

(19) World Intellectual Property  
Organization  
International Bureau



(43) International Publication Date  
31 December 2003 (31.12.2003)

PCT

(10) International Publication Number  
**WO 2004/000651 A1**

(51) International Patent Classification<sup>7</sup>: **B65B 11/54**

(21) International Application Number:  
PCT/EP2003/006247

(22) International Filing Date: 13 June 2003 (13.06.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
GE2002A000053 19 June 2002 (19.06.2002) IT

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(81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

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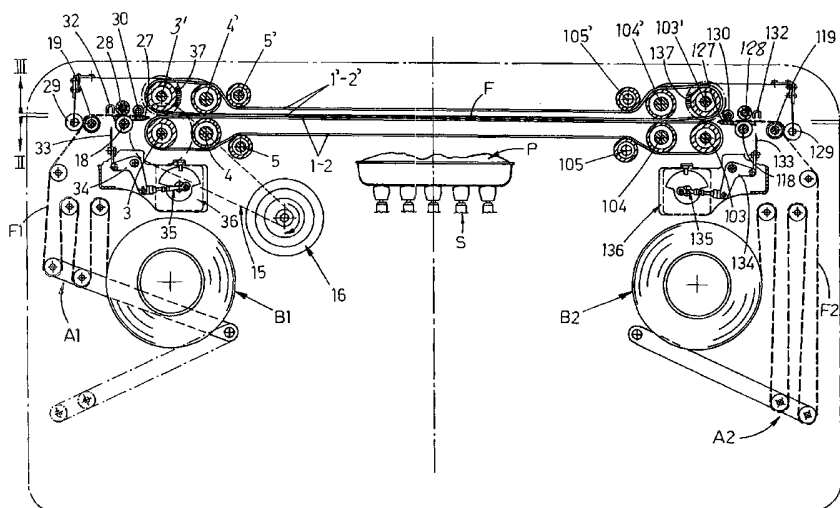
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Published:

— with international search report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: APPARATUS FOR SELECTIVELY FEEDING A FILM IN A PACKAGING MACHINE



(57) Abstract: Reels (B1, B2) of film are located on the opposite ends of the machine and the films unwound from these reels are passed around respective festoon dancers (A1, A2), around respective pairs of pull rolls (19, 29, 18, 28, 119, 129, 118, 128), through respective transverse-weakening means (32, 33, 132, 133) and are then abutted between the opposing ends of the pairs of superimposed opposing transport belts, which are driven by a motor (16) having two directions of rotation. The opposing pull rolls take their drive from the end shafts of the transport belts, through respective clutch and brake units (23, 24, 123, 124) of for example electromagnetic type. Depending on the film selected, the transport belts are advanced in the appropriate direction to take this film from the corresponding reel, while the other feed means connected to the other reel are disconnected from the belts and locked by the associated electro-magnetic brake.

**TITLE:** APPARATUS FOR SELECTIVELY FEEDING A FILM IN A PACKAGING MACHINE

## **DESCRIPTION**

The invention refers to machines designed to package products in stretch film, of the type that employ pairs of parallel belts to grip the opposite lateral edges of the film, unwound from a reel, which they subject to a transverse cutting and tearing operation in order to position cyclically in the packaging station, over the product being packaged, a piece of the said film of the length proportionate to the dimensions of the product itself. A machine of this type is disclosed for example in US patent No. 3 662 513 (Fabbri) dated 16 May 1972.

In these machines, the reel of packaging film is located at one end of the said transport belts and the film is unwound from it, passed around a buffer dancer and through two pairs of driven rolls whose job is to advance the said film. Operating between these pairs is the unit for making a transverse weakening in the said film, which then arrives between the ends of the pairs of superimposed opposing parallel belts. As it advances, the film is kept longitudinally taut by the pull rolls and by the transport belts which operate at speeds that increase appropriately in the direction of the belts. When a piece of film of a length proportionate to the dimensions of the product has entered between the belts, the entire film-advancing system stops temporarily, the transverse film-weakening means act, and the film-advancing system then restarts, and when the transversely weakened area of film has left the last pull rolls, all these rolls stop so that the film advances by the action of the belts only and is positioned by the latter in the workstation of the packaging machine as it is torn away from the upstream film.

