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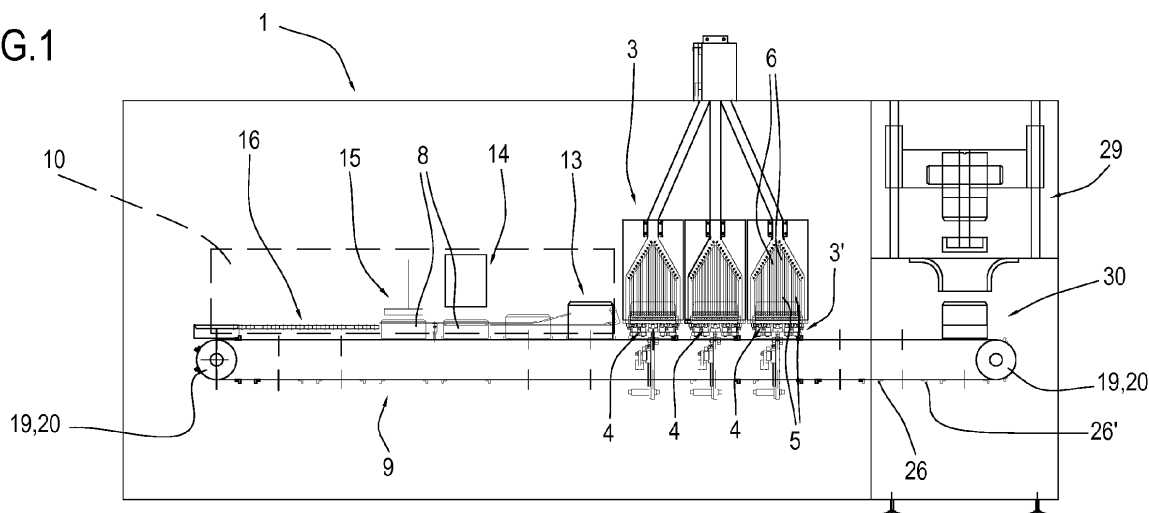
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(54) **Method and apparatus for filling containers with rod-shaped articles**

(57) In a method and an apparatus (1) for filling containers (8) with rod-shaped articles (2) a hopper (3) for feeding the articles (2) comprises at least two mouths (4) for dispensing the articles (2) through respective lower ends, a conveyor device (9) located in the vicinity of the at least two dispensing mouths (4) and supporting a plurality of containers (8) designed to receive inside the superposed layers (12) of articles (2), an extractor device (11) for removing the articles (2) from an unloading zone of each dispensing mouth (4) and inserting them inside containers (8) carried by the conveyor device (9), and an apparatus (29) for dispensing containers (8) designed to

feed containers (8) to be filled towards the conveyor device (9), the conveyor device (9) comprises two conveyors (17, 18) placed side by side and designed to operate independently on the containers (8) supported by the conveyor device (9), and respective motor means (21, 22) are associated with the two conveyors (17, 18) so that one of the two conveyors (17, 18) moves towards the hopper (3) the empty containers (8) carried on the conveyor means (9) from the dispensing apparatus (29), and the other of the two conveyors (17, 18) moves away from the hopper (3) the containers (8) full of rod-shaped articles (2).

FIG.1



Description

[0001] This invention relates to a method and an apparatus for filling containers with rod-shaped articles.

[0002] More specifically, this invention addresses the tobacco industry and has for its objects a method and an apparatus for filling containers, in particular cardboard boxes, with rod-shaped articles consisting, for example, of cigarettes, filters, filter tubes (tubes of paper with a filter at one end and designed to be filled with tobacco by the smoker). Hereinafter in this description, reference is made to the handling of rod-shaped articles consisting of cigarettes, without thereby restricting the scope of the invention.

