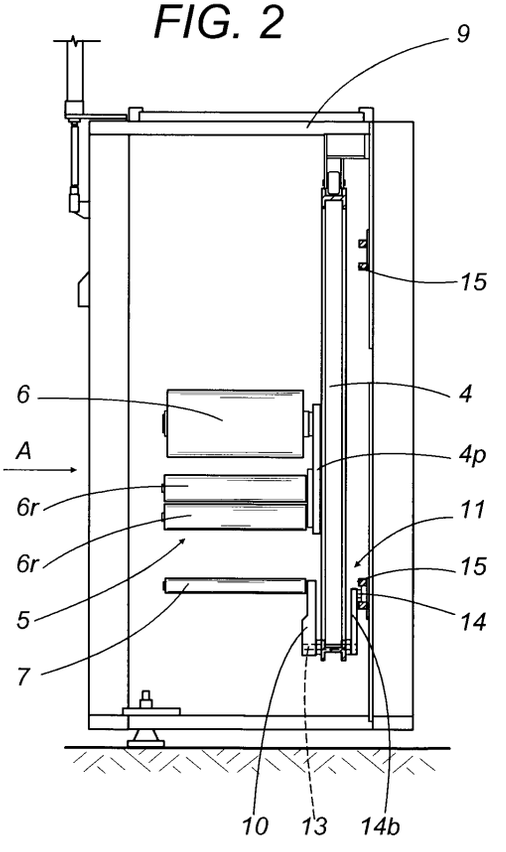
(72) Inventor: **Cere', Mauro**
40050 Loiano (Bologna) (IT)

(74) Representative: **Lanzoni, Luciano**
c/o BUGNION S.p.A.
Via Goito, 18
40126 Bologna (IT)

(54) A machine for wrapping groups of products with plastic film

(57) A machine for wrapping groups of products with plastic film comprises a unit (5) for feeding the film (2) consisting of a roll (6) and an idle roller (7) linked to the rotation of a ring (4) through a supporting arm (10) which is acted upon by means (11) designed to adjust its position relative to the surfaces (1a, 1b, 1c, 1d) of the group (1) of products to be wrapped and relative to the position assumed by the ring (4) when it rotates, in such a manner as to form a guide and to enable the film (2) to be unwound close to the surfaces (1a, 1b, 1c, 1d) independently of the shape and size of the group (1) of products being wrapped.

FIG. 2



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Description

[0001] The present invention relates to a machine for wrapping groups of products with plastic film.

[0002] At the present time, there are several different kinds of machines used to wrap groups of products with stretch plastic film in order to form a tight wrap around the products (not only to hold the products together but also to protect them). These include machines known to experts in the trade as "orbital" machines.

[0003] An orbital stretch wrapping machine has a horizontal table along which the products or groups of products are fed. The feed table is located on opposite sides of a wrapping device consisting of a ring or passing through the ring, and an unwinding unit consisting of a roll of plastic film and an idle roller which feeds the plastic film.

[0004] The unwinding unit, motor-driven, usually rotates together with the ring, and, during the rotation, the idle roller is located at a fixed distance from the roll in such a way that the film is unwound in a spiral shape around the group of products being fed in. The group of products is wrapped either in a break in the feed table so that the film is wrapped right around the products or together with the feed table and the latter is then pulled out of the group upon completion of the wrapping operation.

[0005] Machines made in this way make it possible to wrap groups of products at high speeds but have several drawbacks when the products being wrapped are much wider or longer than they are thick (for example, door and window frames). Thus, on account of the product shape and the circular path of the roll and roller assembly, the portion of film that has to be unwound before the film again comes into contact with the main surface of the product (lying in a horizontal plane) is very large and only touches the product along the edge at quite a long distance from the roll. This portion of film thus has a large free surface area and this, combined with the stretch property of the film and the fact that it is very thin, tends to resist the rotating action of the roll and roller assembly and to trap air during the downward stroke towards the surface being wrapped (to create what is commonly known in the trade as a "balloon effect").

[0006] When the film reaches the surface of the group of products, the balloon effect (that is to say, the air trapped by the film) prevents it from adhering well to the product surface. In some cases, the film also tears when it comes into contact with the following edge of the group of products not only because it does not uniformly adhere to the product surface but also because of the previous resistance generated by the portion of film in relation to the rotation speed of the roll and roller assembly.

[0007] After much research and development, the Applicant has designed and constructed a machine for wrapping products with stretch film in which the roll and roller assembly adjusts to the size of the products to be wrapped, thus eliminating the balloon effect.

[0008] The wrapping mechanisms are rapid and reliable and the basic structure of the machine is not very different from that of existing machines of this kind.

