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(71) Applicants:
- **SOREMARTEC S.A.**
  B-6700 Arlon-Schoppach (BE)
  Designated Contracting States:
  BE CH DK ES FR GB GR IE LI LU MC NL PT SE AT
- **Ferrero S.p.A.**
  I-12051 Alba (Cuneo) (IT)
  Designated Contracting States:
  IT
- **FERRERO OFFENE HANDELSGESELLSCHAFT m.b.H.**
  D-60599 Frankfurt (DE)
  Designated Contracting States:
  DE

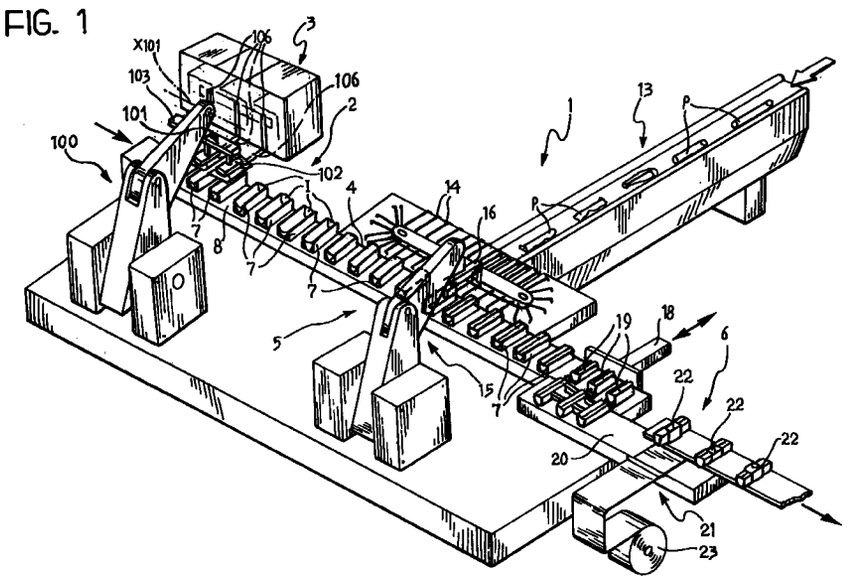
(72) Inventor: **Milano, Giuseppe**
I-12051 Alba (Cuneo) (IT)

(74) Representative: **Bosotti, Luciano et al**
I-10152 Torino (IT)

(54) Package-forming equipment

(57) Elongate elements (P) constituted, for example, by tubular flow-pack wrappers containing a plurality of products such as pralines, chocolates, etc, are inserted in generally boat-shaped wrappers (I). Each wrapper (I) is formed from a flat blank including a central rectangular portion (A), intended to form a channel, plus end flaps including eyelid-shaped portions (B2,C2) intended to form the end walls of the wrapper (I). The elongate elements (P) are supplied through an accumulation stage (14) to a handler (15). This latter takes the elongate elements (P) from the accumulation stage (14) and deposits them in the wrappers (I). The packages thus formed are completed by the application of a band of sheet material (18).

FIG. 1



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Description

The present invention relates to equipment for forming packages comprising elongate elements inserted in generally boat-shaped wrappers.

The invention has been developed with particular but not exclusive attention to its possible use for the formation of packages of the type forming the subject of International Model DM/022926.

This package is constituted essentially by a wrapper defined by a channel portion closed at its two ends by eyelid-shaped end walls and intended to receive a plurality of elongate elements. These latter may be constituted by the products themselves (for example food products such as breadsticks, elongate biscuits, possibly covered in chocolate or other food products, sticks of food products, etc, wrapped in respective wrappers) or - as in the case of the package which is the subject of the International Model cited - by sub-elements of the package such as, for example, tubular wrappers (possibly of the flow-pack type) including a plurality of food products such as spherical pralines.

In the manufacture of packages of the type specified above, it is necessary to take account of two basic requirements, that is to say:

- the outer wrapper of the package is usually provided in the form of a cardboard product constituted by a rectangular sheet of card (possibly corrugated card) having two end appendages folded and partly glued to the card itself with pre-blanked parts for forming the eyelid-shaped end walls: the cardboard product in question must then be formed to give it the required boat shape for receiving the elongate elements, and
- these elements must be located in the wrapper in a centred position of mutual alignment, avoiding any end appendages (such as the end tabs of flow-packs) from interfering with their introduction into the wrapper.

In addition it must not be forgotten that the shaping of the wrapper and filling thereof must be capable of being carried out automatically on an industrial scale, at the very high rates typical of current production processes.

The object of the present invention is to provide equipment which is able to satisfy the requirements mentioned above in an excellent manner.

According to the present invention, this object is achieved by equipment having the characteristics claimed specifically in Claim 1. Advantageous developments of the invention form the subject of Claims 2 to 10.

The invention will now be described, purely by way of non-limitative example, with reference to the appended drawings, in which:

Figure 1 is a general perspective view of equipment operating according to the invention,

Figure 2 illustrates schematically the characteristics of part of a package formed by the equipment of Figure 1,

Figures 3 and 4 illustrate the structure and characteristics of part of the equipment of Figure 1 in greater detail and in two successive stages of operation,

Figure 5 illustrates the effect of the operation of the parts of the equipment illustrated in Figures 3 and 4 on the part of the package illustrated in Figure 2,

Figures 6 and 7 illustrate two successive stages in the operation of a further part of the equipment of Figure 1,

Figure 8 illustrates schematically the structural characteristics of the part of the apparatus the operation of which is illustrated in Figures 6 and 7 in a view corresponding approximately to a section taken on the line VIII-VIII of Figure 6, and

Figure 9 illustrates the effect of the operation of the parts of the apparatus illustrated in Figures 6-8 on the combination of parts illustrated in Figure 5.