[0003] In apparatuses of known type for filling containers with cigarettes, the groups of cigarettes to be packaged are usually formed using a vertical hopper into which the cigarettes are fed through an opening at the top of it. The bottom portion of the hopper is divided into a plurality of mouths arranged side by side horizontally and each divided by a plurality of walls into substantially vertical channels arranged side by side horizontally and designed to receive respective stacks of cigarettes reciprocally superposed. Groups of cigarettes, or layers which are then placed on top of one another to form the groups, are removed from the bottom portion of each hopper mouth by suitable pick-up and transport elements and these groups or layers are directed to a packaging station where they are packed in boxes intended to contain a plurality of layers of cigarettes on top of one another. In the packaging station there is usually a plurality of boxes which are filled with cigarettes simultaneously while they occupy respective dwell positions, so that the apparatus can attain as high a production speed as possible.

[0004] Apparatuses of this kind present critical situations connected with synchronizing the movements of the empty boxes which must be conveyed to the packaging station and of the full boxes which must remain stationary at the station for a relatively extended length of time during filling. Indeed, it is normal practice for a single conveyor to support and move both the empty boxes and those being filled, and the relatively extended length of time during which the boxes being filled need to remain stationary does not allow the conveyor to be supplied with the necessary quantity of empty boxes, since the conveyor does not move during this time. For the empty boxes to be supplied, therefore, it is normally necessary to wait for the conveyor start moving again after the boxes present at the packaging station have been filled completely. This necessity contrasts with endeavours to allow prior art apparatuses to operate at high production speeds.

[0005] This invention has for an aim to provide a method and an apparatus for filling containers with rod-shaped articles capable of overcoming the above mentioned drawback.

[0006] The invention accordingly provides a method

and an apparatus for filling containers with rod-shaped articles, as described in the appended claims.

[0007] The invention is described below with reference to the accompanying drawings, which illustrate a non-limiting embodiment of it, and in which:

- Figure 1 is a schematic front view of an apparatus for filling containers with rod-shaped articles, made according to this invention;
- Figure 2 is a schematic plan view of the apparatus of Figure 1;
- Figure 3 is a schematic elevation view of certain details of the apparatus of Figures 1 and 2;
- Figure 4 is a schematic perspective view of certain details of the apparatus of Figures 1 and 2; and
- Figure 5 is an axonometric view of a container for rod-shaped articles to be filled by the apparatus of Figures 1-4.

[0008] The numeral 1 in Figure 1 denotes in its entirety an apparatus for filling containers 8 with rod-shaped articles, consisting for example of cigarettes 2.

[0009] By way of an example and with reference to Figure 5, the containers 8 comprise a parallelepiped shaped box 8a whose hollow interior faces up and which is defined by a base 8b, a rear wall 8c, a front wall 8d and two side walls 8e. The walls 8c, 8d and 8e are vertical, and the upper edges of the side walls 8e are integral, by way of respective folding lines of weakness, with two side flaps 8f folded squarely towards each other. The upper edge of the rear wall 8c is integral, by way of a folding line of weakness, with a lid 8g which is the same size as the base 8b and which is integral, at the front by way of a folding line of weakness, to a flap 8h folded squarely and designed to be tucked into the mouth at the top of the box 8a.

[0010] The apparatus 1 comprises a vertical hopper 3 operating at a station 3' for filling the containers 8 and whose lower portion comprises at least two mouths 4 for dispensing cigarettes 2 and is preferably subdivided into a plurality of mouths 4 positioned side by side horizontally (three in the embodiment illustrated). Each mouth 4 is subdivided by a plurality of walls 5 substantially vertical and parallel to each other in a plurality of substantially vertical channels 6 positioned side by side horizontally, each of which is designed to accommodate internally a stack 2 of cigarettes reciprocally superposed;

[0011] Transfer or extractor elements, denoted in their entirety by the numeral 11 (Figure 2) extract layers 12 of cigarettes 2 in succession from the bottom ends of the channels 6, at the bottom portion of each mouth 4 of the hopper 3 and insert these layers 12 into containers 8 carried by a conveyor 9, which directs the containers 8, in a manner described in more detail below, to a further handling station of essentially known type schematically represented as a block 10. The transfer elements 11 may be of any suitable type and are not illustrated or described since they do not form the object of this invention.