[0009] The technical characteristics of the invention, according to the above mentioned aims, are described in the claims below and its advantages are apparent from the detailed description which follows with reference to the accompanying drawings, which illustrate a preferred embodiment of the invention without restricting the scope of the inventive concept and in which:

- Figure 1 shows a schematic front view, with some parts cut away in order to better illustrate others, of a stretch film wrapping machine made according to the present invention;
- Figure 2 is a schematic side view of the machine shown in Figure 1, with some parts cut away in order to better illustrate others;
- Figure 3 is a detail from the machine illustrated in Figures 1 and 2, showing a front view of a guide cam of an idle film wrapping roller;
- Figures 4 and 5 are front views of the wrapping cycle performed by the machine illustrated in the previous figures on products of two different sizes;
- Figure 6 is a scaled-up front view, with some parts cut away and others in cross section in order to better illustrate certain details of the invention, of an idle roller and its supporting arm forming part of the machine illustrated in the previous figures;
- Figure 7 is a scaled-up front view, with some parts cut away and others in cross section in order to better illustrate certain details of the invention, of a preferred embodiment of means for adjusting the idle roller supporting arm illustrated in Figure 6;
- Figures 8 and 9 are, respectively, a scaled-up top plan view and a front view, with some parts cut away and others in cross section in order to better illustrate certain details of the invention, showing another preferred embodiment of means for adjusting the idle roller supporting arm illustrated in Figure 6.

[0010] With reference to the accompanying drawings listed above, in particular Figures 1 and 2, the machine concerned is used to wrap a product or group 1 of overlaid products with stretch film 2 (the products being illustrated schematically by a dashed line).

[0011] Machines of this kind comprise a horizontal table 3 along which the group 1 of products is fed in the direction indicated by the arrow A in Figure 2 (the table 3 being illustrated schematically since it is of the known type). The feed motion causes the product group 1 to move past a ring 4 equipped with a unit 5 for feeding the film 2 spirally around the product group 1 in such a way as to completely wrap the product group.

[0012] In the case illustrated in Figure 2, the feed unit 5 comprises a film roll 6 and an idle roller 7 that feeds the film around the group 1 of products, which are placed

alongside each other and which are associated with the ring 4, the latter being power driven by means 8 (of known type and therefore illustrated schematically in Figure 1) mounted on a fixed supporting structure 9 in such a way as to rotate about the axis Y (horizontal).

[0013] As shown in Figures 2, 4 and 5, the film 2 feed unit 5 is linked to the rotation of the ring 4 through a supporting arm 10 which is acted upon by means 11 designed to adjust its position relative to the surfaces, labelled 1a, 1b, 1c and 1d, of the group 1 of products being wrapped and relative to the position assumed by the ring 4 when it rotates: it is thus possible to obtain a guide and to enable the film 2 to be unwound close to the surfaces 1a, 1b, 1c, 1d independently of the shape and size of the group 1 of products passing through the ring 4.

[0014] Looking more closely at the constructional details (see Figures 2, 3, 4 and 5), the position adjustment means act directly on the supporting arm 10 and consist of cam means 11 which act on the arm. The cam means 11 vary according to the shape and size of the product group 1 to be wrapped.

[0015] As clearly shown in Figure 3, the cam means 11 may comprise a structure or track 15 (which, in the case illustrated in Figure 3, is substantially elliptical in shape and inclined relative to the machine axes) located behind the ring 4 relative to the feed direction A of the product group 1 and slidably connected to a cam follower roller 14 linked to the arm 10.

[0016] The specially designed shape of the track 15 is the result of numerous studies and tests performed by the Applicant in order to provide the optimum path for the arm 10 according to the different shapes and sizes of the products to be wrapped. As a further improvement to the solution, the track 15 may be made up of a plurality of interchangeable segments 15a joined to each other by detachable linking means 16 so that the size of the track can be changed according to the shape and size of the group 1 of products to be wrapped. Said link means 16 may consist of plates 16p also used to mount the track 15 on the fixed structure 9.

[0017] Looking again at the wrapping unit 5, Figure 2 shows that the roll 6 is connected directly to the ring 4, while the idle roller 7 is rotatably mounted on the free end of the supporting arm 10: looking in more detail, the roll 6 is connected to the ring 4 through a plate 4p to which a pair of transmission rollers 6r may also be linked, while the idle roller 7 is indirectly linked to the ring 4 upstream or downstream of the roll 6 relative to the direction of rotation of the ring 4.

[0018] The arm 10 which supports the idle roller 7 has, at the end of it that is linked to the ring 4, a rod 13 which passes through the ring and which, through another rigid connecting arm 14b, mounts the cam follower roller 14 that is slidably connected to the track 15: in this way, the position of the arm 10 may be adjusted as the ring 4 turns.

