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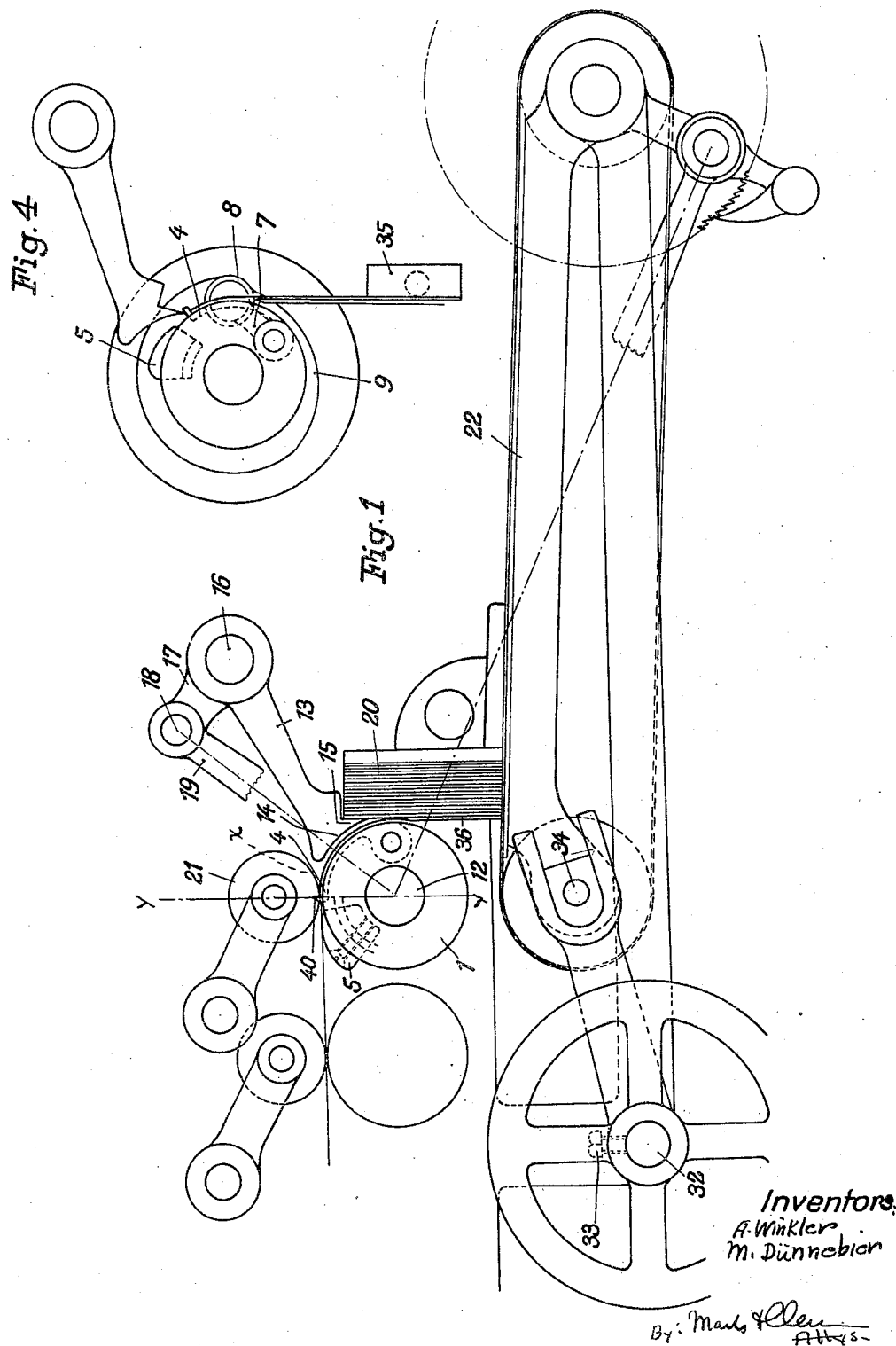
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Filed April 22, 1931