In Figure 1, automatic packaging equipment is generally indicated 1 which can be used for example to form packages such as that forming the subject of International Model DM/022926 already mentioned in the introduction to the present specification.

The apparatus 1 is constituted essentially by several operative parts or sections in succession, that is to say,

- a wrapper-forming section 2 in which the outer wrappers I of the packages, held in the form of blanks (which will be described more fully below with reference to Figure 2) in a store 3, are formed into the general configuration of a boat and inserted in respective receiving cells in a longitudinal main conveyor 4 which passes through the equipment 1;
- a filling station 5 for the loading of the elongate elements P, in which these elements (coming from a forming station such as, for example, a flow-pack wrapping machine in which individual products, such as pralines, chocolates, etc., are inserted in elongate envelopes closed by end tabs) are placed in the wrappers I in the cells of the conveyor 4; and
- an output station 6 at which the packages constituted by the outer wrappers I each filled with a given number of elements P are completed by, for example, the application of a tubular closure band.

Figure 2 illustrates in greater detail the structure of the outer wrappers I intended to be packaged in the equipment 1 in the form in which they are placed in the store 3 prior to insertion in the cells (usually defined by boxes 7) of the conveyor 4.

As they are presented in the form of cardboard blanks (manufactured and prepared according to known criteria not themselves relevant to an understanding of the present invention), the wrappers I are constituted each essentially by a sheet of card, usually corrugated

with longitudinal channels, including a substantially flat central portion A of rectangular shape and two end flaps B and C folded over the central portion A and partly glued to it.

More precisely, each flap B and C can be seen to be constituted by a "fixed" part B1, C1 of generally U-shape, glued to the central portion A, and a "movable" part B2, C2 of generally eyelid shape, not glued and hence raisable from the central part A.

Between the two parts B1, B2 and C1, C2 respectively of each flap B and C is a line of punched holes for forming a zone in which the card can easily be bent. As stated above, this card is preferably constituted by corrugated card with the corrugations oriented so that their channels extend in the direction of the main longitudinal axis of the wrapper I, not only in the central portion A (particularly on the lower face - not visible - with reference to the point of view of Figure 2) but also in the flaps B, C.

The corrugations give the wrapper I a certain longitudinal strength accompanied by a facility to bend in the direction perpendicular to the length of the channels of the corrugations. All this facilitates the possibility of forming the central portion A into a generally channel shape and, together with the upward bending of the eyelid-shaped parts B2, C2 of the flaps B, C, giving the wrapper I a generally boat shape.

Figures 3 and 4 illustrate in greater detail how this result is achieved by the equipment 1 of the invention.

The wrappers I are taken from the store 3 and inserted in the cells 7 of the conveyor 4 by a handling robot 100. This robot has an operative head or hand 101 (Figure 1) including one or more (for example three) pick-up elements 102 which can act between the store 3 and the conveyor 4.

The conveyor in question may be an ordinary conveyor used in plants for the automatic handling of food products, in which each cell 7 is constituted, for example, by a channel-shaped body of rectangular or square section which can receive - in sufficiently tight conditions - a respective boat shaped wrapper I.

Each of the cells 7 is connected to the other cells of the conveyor 4 by drive means of the conveyor, such as, a motor driven central belt 8 to which the cells 7 are fixed (by known means) so as to cause the cells 7 to advance in the general direction of the arrows shown in Figures 1 and 3.

In the preferred embodiment illustrated in the drawings, the head or hand 101 of the robot 100 is in the general form of a rake with the pick-up elements 102 mounted on a common structure 103 exactly like the teeth or prongs of a rake.

The structure 103 may be constituted simply by an elongate plate or rod which extends in the direction of the conveyor 4 in front of the store 3. As shown in the drawings, each pick-up element 102 is generally T-shaped with a stem which carries an active part 104 constituting the head of the T-shape extending perpendicular to the length of the structure 103.

In the embodiment illustrated, the store 3 includes three outlet apertures (or take-up positions for the wrappers) that is, the same number as the number of pick-up elements 102 of the head or hand 101 of the robot 100. The wrappers I are accumulated in the store 3 in rows (one for each outlet aperture) orientated vertically in a plane parallel to the direction of the conveyor 4, with their direction of major extent oriented vertically.

A take-up member 106, of known type, operates in correspondence with each outlet aperture of the store 3 and can be oriented selectively between:

- a rest position (illustrated in full outline in Figure 1) in which the member 106 bears against the row of wrappers I which advance towards the outlet aperture (under gravity or under the action of pusher means not illustrated), and
- a delivery position (illustrated schematically in broken outline in Figure 1) in which the member 106 is tipped forwardly towards the robot 100 into a horizontal position, carrying with it (for example as a result of a hooking action or by virtue of the presence of a suction gripper element, such as a suction cup, not visible in the drawings) the first wrapper I in the row, presenting it in a position for gripping up by the robot 100.