[0019] To further optimise the adjustability of the machine disclosed to the different shapes and sizes of the products 1 being wrapped, it is possible to vary the length of the supporting arm 10 in such a way that it interacts with the cam means 11.

[0020] In one preferred embodiment (see Figure 7), the supporting arm 10 varies in length according to the shape and size of the product group 1 thanks to means 12 designed to automatically control its movement according to its position relative to the product group 1.

[0021] In this embodiment, the arm 10 consists of two tubular parts 17 and 18 (see also Figure 6) connected to each other by said adjustment means 12, which consist of a screw and nut thread connection 19 and 20 located inside the two parts 17 and 18. The screw and nut thread assembly 19 and 20 is connected to means 21 for controlling the length of the arm 10: in practice, as can be seen in Figure 7, there may be a motor 21m located inside one of the tubes 17 or 18 and designed to turn the screw 19 in one direction or the other (see arrows F in Figures 6 and 7) depending on whether the arm 10 has to be shortened or lengthened according to the shape and size of the group 1 of products being wrapped. The activation of the motor 21m may be controlled by an external CNC unit 21u programmed according to the size of the product group 1 so as to provide the optimum wrapping motion for each cycle.

[0022] In another embodiment, illustrated in Figures 8 and 9, the length of the supporting arm 10 can be changed manually.

[0023] In this embodiment, the arm 10 again consists of two matching tubular parts 17 and 18 but in this case joined together by manual engagement / disengagement means 22 passing across the two parts. The means 22 consist of two openings 23 and 24, the one labelled 23 being a slot through which a pin 25 equipped with a threaded nut 26 can be passed in order to enable the operator to manually tighten and slacken two parts 17 and 18. Obviously, after being slackened, the operator can slide the two parts 17 and 18 relative to each other (again in the directions indicated by the arrows F in Figure 6) in such a way as to lengthen or shorten the arm 10 according to the shape and size of the product group 1 before the group is wrapped.

[0024] A numeric scale 27 on the outside of the tubular part with the slot 23 may facilitate the manual adjustment of the arm 10 by clearly displaying the amount by which the length of the arm 10 must actually be adjusted.

[0025] As can be seen in Figures 4 and 5, the machine made in this way wraps the product group 1 by causing the roll 6 to perform a circular rotation, in this case counterclockwise (see arrow F1), while the arm 10 acts on the idle roller 7, which controls the feeding and application of the film 2 on the group 1, and places the roller in the optimum position relative to the surfaces 1a, 1b, 1c and 1d of the group 1 that differs each time according to the position of the idle roller 7 relative to the surfaces of the product 1 and its shape and size. The positioning is performed by the cam follower roller 14 which runs in the track 15 and, if necessary, by adjusting the length of

the arm 10: these two features make it possible to vary the angle of the arm 10 within the ring 4, increasing or decreasing the length of film 2 unwound from the roll 6 and its position relative to the surfaces to be wrapped, so that the wrapping direction of the film 2 over the product group 1 is always optimised.

[0026] The aims of the invention are therefore achieved by a minimal change in the structure of the machine which, however, makes the wrapping operation quick and easy and, above all, allows the film to adhere well to the surfaces of the group of products being wrapped.

[0027] The possibility of adjusting the position of the idle roller by means of a track (cam) combined with the possibility of adjusting the length of the supporting arm, confers a high degree of flexibility on the wrapping system which can thus be adapted to suit many different product shapes and sizes.

[0028] The invention described can be subject to modifications and variations without thereby departing from the scope of the inventive concept. Moreover, all the details of the invention may be substituted by technically equivalent elements.

Claims

1. A machine for wrapping a product or group of products (1) with stretch film (2), the machine comprising a horizontal table (3) along which the group (1) is fed in a direction (A) towards a ring (4) having a unit (5) for feeding the film (2) around the product group (1), passing through the ring (4) in such a way as to completely wrap the product group (1) in a spiral; the feed unit (5) comprising at least one film roll (6) and an idle roller (7) that feeds the film around the group (1) of products, which are placed alongside each other and which are associated with the ring (4), the latter being power driven by means (8) mounted on a fixed supporting structure (9) in such a way as to rotate about the axis (Y), the machine being characterised in that the film (2) feed unit (5) is linked to the rotation of the ring (4) through a supporting arm (10) which is acted upon by means (11) designed to adjust its position relative to the surfaces (1a, 1b, 1c, 1d) of the group (1) of products being wrapped and relative to the position assumed by the ring (4) when it rotates, in such a way as to form a guide and to enable the film (2) to be unwound close to the surfaces (1a, 1b, 1c, 1d) independently of the shape and size of the group (1) of products being wrapped.

2. The machine according to claim 1, characterised in that the position adjustment means act directly on the supporting arm (10) and consist of cam means (11) .