2 Sheets-Sheet 1



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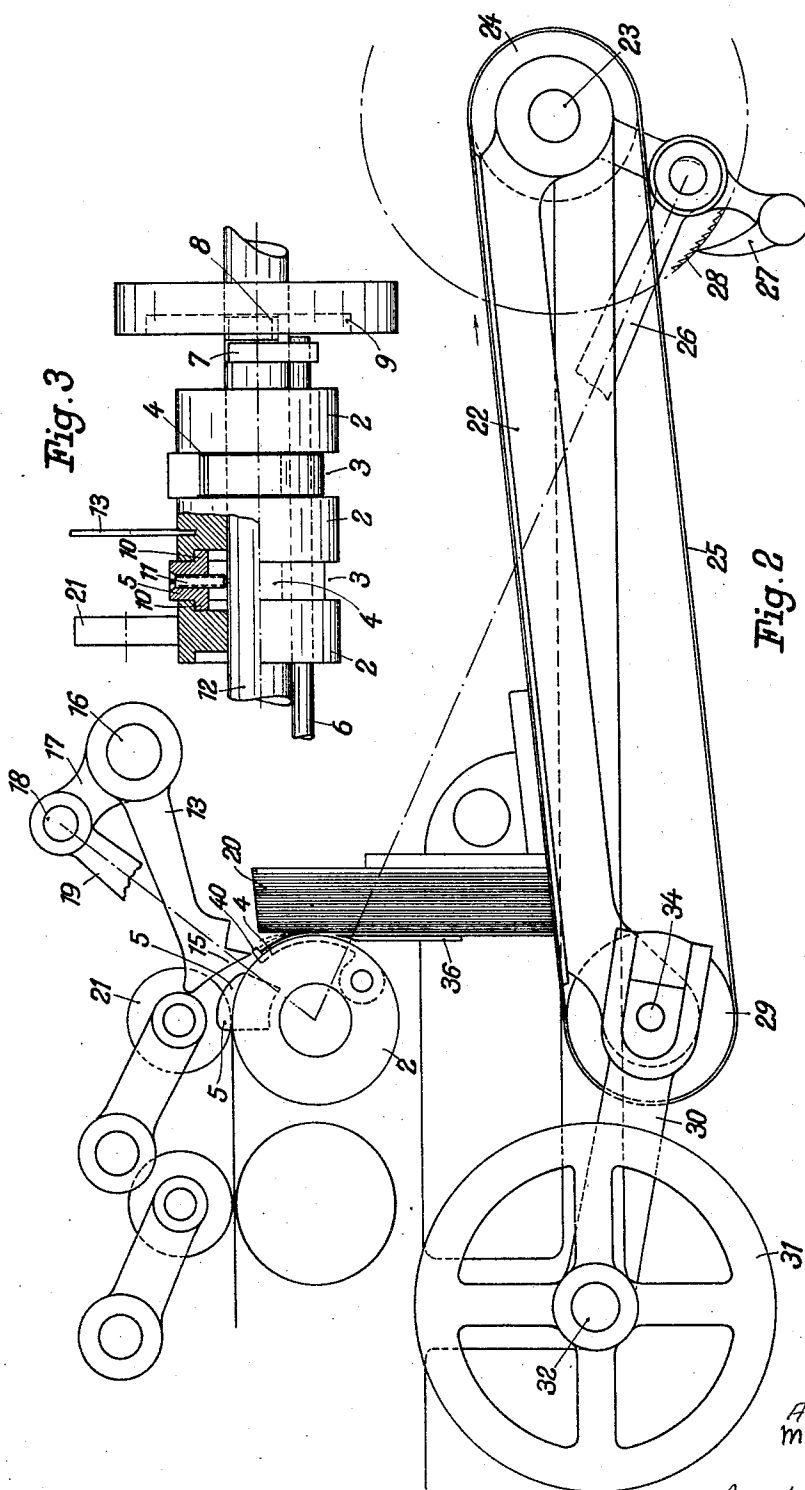
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2 Sheets-Sheet 2



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METHOD AND APPARATUS FOR STACKING FLAT ARTICLES

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The subject-matter of the invention is a method and apparatus for depositing and stacking the work pieces coming from a conveying or feeding apparatus of any kind, for example from the last stage of a machine for manufacturing envelopes and flat bags, after they leave the last feeding device. In particular the invention is suitable for high output machines for making envelopes and flat bags, such as those for example which operate on the rotary principle in such a manner that the work-pieces (envelopes or bags) are fed forwards between rotating parts.