This latter (and in particular the head or hand 101) is in turn reciprocable between:

- a pick-up position, in which the or each of the active parts 104 is located above a wrapper I carried by the respective member 106, captures it and retains it against itself by virtue of the action of the pick-up means, such as suction cups 105 connected in known manner to a low pressure (vacuum) source, not explicitly shown in the drawings, and
- a loading position in which the head or hand 101, with its respective pick-up elements 102 carrying the wrappers I attached to the parts 104, is located above the conveyor 4 momentarily stopped or slowed, so as to place each wrapper I taken from magazine 3 over the aperture of a respective cell 7 as shown schematically in Figure 3.

The same drawing shows clearly how the active parts 104 and the cells 7 of the conveyor 4 have approximately corresponding dimensions so that they are of generally male-female configuration. This enables the parts 104 to enter the corresponding cells 7 from above (as a result of a vertical downward movement of the arm of the robot 100 which carries the head or hand 101), forcing the wrappers I into them.

From an observation of Figure 3, it may also be appreciated that the parts 104 are U-shaped in cross sectional profile, this shape being approximately complementary to the channel shape which it is wished to impart to the central portion A of the wrappers I. Moreover, the length of the parts 104 (measured between the flat end

faces 104a in the direction of longitudinal extent of the blanks I, which direction obviously also corresponds to the direction of alignment of the suction cups 105 and to the direction of the major axes of the cells 7, which is perpendicular to the direction of advance of the conveyor 4) is just slightly less than the distance between the mutually facing apex portions of the eyelid-shaped parts B2 and C2.

This enables two spreader flaps 11 to be provided, one at each end of the active part 104 (that is, in correspondence with the faces 104a).

As can best be deduced from a comparison of Figures 3 and 4, each spreader flap is mounted on the part 104 so as to be pivotable about a respective horizontal axis X11, defined, for example, by hinge systems 11a. The axes X11 are thus parallel to the general direction of advance of the conveyor 4.

The pivoting of the flaps 11 about the axis X11 is driven by known mechanisms (for example by respective fluid-actuated pushers not visible in the drawings) mounted within the part 104 and each acting on the face of the respective flap 11 facing into the part 104.

As a result of the vertical movement of the arm of the robot 100, the or each part 104 mounted on the head or hand 101 can move downwardly relative to the conveyor 4 so as to insert the or each wrapper I in the respective cell 7 of the conveyor 4.

When a wrapper I taken from the store 3 is placed on the opening of a respective cell 7, the arm of the robot 100 is lowered (under the action of drive means of known type not shown explicitly in the drawings) so as to force the wrapper I, carried by the part 104 as a result of the action of the suction cups 105, into the respective cell 7. At the same time (see the sequence of Figures 3 and 4) the flaps 11 are pivoted about their respective axes X11 in the spreading sense as illustrated in Figure 4.

The lowering of the part 104 into the cell 7 beneath it serves to force the central portion A of the wrapper I into the cell 7 so as to give it the desired channel shape. At the same time, the diverging of the flaps 11 causes the eyelid-shaped parts B2, C2 to be spread apart and thus raised so as to form the end parts of the wrapper I. Once it has been inserted fully into its cell 7, this wrapper is formed (erected) into its desired boat shape, illustrated in Figure 5.

At this point the suction cups 105 may be deactivated and the head or hand 101 returned upwardly so as to be ready for a repetition of the cycle of picking up, shaping and loading the wrappers I into the cells 7, as described above, while each wrapper I is held securely in its cell 7 for example by retaining teeth 7a along the longitudinal edges of the opening of the cell 7.

As has been seen, the head or hand 101 preferably carries several elements 102 with their respective parts 104 (for example three). The action of picking up, shaping and loading into the cells 7 is thus carried out simultaneously on a group of wrappers I (for example three wrappers I) taken from the store 3 at the same time.

As a result of the advance of the conveyor 4, the wrappers I are carried to the filling station 5, being advanced in the direction of their widths, that is, with their longer dimension perpendicular to the direction of advance (Figure 1).

The filling station is constituted by several operative stages, that is to say:

- a conveyor 13 which supplies the elements P to the conveyor 4, advancing them in the direction of their lengths (that is with their longer dimension aligned with the direction of advance),
- an alignment and accumulation stage 14 located downstream of the conveyor 13 for forming a buffer or accumulation of elements P, and
- a further robot or handler 15 for taking the individual elements P from the accumulation stage 14 and placing them in the wrappers I in the cells 7.

The conveyor 13, like the conveyor 4, is an ordinary conveyor device (for example with motor-driven belts of the type currently used in automatic packaging plants for food products).

The alignment and accumulation stage 14 is also constituted by a known device: this may be constituted, for example, by equipment substantially like that described in the document DE-A-37 24 839.

The handler 15 is constituted essentially by a robot having one or more grippers 16 which can effect generally vertical and translational movements in a cyclic sequence of steps including:

- lowering over one or more accumulation cells of the stage 14 with the take up of a corresponding number (for example a pair) of elements P,
- raising with subsequent translational movement to a position above the conveyor 4,
- lowering towards the conveyor 4 with the deposition of the elongate elements P taken from the stage 14 into the wrapper I in the underlying cell 7, and
- return travel to the accumulation stage 14 to take up a new group of elongate elements P.

The sequence shown in Figures 6 and 7 shows how the (or each) gripper or hand 16 of the handler 15 may be arranged to grasp a pair of elongate elements P simultaneously and then deposit them in the wrapper I (which is then filled with a predetermined number of pairs - for example two - of elongate elements P).

The side view of Figure 8 shows how, as is preferred, the action of the hand 16 in gripping the elements P is exerted not (or at least not exclusively) on the sides of the elements P but also (although not exclusively) on the ends of the elements P. This fact is illustrated clearly by the position of the gripper flaps 17 of the hand 16. In Figure 8 these flaps are shown in full outline in a closed position in which they grip the elements P and in broken outline in an open position in which they are disengaged from, and hence release, the elements P.