In these machines it is often necessary to use films with different characteristics, such as films of different widths, for packaging products of different size. At present the practice is for reels of film of different widths all to be located at the same end of the said transport means, and, depending on requirements, the head end of the selected film has to be inserted between the first pull rolls, with the many problems that arise from this manual operation.

It is an object of the invention to obviate these and other drawbacks of the prior art, with the following proposed solution. The reels of film of different characteristics are located on the opposite ends of the machine and the films unwound from these reels are passed around respective buffer dancers, around  
5 respective pairs of pull rolls, through respective transverse-weakening means and are then abutted between the opposing ends of the said pairs of superimposed opposing transport belts, which are driven by a motor having two directions of rotation. The opposing pull rolls take their drive from the end shafts of the transport belts, through respective clutch and brake units of for example electromagnetic type.  
10 Depending on the film selected, the transport belts are advanced in the appropriate direction to take this film from the corresponding reel, while the other feed means connected to the other reel are disconnected from the belts and locked by the associated electro-magnetic brake. As the width of the film employed varies, means are provided to adjust the distance between the transport belts. It will be understood  
15 that with the apparatus according to the invention it is also possible to place at the opposite ends of the machine, reels of film of identical width but of different characteristics, in order to package products with different requirements, such as meat and fish or vegetable/fruit products, or exactly identical reels, the advantage being that the machine is given great working autonomy and allows an exhausted  
20 reel to be replaced with a new reel while the machine is still working with the film of the other reel.

Other characteristics of the invention, and the advantages it provides, will be made more evident by the following description of a preferred embodiment thereof, illustrated purely by way of non-restrictive example, in the figures of the attached  
25 sheets of drawings, in which:

Fig. 1 is a side view with certain parts in section of the new feed apparatus having two opposing reels;

Figs. 2 and 3 are plan views with certain parts in section of the same apparatus as in Fig. 1, viewed in the direction of section planes II-II and III-III,  
30 respectively.

In the figures, 1, 1' and 2, 2' denote the pairs of superimposed mutually parallel belts which transport the film horizontally. In the present example, there are three belts 1, 1' and two belts 2, 2' which are flanked internally by groups of three short belts 102, 102' and 202, 202' to improve the transverse support of the film as it enters these belts, the belts being arranged with a lead-in divergence of both ends and being passed symmetrically around the shafts 3, 4, 5, 103, 104, 105 in the case of the lower belts (Fig. 2) and around the shafts 3', 4', 5', 103', 104', 105' in the case of the upper belts (Fig. 3).

The lower shafts 3, 5, 103, 105 are supported rotatably by the sides 6, 6' of the machine, while the shafts 4, 104 are fixed to these sides and support their pulleys in bearings. The upper shafts 4', 5' and 104', 105' are also fixed to the sides 6, 6', while the end shafts 3', 103' are mounted rotatably on the sides of frames 7, 7' that pivot on the ends of the shafts 4', 104' to facilitate the initial operations of inserting the ends of films unwound from new reels between the belts (see below).

The end pulleys 8, 108 and 8', 108' of the belts 2, 2' are keyed to the shafts 3, 103 and 3', 103', whereas all the other pulleys of this group of belts are idle. The belts 2, 2' do not modify their position in space when the width of the film changes. The end pulleys 9, 109 and 9', 109' of the belts 1, 1' are also keyed to the shafts 3, 103 and 3', 103', whereas all the other pulleys of this same group of belts are idle. Unlike the other belts, the belts 1, 1' must be able to modify their position in space when the width of the film changes and for this purpose the pulleys of these belts are designed to be able to slide axially along their shafts and are controlled by the sides of small housings 10, 110 and 10', 110', the lower housings of which are connected to the corresponding upper housings by the flanks nearest the side 6', so as not to interfere with the film passing between the belts 1, 1'. As can be seen in Figure 2, the lower housings 10, 110 support, fixed coaxially to the shafts 5, 105, nuts 12, 112 which engage with corresponding threaded sections 11, 111 of these shafts 5, 105 which are interconnected at one end by a positive drive transmission 13 and one of the same shafts is connected at one end to a control or servocontrol 14 for right-hand

or left-hand rotation, by means of which the group of belts 1, 1' can be moved towards or away from the static belts 2, 2'.