3. The machine according to claim 1, characterised in that the position adjustment means act directly on the supporting arm (10) and consist of cam means (11) whose length varies according to the shape and size of the product group (1) to be wrapped.

4. The machine according to claim 1, characterised in that the supporting arm (10) varies in length according to the shape and size of the product group (1) to be wrapped.

5. The machine according to claims 1 and 4, characterised in that the supporting arm (10) varies in length according to the shape and size of the product group (1) and thanks to means (12) designed to automatically control its movement according to its position relative to the product group (1).

6. The machine according to claims 1 and 4, characterised in that the supporting arm (10) varies in length according to the shape and size of the product group (1) and thanks to manual adjustment of the arm itself.

7. The machine according to claims 1 and 2, characterised in that the idle roller (7) is rotatably mounted on the free end of the supporting arm (10); the arm (10) having at the end of it that is linked to the ring (4), a rod (13) which passes through the ring and which, through another rigid connecting arm (14b), mounts a cam follower roller (14) that is slidably connected to the cam means (11) .

8. The machine according to claim 1, characterised in that the adjustment means consist of cam means (11) comprising a structure or track (15) located behind the ring (4) relative to the feed direction (A) of the product group (1) and slidably connected to a cam follower roller (14) linked to the arm (10).

9. The machine according to claim 8, characterised in that the track (15) is made up of a plurality of interchangeable segments (15a) joined to each other by detachable linking means (16) so that the size of the track can be changed according to the shape and size of the group (1) of products to be wrapped.

10. The machine according to claim 1, characterised in that the arm (10) is made up of two parts (17, 18) connected to each other by adjustment means (12) which consist of a screw and nut thread connection (19, 20) located inside the two parts (17, 18) and connected to means (21) for controlling the length of the arm (10) according to the shape and size of the group (1) of products being wrapped.

11. The machine according to claim 1, characterised in that the arm (10) is made up of two parts (17, 18)

connected to each other by engagement/disengagement means (22) passing across the two parts; each part (17, 18) having an opening (23, 24) made in it, one of which is a slot (23), and both openings together being designed to enable the passage of a pin (25) equipped with a threaded nut (26) so that the two parts (17, 18) can be manually slackened and tightened in order to vary the length of the arm (10) according to the shape and size of the product group (1) and before the product group is wrapped.