As stated above, the elongate elements P are preferably constituted by individual flow-pack wrappers having closure and sealing tabs at their ends.

The fact that the gripper flaps 17 of the hand 16 act on these ends has the advantage of flattening the tabs of the flow-pack against the body of the package itself as a result of the gripping of the elements P by the gripper hand 16. When the elements P are deposited in the wrapper I, these tabs thus cannot interfere with the end walls of the wrapper I defined by the eyelid-shaped parts B2 and C2. The correct and regular deposition of the elements P within the wrapper I is thus ensured.

Once the filling with the elements P is completed, the completed packages (Figure 9) are advanced towards the station 6. Here each package is removed from its cell 7 by a lateral pusher member 18 which moves to and fro, the respective pusher elements 19 entering the cells 7 longitudinally to push the packages out longitudinally and transfer them to an output conveyor 20 alongside the downstream end of the conveyor 4. The conveyor 20 carries the packages to a banding machine 21 (of known type) in which an annular band 22 of sheet material (cellophane or the like), taken from a reel indicated 23, is applied around each package. As stated, the operating criteria and details of such machines for applying bands should be considered as known per se and such as not to require a description herein.

Naturally, the principle of the invention remaining the same, the constructional details and forms of embodiment may be varied widely with respect to those described and illustrated without thereby departing from the scope of the present invention.

Claims

1. Equipment for forming packages comprising elongate elements (P) inserted in generally boat-shaped wrappers (I), characterised in that it comprises:

   - a source (3) for supplying the wrappers (I) in the form of blanks including a substantially flat central portion (A) with end flaps (B,C) folded onto the central portion (A) with respective eyelid-shaped portions (B2,C2) which can be raised up from the central portion (A),
   - conveyor means (4) including cells (7) for receiving the wrappers (I) coming from the source (3),
   - forming means (104,11) which can act on the blanks coming from the source (3) when each blank is placed on the opening of a respective cell (7) of the conveyor means (4); the forming means (104,11) being capable of entering the cells (7) of the conveyor means (4) so as to form the central portion (A) of each blank located on a respective one of the cells (7) into a generally channel shape as well as to effect a spreading movement (11) so as to lift up the eyelid-shaped portions (B2,C2) from the central portion (A) and spread the eyelid-shaped portions (B2,C2) apart so that they form respective end walls of a respective one of the generally boat-shaped packages (I),
   - further conveyor means (13) for advancing the elongate elements (P) towards the conveyor means (4) after the conveyor means (4) have received the wrappers (I) in the cells (7), and
   - inserter means (14-17) acting between the further conveyor means (13) and the conveyor means (4) for selectively placing the elongate elements (P) in the generally boat-shaped wrappers (I) in the respective cells (7) of the conveyor means (4).

2. Equipment according to Claim 1, characterised in that it further includes, downstream of the inserter means (14-17) in the general direction of advance of the conveyor means (4), a banding station (6) in which each of the packages is completed by the application of a tubular band (22) of sheet material.

3. Equipment according to Claim 1 or Claim 2, characterized in that the forming means comprise:

   - an active part (104) having a profile complementary to that of the cell (7), which can hold a respective blank (I) on to itself (105) and force it into a respective cell (7), and
   - a pair of appendages (11) connected to the active part (104) in opposing positions which, in use, face the eyelid-shaped portions (B2, C2) of the respective blank (I); the appendages (11) being able to effect a generally spreading movement between a closed position of engagement with the eyelid-shaped portions (B2,C2) and an open position in which the eyelid-shaped portions (B2,C2) are raised from the central portion (A) to form respective end walls of the wrappers (I).

4. Equipment according to Claim 3, characterized in that the active part (104) has associated suction gripper means (105) for holding the blank (I) to the active part (104).

5. Equipment according to any one of the preceding claims, characterized in that the forming means (104, 11) are attached to movable apparatus (101) which can move upwards and downwards relative to the cells (7) of the conveyor means (4); the downward movement causing the forming means (104,11) to enter the cells (7).

6. Equipment according to any one of the preceding claims, characterised in that the forming means (104, 11) are attached to movable apparatus (101) which can reciprocate between a pick-up position,

in which the forming means (104,11) cooperate with the source (3) in order to pick up the wrappers in the form of blanks (I) selectively from the source (3), and a loading position, in which the forming means (104,11) are aligned with the conveyor means (4) ready to effect a penetrating movement into the cell (7).

7. Equipment according to any one of the preceding claims, characterised in that an accumulation stage (14) for the accumulation of the elongate elements (P) is inserted between the further conveyor means (13) and the inserter means (14-17).

8. Equipment according to any one of the preceding claims, characterised in that the further conveyor means (13) advance the elongate elements (P) in the direction of their lengths while the conveyor means (4) advance the wrappers (I) received in the respective cells (7) in the direction of their widths.

9. Equipment according to any one of the preceding claims, characterised in that the inserter means (14 to 17) include a pick-up element (16,17) which can grip the elongate elements (P) coming from the further conveyor means (13) in order to insert them in the wrappers (I) in the cells (7) of the conveyor means (4).

10. Equipment according to any one of the preceding claims, for the manufacture of packages in which the elongate elements (P) are constituted by package elements having end tabs, characterised in that the pick-up element (16,17) operates primarily by gripping the elongate elements (P) by the end tabs, folding the tabs themselves against the respective elongate element (P).