Figures 1 and 2 show that the shaft 3 is connected by the positive transmission 15 to a two-directions-of-rotation drive unit 16 fixed for example to the side 6' and having an associated encoder 116 for controlling this unit with the operational logic mentioned earlier. At the other end, the shaft 3 is keyed to a gear wheel 17 meshing with a gear wheel of identical characteristics 17' (Fig. 3) keyed to the end of the upper shaft 3'. By means of this gearing the drive is passed from the lower belts to the upper belts.

It can also be seen in Figures 1 and 2 that there are, coplanar with the upper run of the belts 1, 2, parallel to the shafts 3, 3', at an increasing distance from these and at the opposite ends of the belts, rolls 18, 118 with annular equidistant rubber projections, and smooth rubber-coated rolls 19, 119 supported rotatably by the sides 6, 6' of the machine. Via suitable positive drive transmissions 20, 120 (see below), the shafts 3, 103 turn the pulleys 21, 121, which latter are mounted rotatably on the axles of the shafts 19, 119 and carry an integral ferromagnetic disc 22, 122, against the side of which is an electromagnetic clutch disc 23, 123 keyed to the shaft of the roll 19, 119, its energizing element 23', 123' being fixed to the adjacent side 6'. When this element is energized, the axles of the rolls 19, 119 are connected to the respective drive transmissions 20, 120, whereas when the said elements are de-energized, the said axles are disconnected from the transmission 20, 120 and are preferably braked by an electromagnetic brake 24, 124 which has a ferromagnetic disc 24', 124' keyed to the end of the axles of the rolls 19, 119, its energising element 24'', 124'' being fixed to a support structure 25, 125 fixed to the adjacent side 6' and traversed rotatably by the axles of the shafts 18, 118 and 19, 119. The numbers 26, 126 denote positive transmissions that permanently connect together the rolls 18, 19 and 118, 119. The peripheral speeds of the pull rolls and the linear speed of the film-transport belt(s) increase by suitable amounts in the direction of the said belts, so that the film advances with appropriate tension in the longitudinal direction.

The rubber-coated rolls 18, 118 project through the corresponding slots of a horizontal support surface 27, 127 (Fig. 1) and an idle parallel steel roll 28, 128 presses on these rolls and, as illustrated in Fig. 3, is supported, with the possibility of up and down movement, by the pivoting structure 7, 7' which also carries, with the possibility of up and down movement, an idle steel roll 29, 129 that lies parallel to the roll 19, 119. As Figure 3 also shows, the pivoting structure 7, 7' supports rotatably downstream of the rolls 18, 28 and 118, 128 and above the surface 27, 127, a roller 30, 130 made of plastic or other suitable material which has a plurality of small annular reliefs and which by means of the positive transmission 31, 131 receives the drive from the shafts 3', 103' of the upper belts 1', 2'.

Between the pairs of rolls 18, 28 and 19, 29 and the rolls 118, 128 and 119, 129 are known means which in response to a command make a transverse perforation across the packaging film and these means comprise a grooved blade anvil 32, 132 fixed to the pivoting structure 7, 7' and, beneath this, a blade 33, 133 guided by suitable means upstream of the surface 27, 127 and controlled by a motor 36, 136 via a connecting-rod-and-crank system 35, 135 and an arrangement of cranked levers 34, 134.

At the ends of the apparatus described above, for example underneath its ends, are the reels B1 and B2 of film, optionally having different characteristics. They are parallel to the various shafts of the said apparatus and controlled by known means (not illustrated). The films F1, F2 unwound from the reels B1, B2 pass through a dancer festoon device, also known, A1 and A2, which controls the activation of the reel rotating and unwinding means and the said films are then passed respectively between the pairs of rolls 19, 29, 119, 129, between the weakening means 32, 33, 132, 133 between the pairs of rolls 18, 28 and 118, 128 and under the rollers 30, 130 and are finally abutted between the initial lead-in part of the pairs of transport belts 1, 1' and 2, 2'. As Figures 1 and 3 show, the initial shaft 3', 103' around which the upper belts 1', 2' pass, has fixed to it a plurality of small annular brushes 37, 137 which lightly touch the film placed in the initial lead-in part of the pairs of belts.