FIG. 2

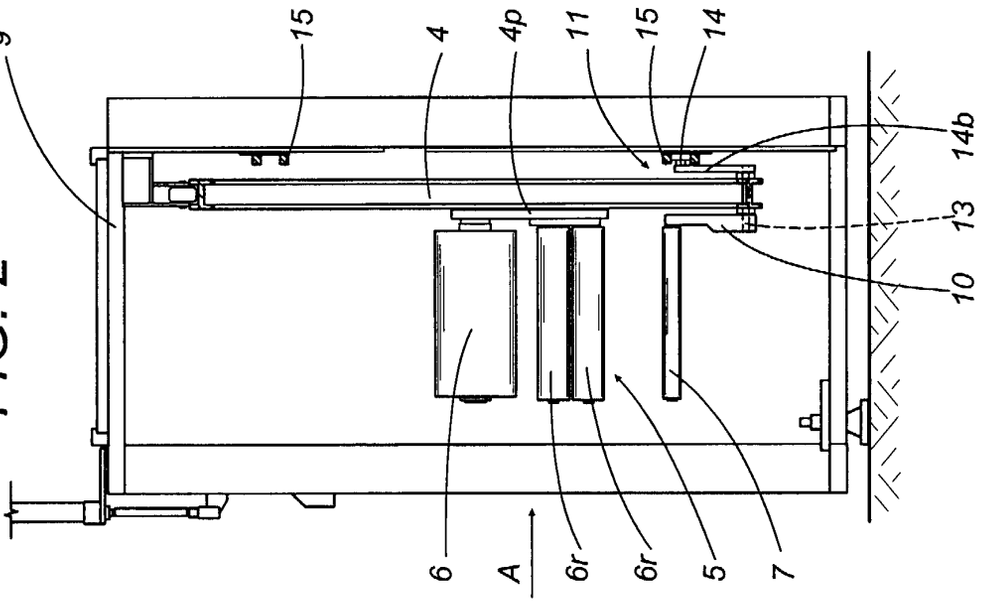
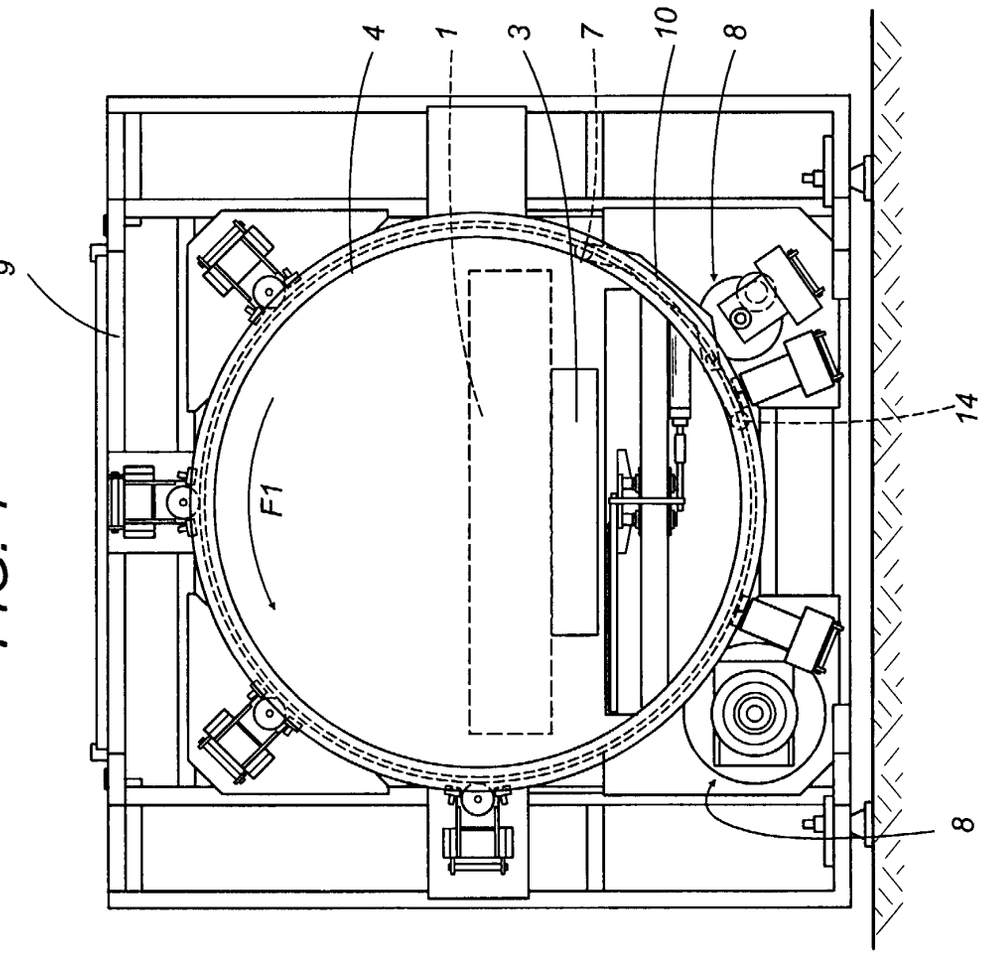