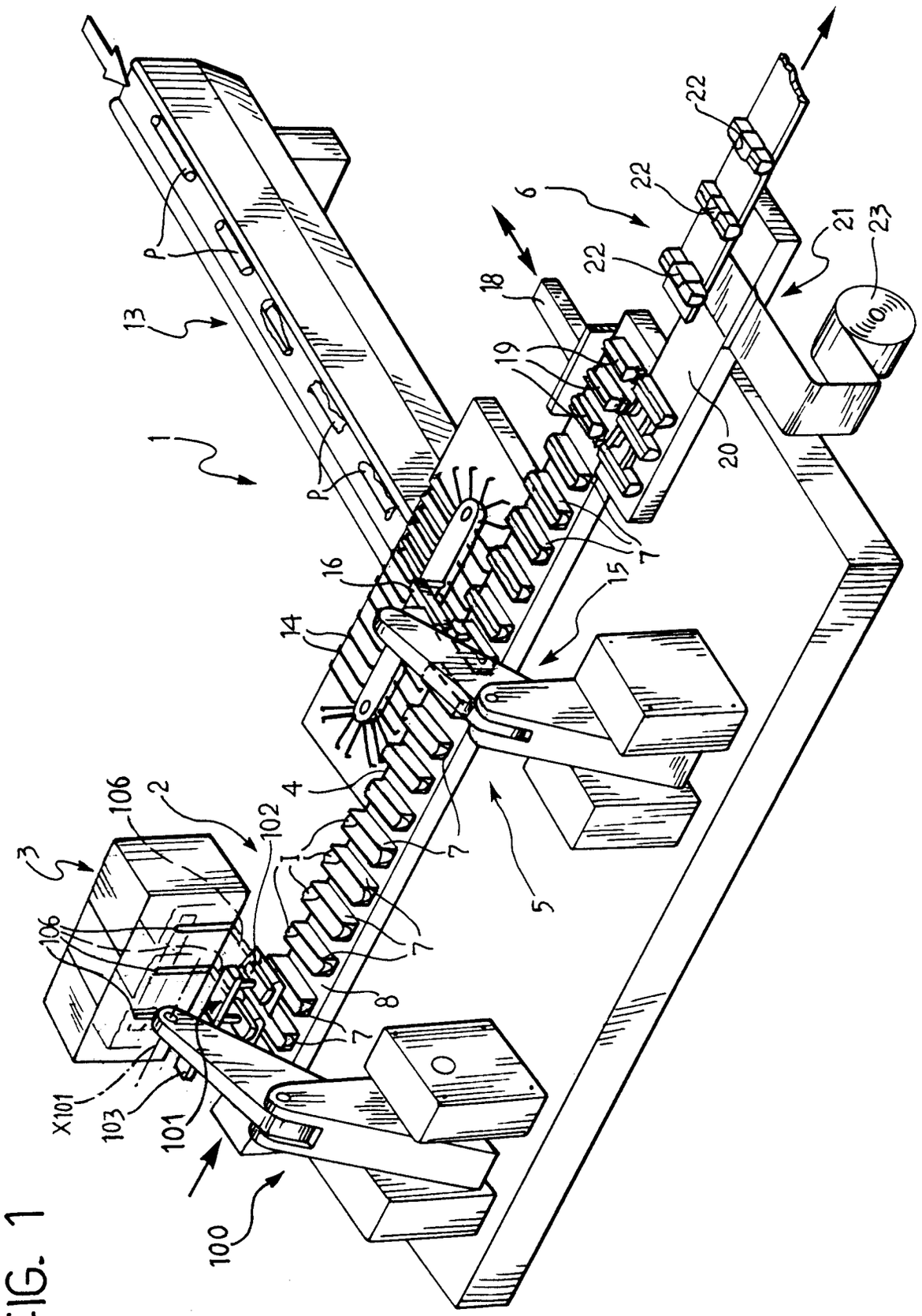


FIG. 1

FIG. 2

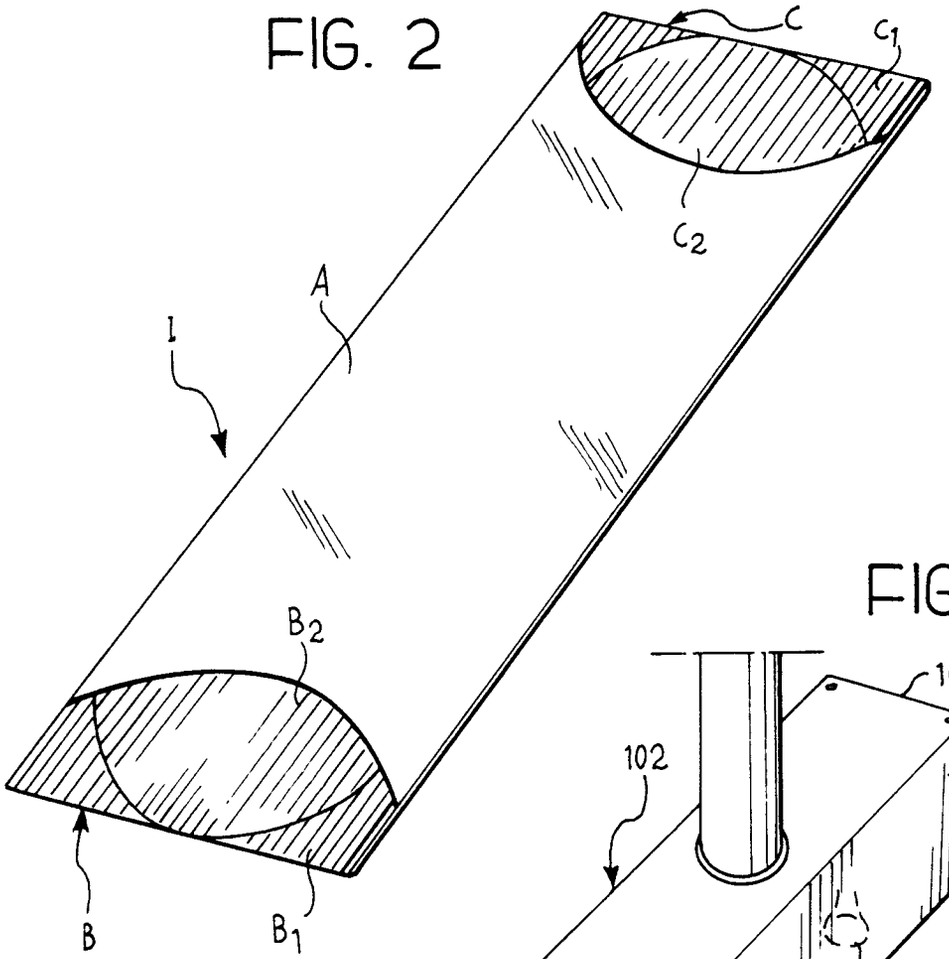

C
C1
C2
A
I
B2
B
B1

FIG. 3

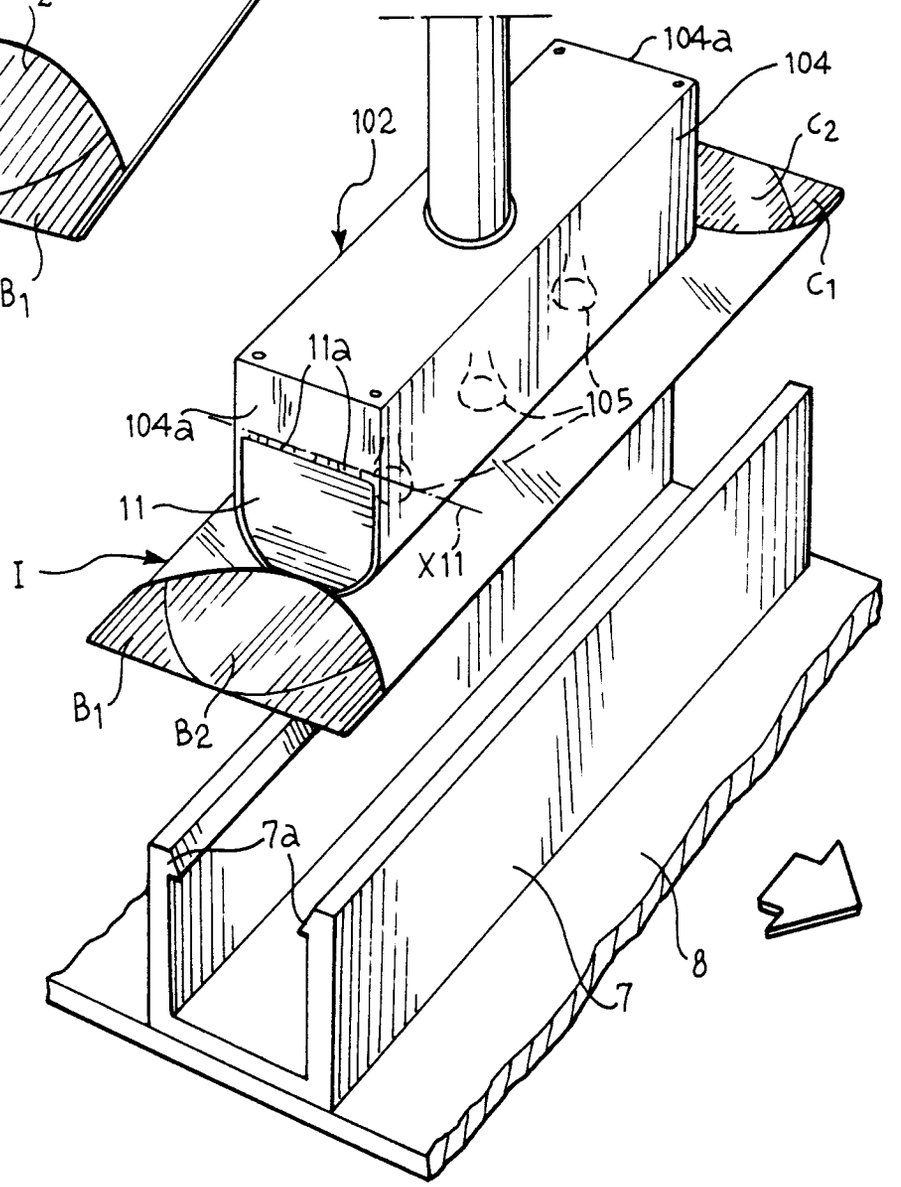

104a
104
102
C2
C1
11a
105
104a
11
X11
I
B1
B2
7a
7
8

FIG. 4