The apparatus as described works in the following manner. The packaging machine equipped with the apparatus according to the invention can use either the film F1 or the film F2, whichever is required. If the machine is using the film F1, for example, the motor 16 is set up to rotate clockwise (when viewing Fig. 1), while the clutch 123 is de-energized and the brake 124 is energized, so that the head of the film F2 remains pinched between the pairs of pull rolls, which remain stationary. The film F1 is used with the brake 24 de-energized and the clutch 23 energized, so that the pairs of rolls 19, 29, 18, 28 of the roller 30 are kinematically connected to the motor 16 in such a way that when the latter is activated to transport the belts towards the right (when viewing Fig. 1), a corresponding section of film is unwound from the upstream feed means and inserted between these belts, which grip it by portions of the lateral edges. During this phase the transverse film-weakening saw-toothed blade 33 is down. After a section of film of predetermined length has been inserted between the belts, and before the said section of film reaches the correct position over the lifter S carrying the product P that is to be packaged, the motor 16 stops temporarily, the saw-toothed blade 33 is raised and then lowered again to form a transverse weakening in the film and immediately afterwards the motor 16 starts turning again. When the weakened zone of film has passed the pair of rolls 18, 28, the clutch 23 de-energizes and the brake 24 energizes so that the entire system of pairs of pull rolls 19, 29, 18, 28 stops, thus holding the film upstream of the transverse weakened zone, whereas downstream of this zone the broad section of film F held between the superimposed belts 1, 1' and 2, 2' is advanced, is separated by tearing the film upstream of the said line of weakness and is correctly positioned over the lifter S, after which the motor 16 stops. The above-mentioned operations are synchronized so that the new film end left by the tear is preferably downstream of the roller 30, more preferably underneath the brushes 37.

If the machine has to use the film F2, the motor 16 is caused to turn in the opposite direction from the previous direction and the electromagnetic clutch 123 and the electromagnetic brake 124 will now function, while the electromagnetic clutch 23

remains de-energized and the electromagnetic brakes 24 remains energized to prevent the pairs 18, 28, 19, 29 and 30 turning.

**CLAIMS**

1. Apparatus for selectively feeding film to the workstation of a machine for packaging products in stretch film, unwound from an associated reel, which passes through a controlling festoon dancer and which then passes through at least two pairs of driven pull rolls, operating between which are means which in response to a command make a transverse weakness in the film and downstream of which pairs is the open lead-in end of pairs of horizontal superimposed parallel opposing belts (1, 1', 2, 2') which advance the film with support for lateral portions, which apparatus is characterised in that both of the opposite ends of the said transport belts are designed with a lead-in to receive the corresponding films (F1, F2) unwound from corresponding reels (B1, B2), which pass through respective festoon dancers (A1, A2) and respective pairs of pull rolls (19, 29, 18, 28, 119, 129, 118, 128), between which are respective transverse-weakening means (32, 33, 132, 133), the said belts being actuated by two-directions-of-rotation means (16) from which the rotary motion is also taken to the pairs of pull rolls for the two different films, via means (23, 24, 123, 124) for engaging and/or disengaging the drive take-off, in such a way that only those pairs of rolls that are pulling the film which is to be used are active, while the pull rolls of the other film remain stationary.
2. Apparatus according to Claim 1, in which the two-directions-of-rotation drive means (16) is connected by a positive drive transmission (15) to one of the end shafts (3) of the lower film-transport belts (1, 2) and these shafts (3, 103) are in turn connected by respective drive transmissions (20, 120) to respective electromagnetic clutches (23, 123) which, depending on whether they are de-energized or energized, disconnect or connect the said drive transmissions to one of the film pull rolls (19, 119), which roll is permanently connected to the other pull roll (18, 118) by a positive drive transmission (26, 126), the arrangement being such that when the said electromagnetic clutch is de-energized, one of the two film pull rolls engages with an electromagnetic brake (24, 124) that locks the said pull rolls not involved in transporting the film.