[0012] The station 10 comprises (for example) a station 13 for folding the side flaps 8f, followed by a station 14 (optional) for inserting coupons (not illustrated) into the boxes 8a, a station 15 for closing the lids 8g of the boxes 8a, and a station 16 for stabilizing the full, closed boxes 8a and comprising, for example, a compressing roller conveyor (not illustrated) designed to facilitate drying of the adhesive on the boxes 8a and to stabilize the shape of the boxes 8a.

[0013] As shown in Figures 3 and 4, the conveyor 9 comprises two identical belt conveyors 17 and 18 running side by side along identical paths comprising respective upper horizontal transport paths 17', 18' wound in a loop around respective pairs of pulleys 19 and 20 (only the ones on the right being shown in Figure 4) rotatable about horizontal axes. The pulleys 19 of the two conveyors 17 and 18 are coaxial and are power driven by respective motor means 21 and 22. Similarly, the pulleys 20 are coaxial. Each of the motor means 21 and 22 comprises a stepping motor not illustrated (or other kind of motor offering similar performance) driven by a control circuit of known type (also not illustrated) which allows variable motion to be imparted to the motors 21 and 22 independently of each other, with respective laws of motion which are better specified below. As shown in Figure 3, the upper transport branches 17', 18' run side by side along respective contiguous flanks, whilst the other flanks run alongside respective strips 23 having an L-shaped cross section and extending parallel to the upper transport branches 17', 18' themselves, and each having a horizontal wing 24 lying in the same plane as the transport branches 17', 18' and an upwardly directed vertical wing which, in use, runs alongside and in contact with one side of the containers 8 being carried.

[0014] The belt conveyors 17 and 18 are provided, on their peripheral transport surfaces 25, with a plurality of projections or accompanying elements 26 which follow each other along the direction of extension of the peripheral transport surfaces 25. The accompanying elements 26 are not distributed uniformly along the peripheral transport surface 25 since on each peripheral surface 25 there are stretches 27 of predetermined length having on them a sequence of accompanying elements 26 equal in number to the number of mouths 4 of the hopper 3, alternated with stretches 28 of the same length without any accompanying elements 26 on them. Further, the stretches 27 with accompanying elements 26 on each of the conveyors 17, 18 are placed alongside the stretches 28 without accompanying elements 26 on the other conveyor 18, 17. It should be noted that each accompanying element 26 might be associated with a positioning element 26' (Figure 1) comprising a projection positioned downstream of the accompanying element 26 with reference to the direction of feed of the belt conveyors 17, 18, at a distance from the accompanying element 26 which is slightly greater than the dimension of the containers 8 measured according to the direction of feed. The function of each positioning element 26' is to act in

conjunction with an accompanying element 26 associated therewith in order to better define the position of the containers 8 carried by the conveyors 17, 18.

[0015] Upstream of the hopper 3 with reference to the transporting direction of the conveyor 9, alongside and in the proximity of the conveyor 9 itself, there is an apparatus 29 for forming and dispensing the containers 8, capable of forming containers 8 from cardboard blanks (not illustrated) and feeding them one at a time towards the conveyor 9, in a manner that will become clearer as this description continues, to a dispensing station 30. For reasons that will become clearer as this description continues, the outfeed section of the apparatus 29 is located, with reference to the feed direction of the conveyor 9, at a distance from the hopper 3 not less than the length of a portion of the conveyor 9 carrying a number of consecutive containers 8 equal to the number of mouths 4 of the hopper 3 itself.

[0016] Described below is the operation of the apparatus 1 starting from the moment when three containers 8, which have been brought by the conveyor 9 to the filling station 3', are stationary in the proximity of respective mouths 4 of the hopper 3, and the conveyor 9 has no other containers 8 on it. The lids 8g of the containers 8 being filled are raised and, if necessary, directed backwards, and the container sidewalls 8e are directed upwards.