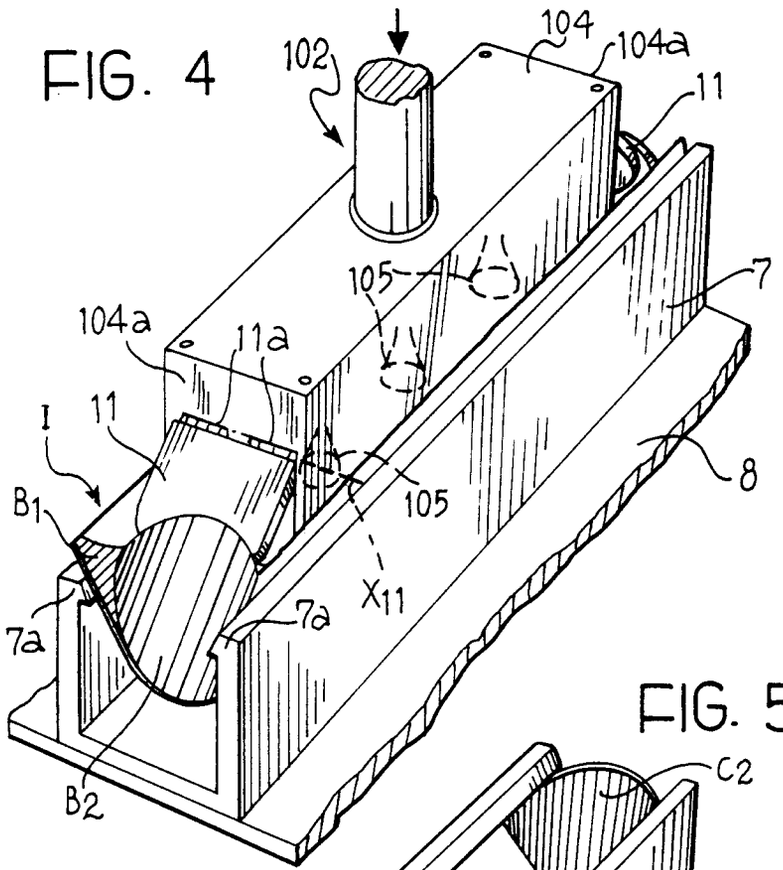


FIG. 5

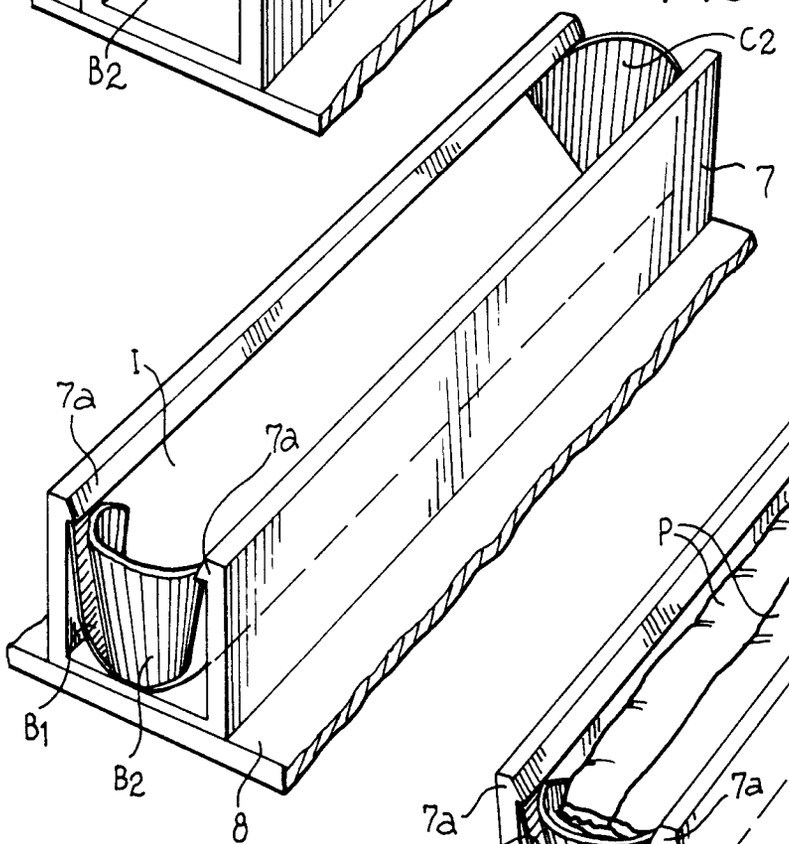


FIG. 9

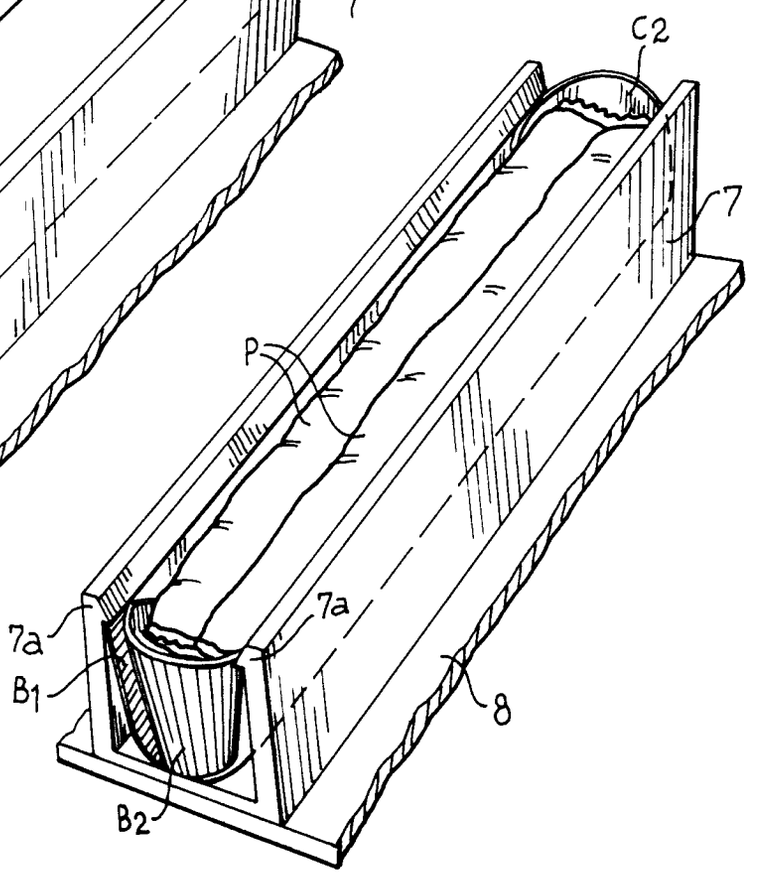


FIG. 6

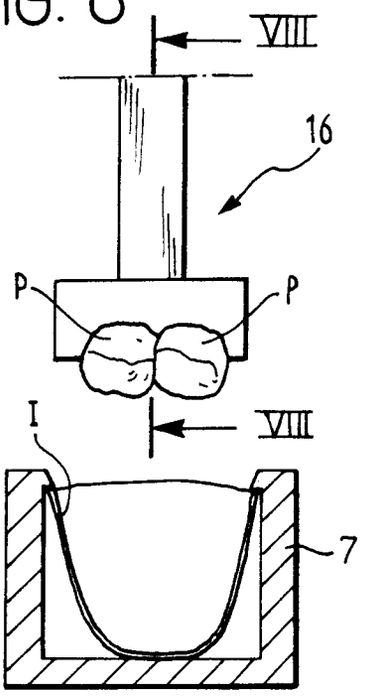


FIG. 7

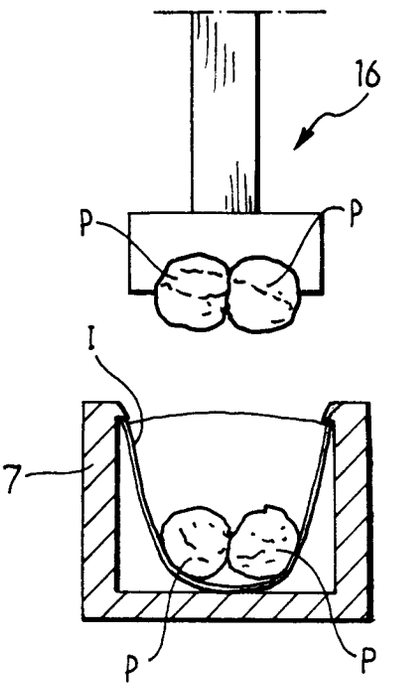