3. Apparatus according to claim 2, in which the shafts (3', 103') carrying the end deflection pulleys of the upper film-transport belts (1', 2') are mounted rotatably on structures (7, 7') pivoting on the ends of adjacent shafts (4', 104') that carry  
5 corresponding deflection pulleys for the said belts, a short distance from which are outer pulleys mounted on shafts (5', 105') acting as tensioners, the whole being such as to be able to raise an initial section of the upper transport belts whenever it is necessary to place between these belts the head of a new film unwound from a new reel, one of the said end shafts (3', 103') of the upper belts being connected by a  
10 gear (17', 17) to the subjacent end shaft (3) of the lower belts.

4. Apparatus according to claim 1, in which the film-transport belts (1, 1', 2, 2') are made up of several belts side by side, and, between one belt and the next, small annular brushes (37, 137) are keyed to the end shafts (3', 103') of the upper belts or  
15 to their pulleys (8', 108', 9' 109'), which brushes project suitably from the said belts and touch the film to help it enter correctly between the transport belts.

5. Apparatus according to claim 2, in which one pair (2, 2') of the superimposed film-transport belts is static on its deflection shafts, while the other pair (1, 1') of the  
20 said belts is adjustable in terms of its distance from the said static pair, to adapt to packaging different sizes of product in films (F1, F2) of different widths, the pulleys and the deflection rolls of these movable belts being mounted with the ability to slide axially on the respective shafts, the end shafts (3, 103, 3', 103') of which are designed to transmit the drive to the respective pulleys while allowing them to be  
25 moved axially, the pulleys and the deflection rolls of the said movable belts being grouped together by connection to housings (10, 10' and 110, 110') that can be moved simultaneously and in the same direction by screw-and-nut systems (11, 111, 12, 112) synchronized with each other by a positive transmission (13) and connected to a centralized actuating means (14), by means of which latter it is possible to set  
30 the desired distance between the pairs of parallel opposing film-transport belts.

6. Apparatus according to claim 1, in which the film pull rolls (F1, F2) comprise, supported rotatably by the sides (6, 6') of the machine, and proceeding in order from the reel to the transport belts, first rubber-coated smooth rolls (19, 119) and second  
5 rolls (18, 118) with a plurality of annular rubber-coated projections projecting slightly through the corresponding slots in a superjacent horizontal film support surface (27, 127), upstream of which are the means (32, 33, 132, 133) for cutting the said film transversely, while corresponding spring-loaded idle opposing rolls (29, 129, 28, 128), connected to the same pivoting structures (7, 7') as rotatably support the first  
10 end shaft (3', 103') of the upper transport belts (1' 2') are positioned against and parallel to the said rubber-coated rolls.

7. Apparatus according to claim 6, in which, between the last pair of film pull rolls (18, 28, 118, 128) and the adjacent end of the film-transport belt(s), there is, parallel  
15 to the said rolls and above the film support surface (27, 127), a roller (30, 130) with a plurality of small equidistant annular projections, the said roller being made from a material with a low coefficient of friction on the film and supported rotatably by the pivoting structures (7, 7') that carry the first deflection shaft (3', 103') of the upper belts (1', 2') and that is connected to it kinematically by a suitable drive transmission  
20 (31, 131).

8. Apparatus according to claim 7, in which the peripheral speeds of the pull rolls and the linear speed of the transport belts are increased appropriately in the direction of the belts, so that the film is satisfactorily taut in the longitudinal direction as it  
25 advances.

9. Apparatus according to claim 1, characterized in that it comprises:

- means (116) for detecting the speed of rotation and the angular position of the drive means (16) by which the entire apparatus is driven;

- means for deactivating and activating the electro-magnetic clutch and the electromagnetic brake of the pairs of pull rolls associated with the film that is not being used;
- means for activating the said drive means (16) in the appropriate direction of rotation for insertion into the packaging station, by the pairs of superimposed opposing belts and associated pull rolls, of one of the two selected films, means being provided for this purpose to de-energize the electromagnetic brake and energize the electromagnetic clutch connected to these pull rolls;
- means for temporarily stopping the drive means (16) when the correct length of selected film has been inserted between the pairs of transport belts and advanced by them;
- means for activating and then deactivating the means used for the transverse perforation of a transverse line of weakness in the film as it is being fed in; and
- means for reactivating the drive means (16) in order to move the transverse line of weakness of the film downstream of the last pair of pull rolls, after which there are means for de-energizing the clutch and energizing the electromagnetic brake of these pull rolls so that the film advances only due to the transport action of the belts and is positioned by these belts in the packaging station, having been torn off from the upstream film, the head of which stays at the open lead-in end of the said transport belts.