[0017] In this situation, the transfer elements 11 extract the layers 12 of cigarettes 2 from the bottom ends of the channels 6, at the bottom portion of each mouth 4 of the hopper 3, and place the layers 12 into the waiting containers 8 in front of the hopper 3. Respective accompanying elements 26 associated with the conveyor 17 are adjacent to the containers 8 being filled and the conveyor 17 is stationary.

[0018] While these containers 8 are being filled, the apparatus 29 erects other containers 8 and delivers a first one immediately downstream of, and in contact with, the most advanced (with reference to the feed direction of the conveyor 9) of the accompanying elements 26 of the conveyor 18 forming part of a sequence of accompanying elements 26 which are stationary at the dispensing station 30. After that container 8 has been placed in contact with an accompanying element 26, the motor means 22 set the conveyor 18 in motion and cause it to move forward one step whose length is such that the accompanying element 26 immediately following the one just associated with a container 8 is brought to the dispensing station 30. A container 8 is then dispensed by the apparatus 29 and brought into contact with the accompanying element 26 and the motor means 22 are started once again in the same way as just described to move another accompanying element 26 into the dispensing station 30 so that it, too, is associated with a container 8.

[0019] During these movements of the conveyor 18, the filling of the stationary containers 8 at the filling station 3' is in no way disturbed since the stretch of the conveyor

18 under these containers 8 has no accompanying elements 26 on it and does not act on these containers 8 in any way.

[0020] When the containers 8 in the station 3' have been filled and the apparatus 29 has placed three containers 8 in contact with respective accompanying elements 26 forming part of the sequence of the accompanying elements 26 waiting in the proximity of the dispensing station 30, the conveyor 17 is started by the motor means 21 and pushes the containers 8 just filled towards the further handling station 10, whilst the conveyor 18 is started to bring into the filling station 3' the containers 8 which were placed on the conveyor 9 of the apparatus 29.

[0021] In practice, the latter operations cause the roles of the conveyors 17 and 18 to be temporarily reversed compared to what has been described up to now, since the containers 8 which are now located in the proximity of the dispensing station 30, that is, in front of the hopper 3, are in contact only with a sequence of accompanying elements 26 associated with the conveyor 17 itself, while in the proximity of the dispensing station 30 there is a sequence of accompanying elements 26 associated with the conveyor 18 and downstream of which, with reference to the feed direction of the conveyor 9, there is a stretch of the conveyor 18 without accompanying elements 26 on it. Thus, the operations described above of filling three containers 8 with cigarettes 2 and placing three empty containers 8 on the conveyor 9 occur, during this operating cycle, with the conveyor 18 acting on the containers 8 being filled and the conveyor 17 acting on the empty containers 8 arriving from the apparatus 29. When this operating cycle has been completed in the same way as described above, the apparatus 1 is back to the operating situation the above description started from.

[0022] From the foregoing, it is evident that the apparatus 1 described overcomes in a simple and effective manner the drawback described above with reference to the prior art, since the presence, design and operating mode of the conveyors 17 and 18 allow the apparatus 1 to minimize idle time, thereby appreciably increasing production speed.

Claims

1. A method for filling containers with rod-shaped articles, which can be used in an apparatus (1) comprising a hopper (3) for feeding the articles (2), having at least two mouths (4) for dispensing the articles (2) through respective lower ends, conveyor means (9) located in the vicinity of the at least two dispensing mouths (4) and supporting a plurality of containers (8) designed to receive inside the superposed layers (12) of articles (2), extractor means (11) for removing the articles (2) from an unloading zone of each dispensing mouth (4) and inserting them inside contain-

ers (8) carried by the conveyor means (9), and an apparatus (29) for dispensing containers (8) designed to feed containers (8) to be filled towards the conveyor means (9), **characterised in that** the conveyor means (9) comprise two conveyors (17, 18) placed side by side and designed to operate independently on the containers (8) supported by the conveyor means (9), and **in that** respective motor means (21, 22) are associated with the two conveyors (17, 18) for activating them independently so that one of the two conveyors (17, 18) moves towards the hopper (3) the empty containers (8) carried on the conveyor means (9) from the dispensing apparatus (29), and the other of the two conveyors (17, 18) moves away from the hopper (3) the containers (8) full of rod-shaped articles (2) and feeds them towards a further handling station (10).