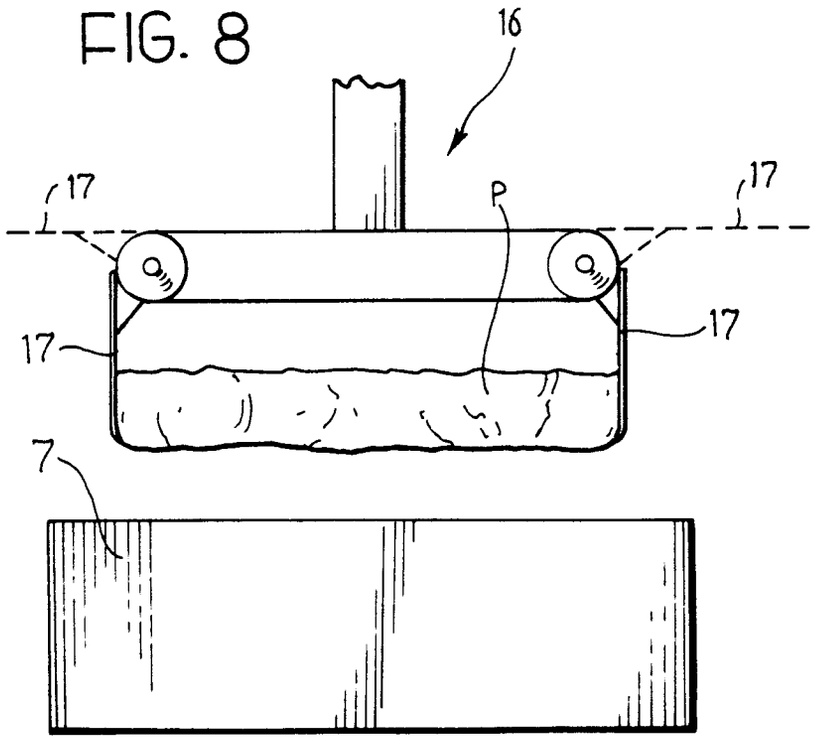


FIG. 8



European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 95 11 1179

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)
A	CH-A-453 188 (F. BANZ) 14 June 1968 * column 1, line 30 - column 2, line 18; figure 1 * -----	1	B65B5/02 B65B19/34
			TECHNICAL FIELDS SEARCHED (Int.Cl.6) B65B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	14 November 1995	Grentzius, W

CATEGORY OF CITED DOCUMENTS

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