FIG. 1



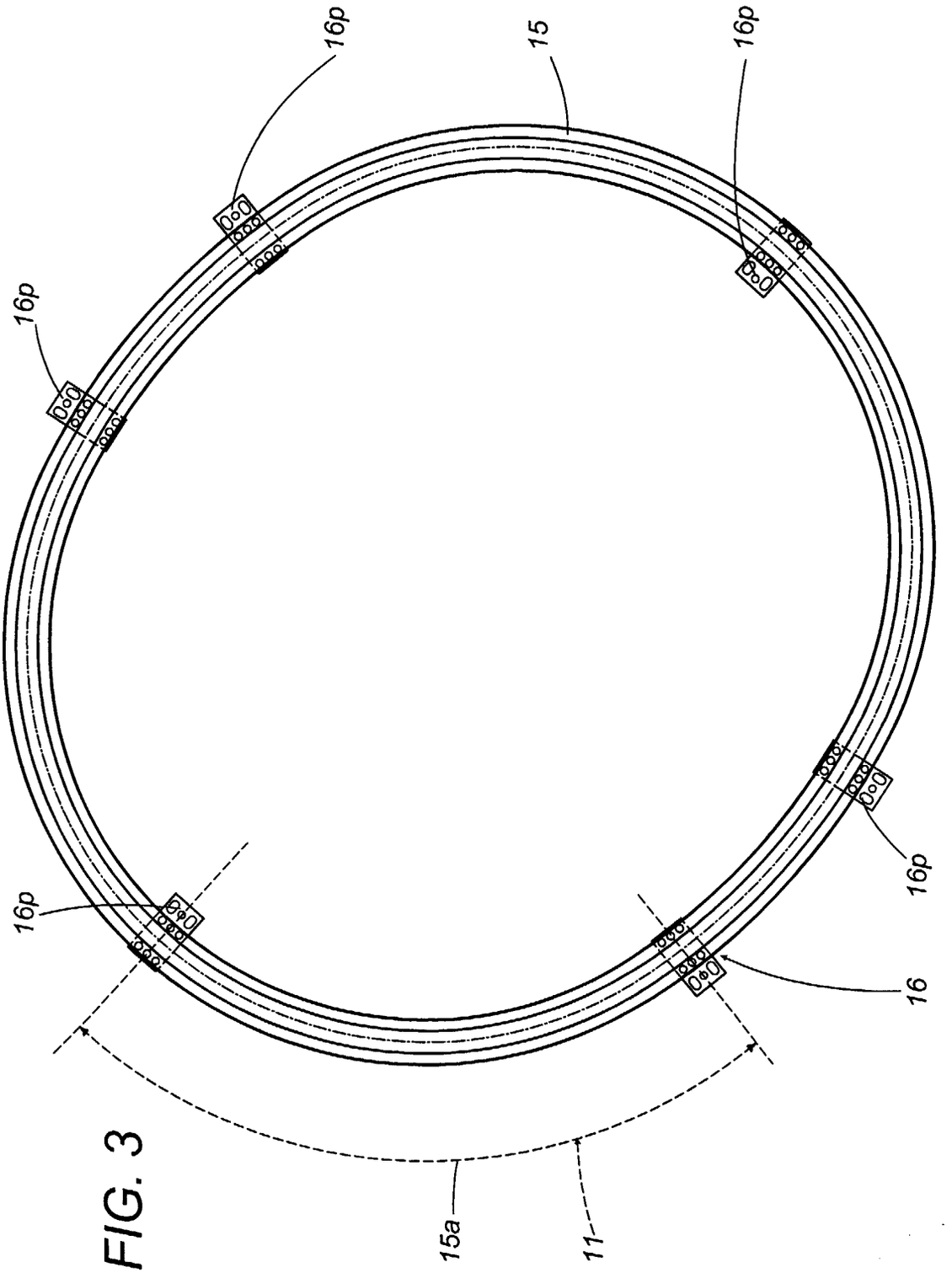


FIG. 3

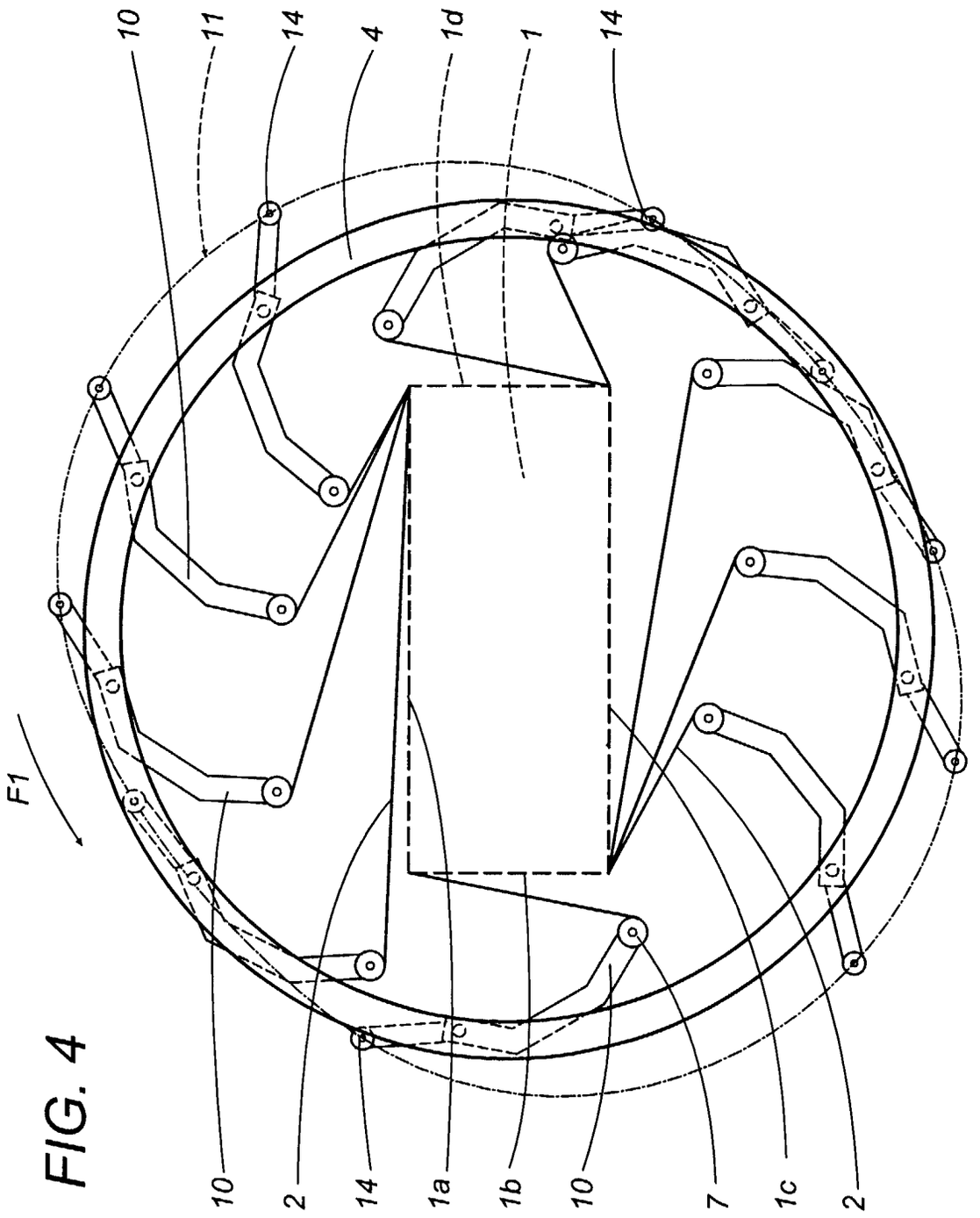


FIG. 4

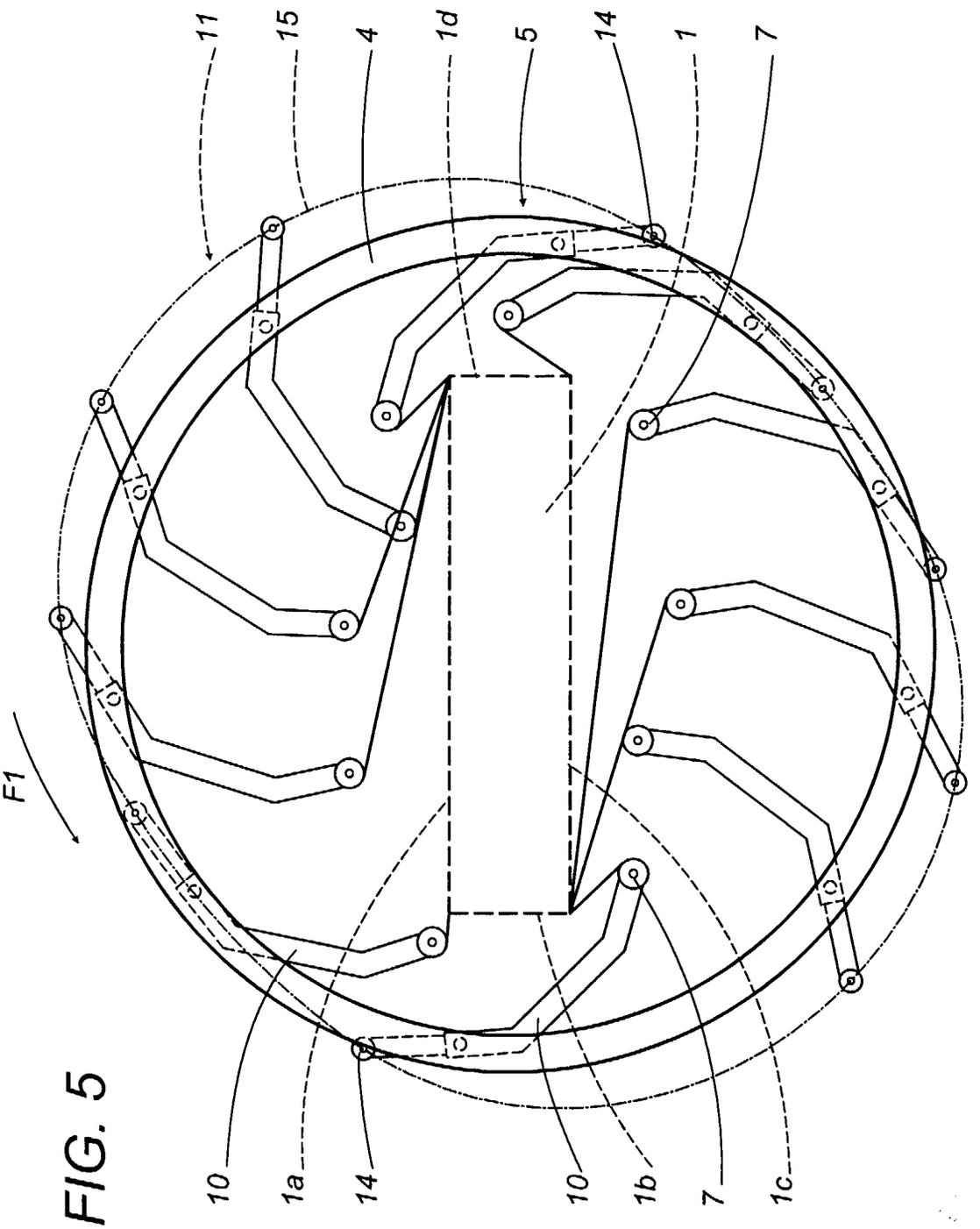


FIG. 5

FIG. 6

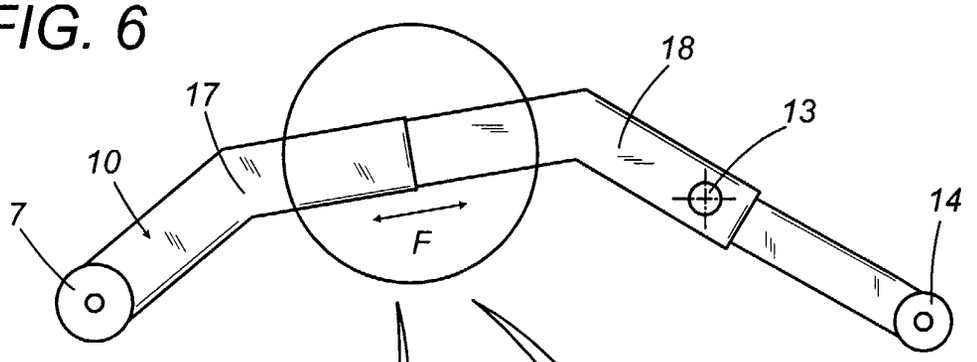


FIG. 8

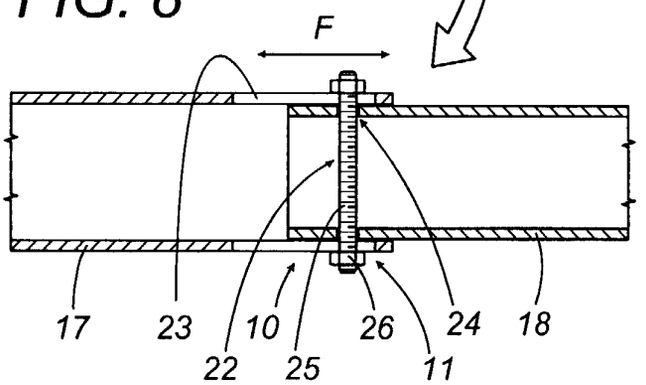


FIG. 7

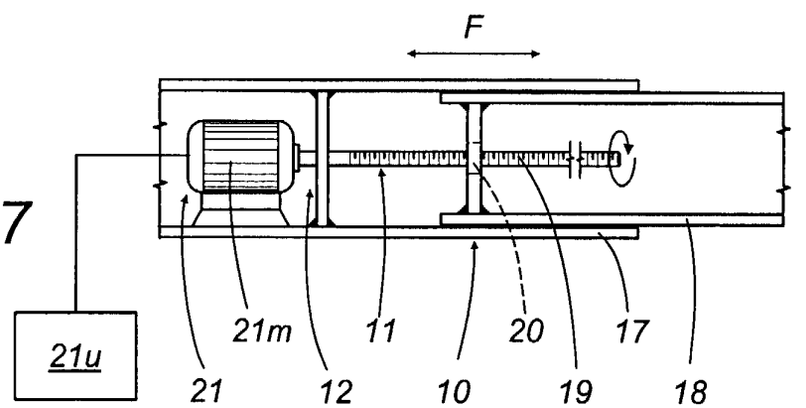
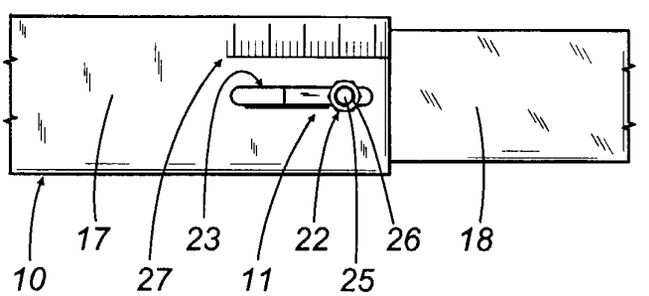


FIG. 9



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EUROPEAN SEARCH REPORT

Application Number
EP 00 83 0107

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.7)
A	US 5 285 891 A (KEIP) 15 February 1994 (1994-02-15) * column 6, line 61 - column 7, line 5; figure 1 *	1	B65B11/00
A	EP 0 152 960 A (LANCASTER ET AL.) 28 August 1985 (1985-08-28) * claims 1,9; figure 12 *	1	
A	US 5 123 230 A (UPMANN) 23 June 1992 (1992-06-23) * abstract; figure 1 *	1	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			B65B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	18 May 2000	Grentzius, W

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18-05-2000

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