2. The method for filling containers with rod-shaped articles according to claim 1, **characterised in that** the two conveyors (17, 18) alternate with each other in the operations for moving towards the hopper (3) the empty containers (8) carried on the conveyor means (9) from the dispensing apparatus (29) and for moving away from the hopper (3) the containers (8) full of articles (2) with a rod shape (2).
3. An apparatus for filling containers with rod-shaped articles, comprising a hopper (3) for feeding the articles (2), having at least two mouths (4) for dispensing the articles (2) through respective lower ends, conveyor means (9) located in the vicinity of the at least two dispensing mouths (4) and supporting a plurality of containers (8) designed to receive inside the superposed layers (12) of articles (2), extractor means (11) for removing the articles (2) from an unloading zone of each dispensing mouth (4) and inserting them inside containers (8) carried by the conveyor means (9), and an apparatus (29) for dispensing containers (8) designed to feed containers (8) to be filled towards the conveyor means (9), **characterised in that** the conveyor means (9) comprise two conveyors (17, 18) placed side by side and designed to operate independently on the containers (8) supported by the conveyor means (9), and **in that** respective motor means (21, 22) are associated, respectively, with the two conveyors (17, 18) for activating them independently, for moving, respectively, towards the hopper (3) the empty containers (8) carried on the conveyor means (9) from the dispensing apparatus (29), and for moving away from the hopper (3) the containers (8) full of rod-shaped articles (2) for feeding them towards a further handling station (10).
4. The apparatus according to claim 3, **characterised in that** the conveyors (17, 18) comprise two belt conveyors, to the transport surfaces of which are inte-

grated a plurality of accompanying elements (26) designed to run alongside respective portions of the conveyors (8); the accompanying elements (26) of each conveyor (17, 18) being subdivided into groups of consecutive accompanying elements (26), and these groups being separated from each other by portions of the conveyors (17, 18) without the accompanying elements (26). 5

5. The apparatus according to claim 4, **characterised in that** along each conveyor (17, 18) stretches (27) of predetermined length in which the accompanying elements (26) are present to form a sequence comprising a number equal to the number of mouths (4) of the hopper (3) alternate with stretches (28) of equal length in which there are no accompanying elements (26). 10 15

6. The apparatus according to claim 5, **characterised in that** the stretches (27, 28) provided with accompanying elements (26) of each of the conveyors (17, 18) are positioned side by side with stretches (28, 27) of the other conveyor (18, 17) without the accompanying elements (26). 20 25

7. The apparatus according to any one of claims 4 to 6, **characterised in that** each accompanying element (26) is associated with a positioning element (26'), comprising a projection positioned downstream of the accompanying element (26) with reference to the direction of feed of the conveyors (17, 18), at a distance from the accompanying element (26) which is slightly greater than the dimension of the containers (8) measured according to the direction of feed each positioning element (26') acting in conjunction with an accompanying element (26) associated with it for better defining the position of the containers (8) carried by the conveyors (17, 18). 30 35

8. The apparatus according to any one of claims 3 to 7, **characterised in that**, in use, the two conveyors (17, 18) alternate with each other in the operations for moving towards the hopper (3) the empty containers (8) carried on the conveyor means (9) from the dispensing apparatus (29) and for moving away from the hopper (3) the containers (8) full of articles (2) with a rod shape (2). 40 45