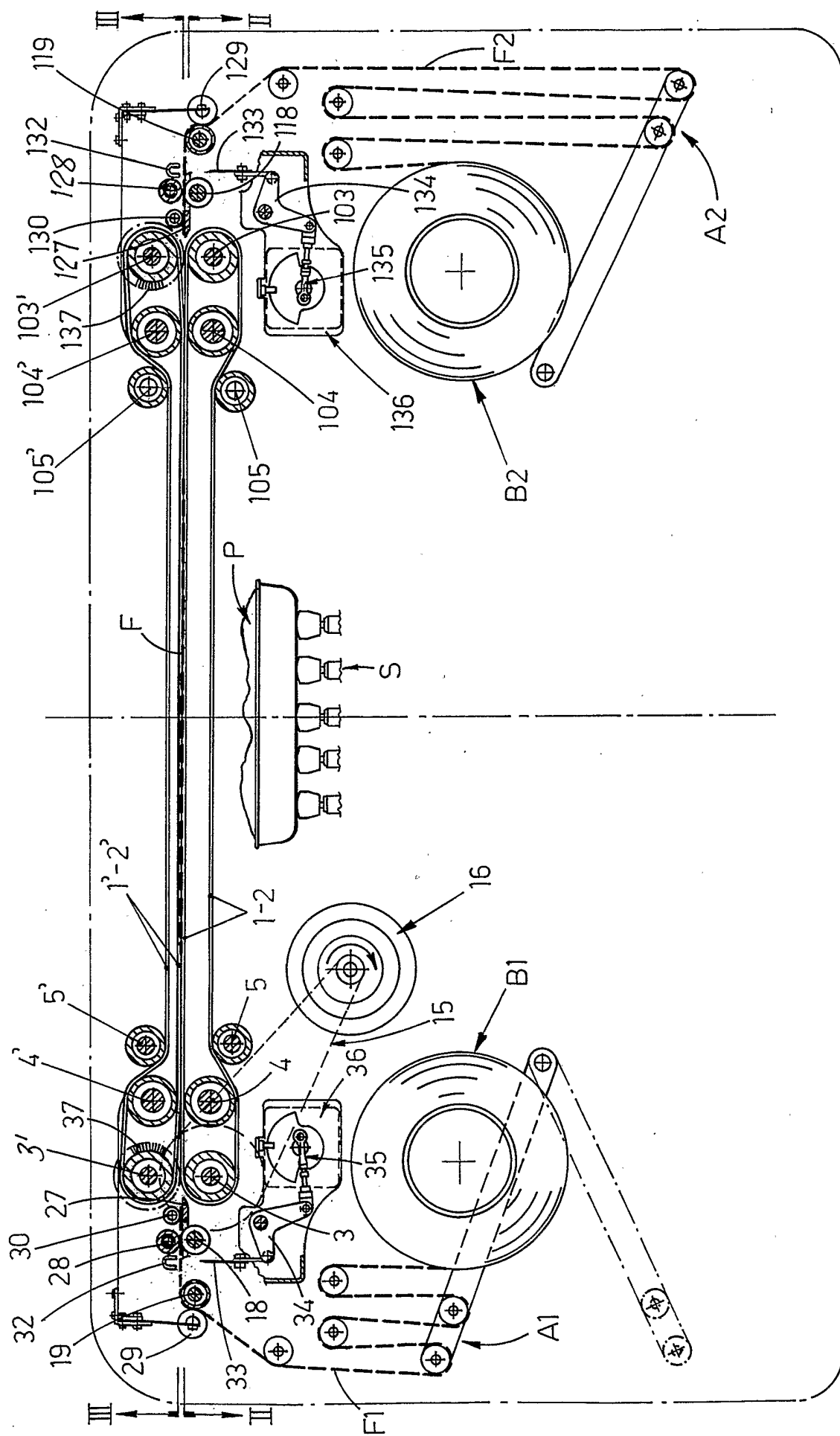


Fig.1

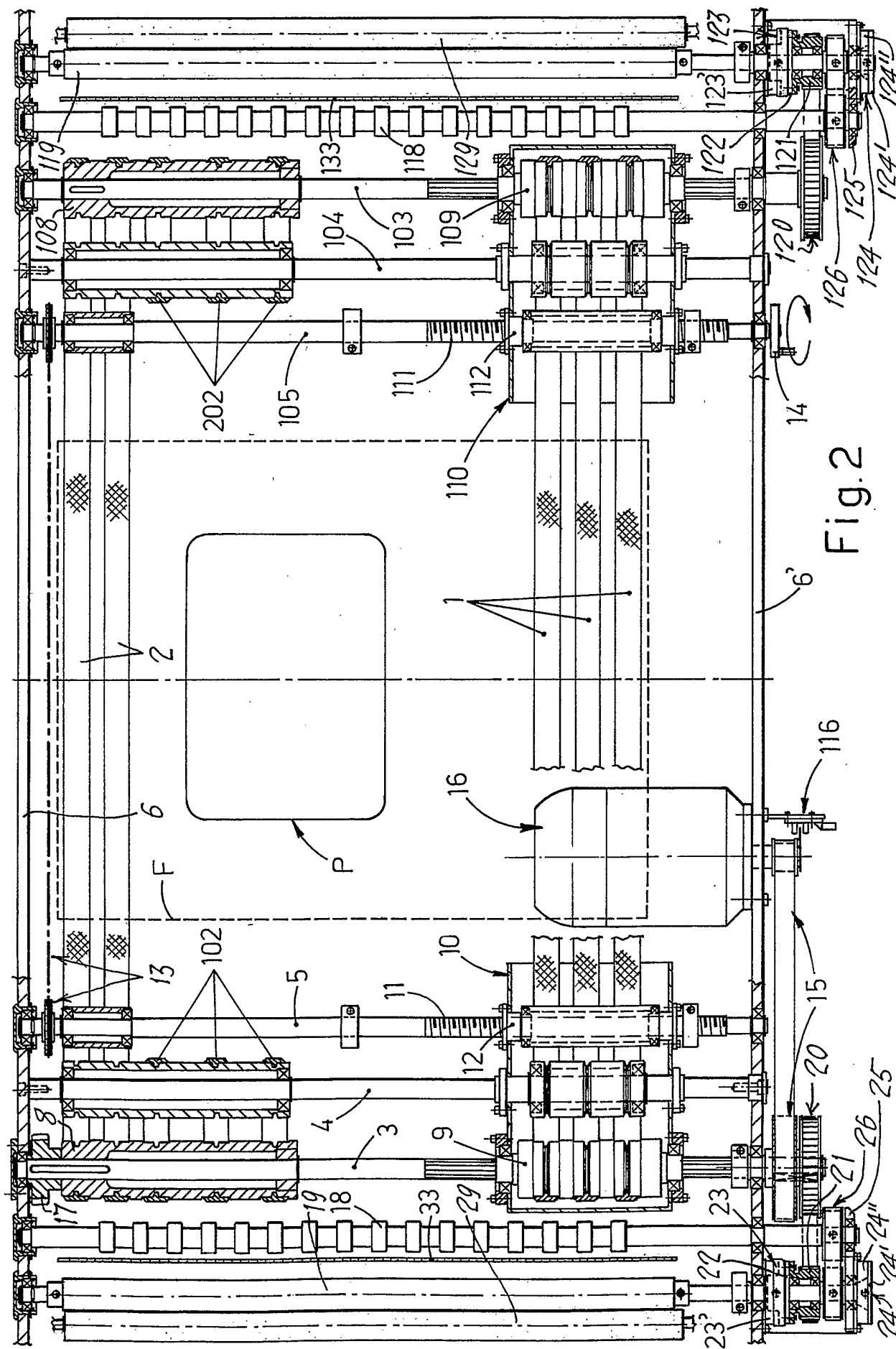


Fig. 2

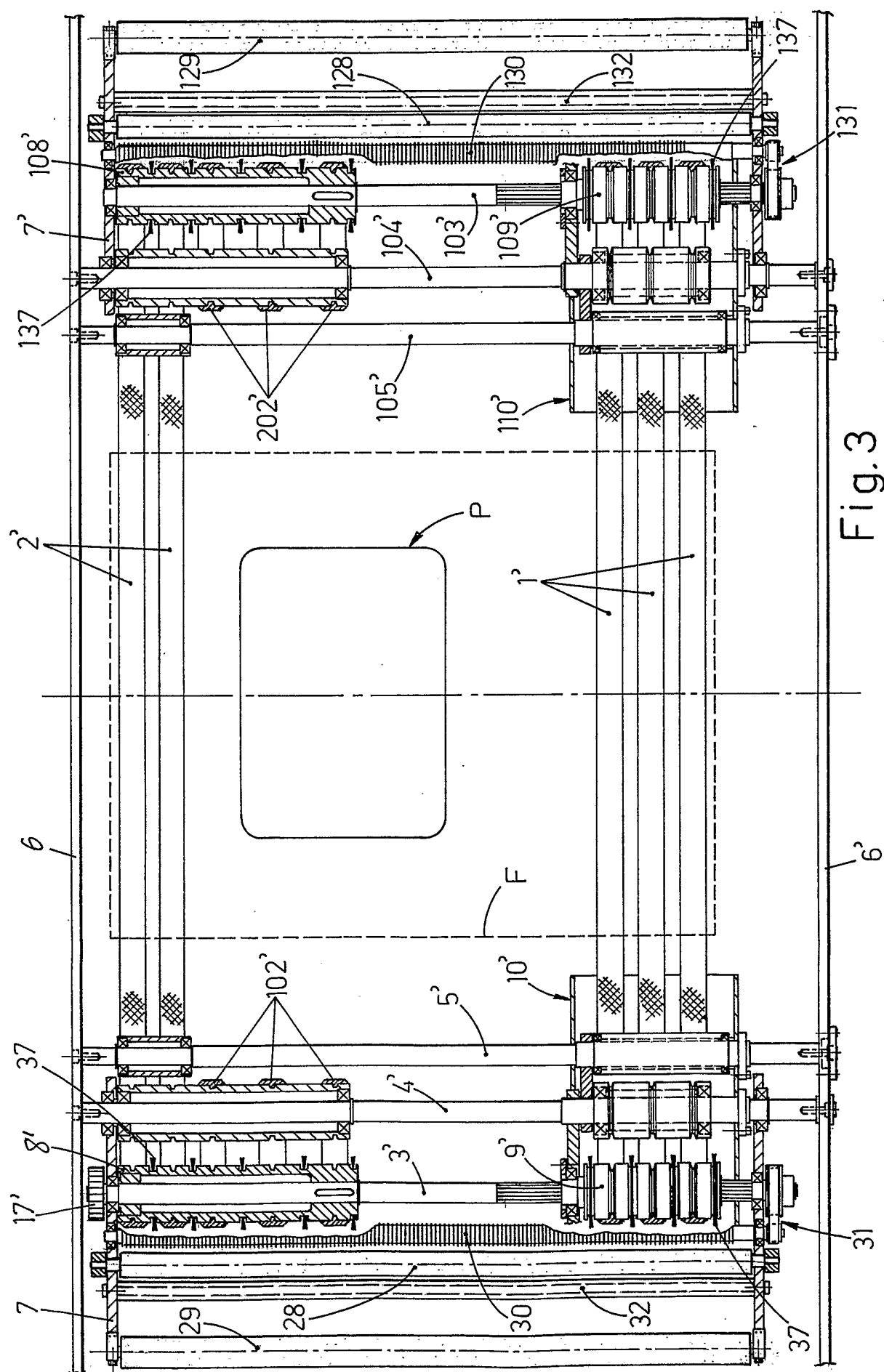


Fig. 3

## INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 03/06247

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 B65B11/54

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 B65B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

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## C. DOCUMENTS CONSIDERED TO BE RELEVANT

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|            | ---<br>-/--                                                                                                                              |                       |

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

16 September 2003

Date of mailing of the international search report

25/09/2003

Name and mailing address of the ISA

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## INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 03/06247

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

| Category ° | Citation of document, with indication, where appropriate, of the relevant passages                     | Relevant to claim No. |
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Information on patent family members

International Application No

PCT/EP 03/06247

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