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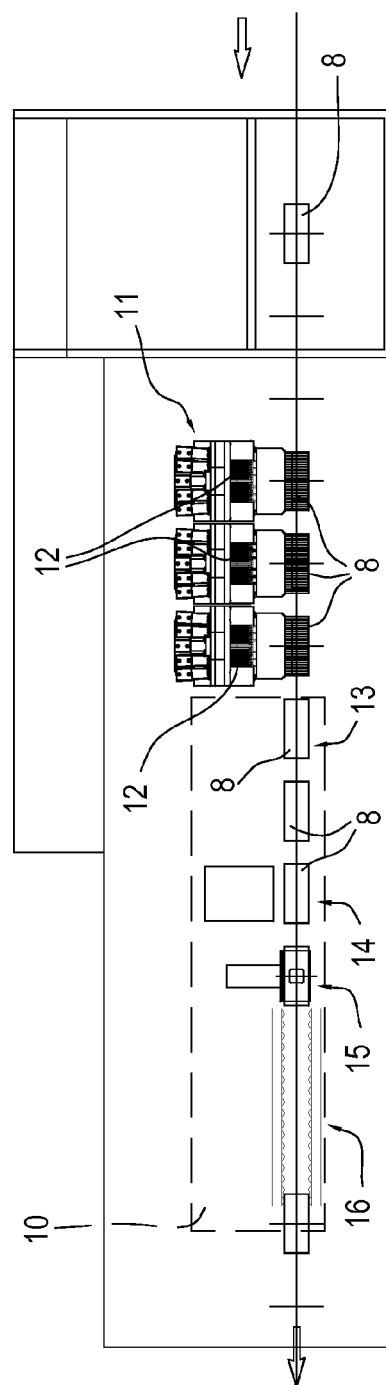
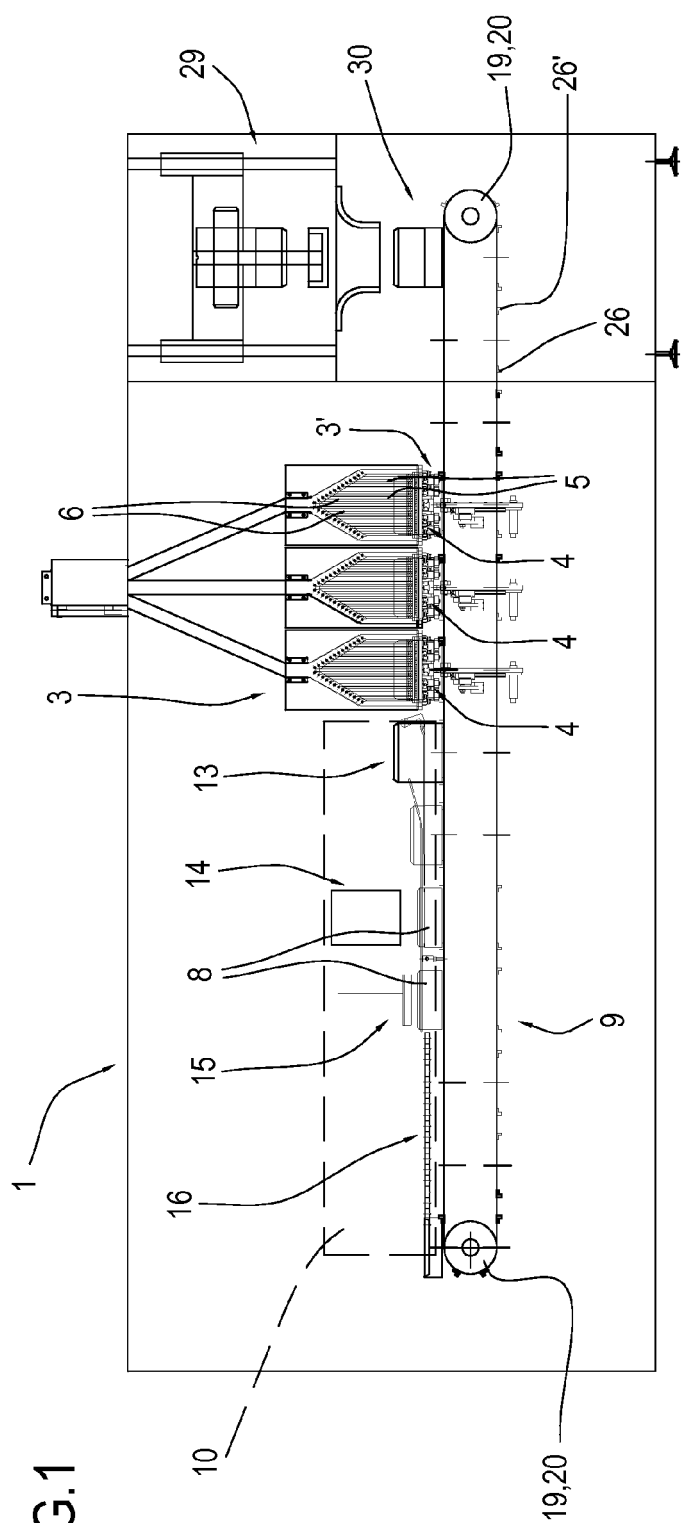


FIG.3

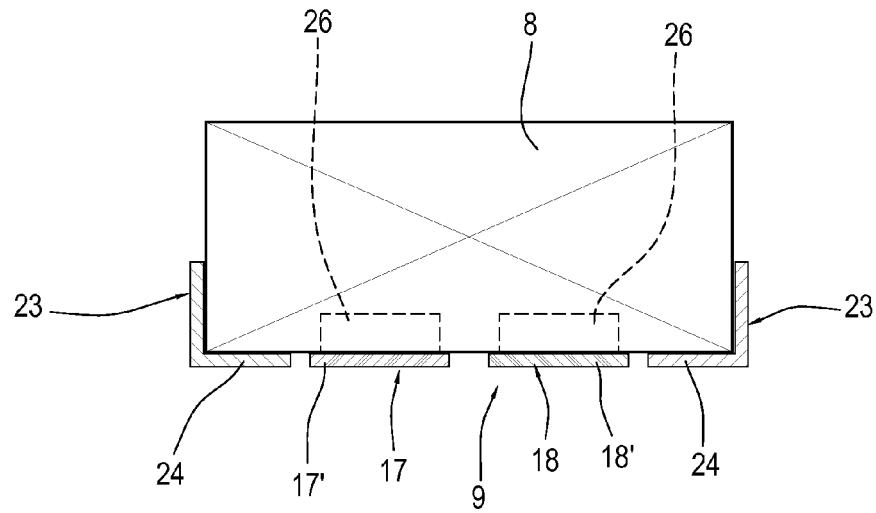


FIG.5

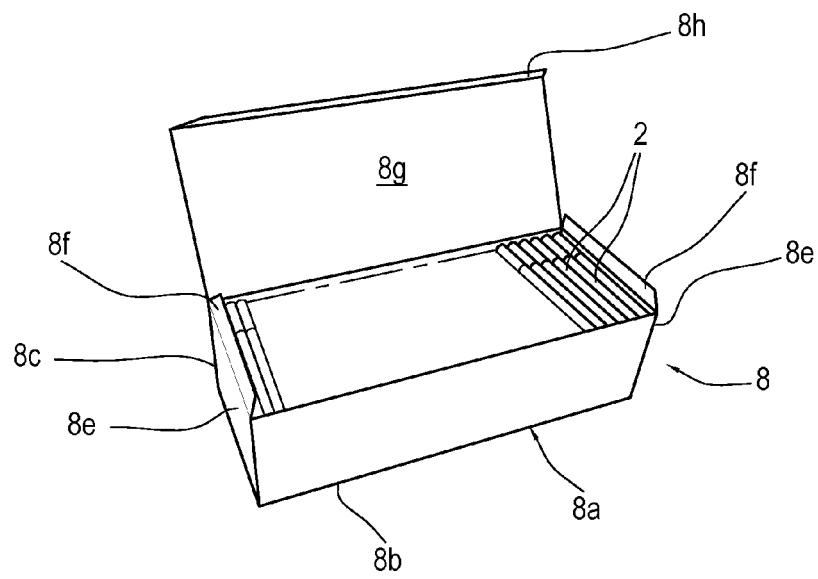
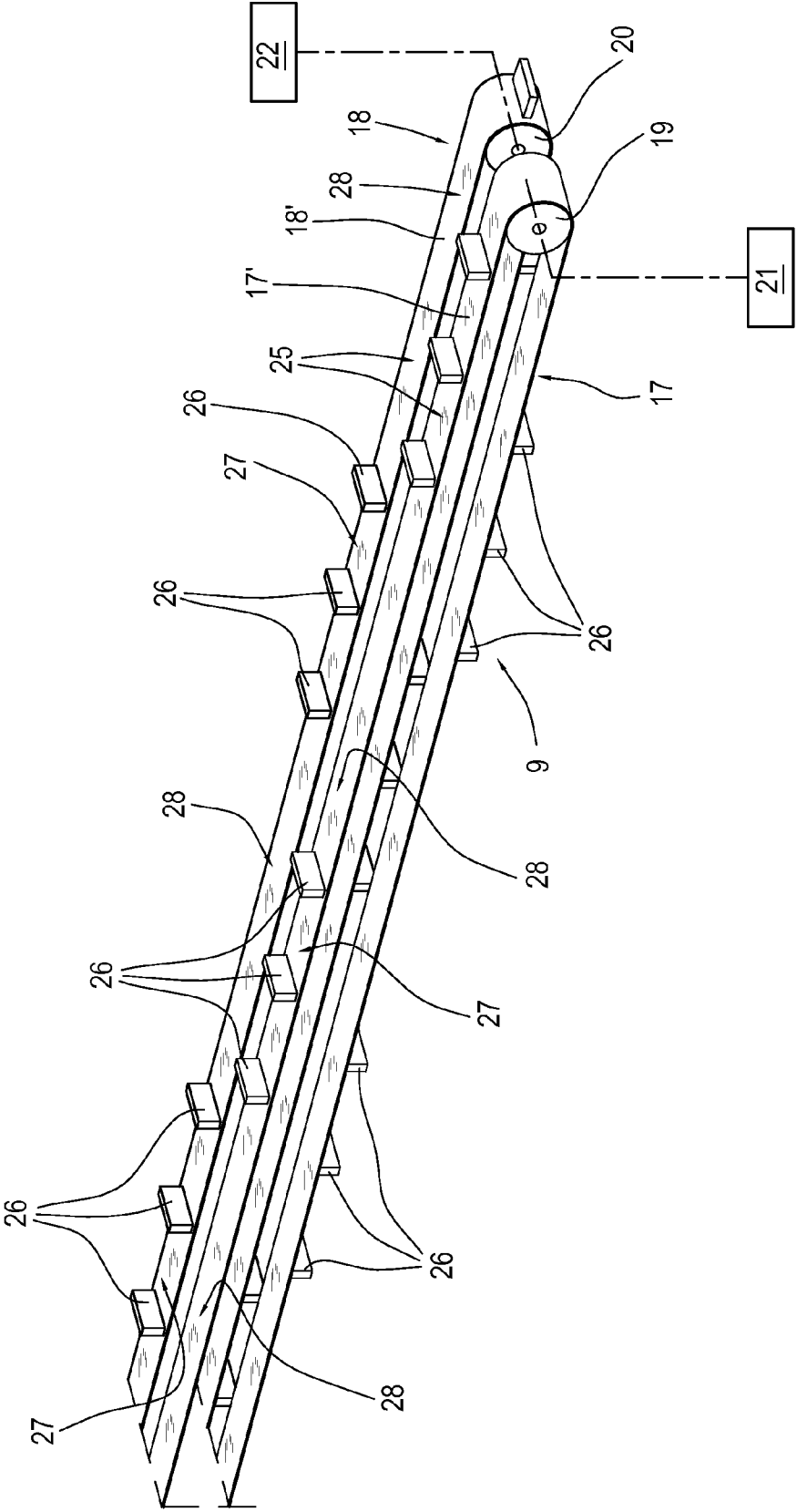


FIG.4





EUROPEAN SEARCH REPORT

Application Number
EP 13 17 1871

DOCUMENTS CONSIDERED TO BE RELEVANT			
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 5 September 2013	Examiner Schelle, Joseph
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 13 17 1871

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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05-09-2013

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