The difficulty which is overcome by the present invention is that the work-pieces coming at high speed from the last feeding device must be stacked on being transferred into a state of rest and that, having regard to the high speed of revolution, the individual parts which effect this transfer can traverse only quite short paths.

The method according to the invention consists in imparting a tension to the individual work-pieces themselves on their way from the last feeding device by bending them between guide members, so that this tension, at the moment when the work-piece arrives in position at the stack, effects, on the guide being slightly raised, the movement of the work-piece behind the guide and thereby against the stack.

The apparatus is constructed in such a manner that the work-piece from a last rotating roller is conducted to the stack under one or more guide levers while lying on the surface of the last roller, the final movement to the position in the stack being effected by conveying levers which are inlet in the final roller. At the moment when the work-piece arrives at the position of the stack the guide levers are slightly raised and owing to the tension of the upper curved part of the work-piece the paper is caused to snap below the lower edge of the guide lever and against the stack.

A constructional embodiment of an apparatus of this kind is illustrated diagrammatically by way of example in the accompanying drawings, in which

Fig. 1 shows the general arrangement with

small work-pieces entering below the guide levers,

Fig. 2 is a similar view of the apparatus in the position in which the guide lever is swung away and the work-piece springs on to the stack below the guide lever owing to its own tension,

Fig. 3 is a part front elevation of the last feed roller, while

Fig. 4 illustrates in side elevation the drive of the conveyor lever in the last feed roller.

Referring to the drawings, the last conveyor roller 1 consists of several separate rollers 2 between which in the axial direction intervening spaces 3 are left free for enabling conveyor fingers 4 and pressure members 5 to be fitted. The fingers 4 are mounted on a shaft 6 which passes through the individual parts 2 and is provided at its outer end for the purpose of actuating the fingers with a lever 7, on which there is a roller 8 which rolls on a curved track or cam 9. By fitting any suitable form of spring, which is not illustrated in the drawings, the lever 7 or its roller 8 is continuously pressed against the curved path 9.

There are also provided in the openings 3 pressure members 5 which are for the purpose of pressing the stack of paper a small distance away from the roller 1 when the next work-piece enters. These parts 5 engage by means of projections 10 in undercut recesses in the parts 2 and are held in position on the periphery by clamping screws 11 which clamp the parts between the shaft 12 which carries the individual parts 2 and the undercut recesses in the parts 2. These parts 5 are so constructed that they project out gradually beyond the surface of the roller parts 2. The guide members 13, which, with their rounded ends 14 curved in conformity with the surface of the roller 1, on the one hand, serve the purpose of a guide for the entering sheet and, on the other hand, hold back the stack from the roller 1 by means of a downwardly projecting point 15, are rigidly fixed to a shaft 16 which is revolutely mounted in any suitable manner on the machine frame. On one end of this shaft 16 there is mounted a lever 17, which is also rigidly

fixed to the shaft 16, and is connected by means of a bolt 18 with a thrust-rod 19, the reciprocating movement of which is effected by means of a cam which is not illustrated and is mounted on the shaft 12 and rotates
 5 with the parts 2. By means of this movement of the rod 19 which is effected by the cam, the guides 13 are swung for a short moment out of the position illustrated in Fig. 1 into the position illustrated in Fig. 2,
 10 when the work-piece has reached the base of the stack and its upper edge owing to the tension produced by the bending has to spring against the stack 20 after the removal
 15 of the guide 15. Then the guides 13, which may be made for example of sheet steel, are again lowered into the position illustrated in Fig. 1 whereby the rear edge 15, which is adapted to fit the shape of the stack, holds
 20 the stack together with the last work-piece which has been added. The pressure part 5 then comes simultaneously against the stack 20 and presses the stack slightly away from the roller 1 in order that the next arriving
 25 sheet may enter without difficulty and without any particular friction.

The parts 5 are always adjusted at the periphery of the parts 2 by means of the screws 11 in such a manner that they press back
 30 the stack 20 just when the next sheet begins to enter.

The feeding of the work-pieces within the machine is effected, for example, between
 35 rollers 1 and rubber rollers 21 which are spring-pressed against the rollers 1. As soon as the rear edge of the work-piece between the last pair of rollers 1, 21 is set free the further conveyance of the work-piece to the
 40 bottom of the stack is undertaken by the levers 4 which are pivoted between the rollers 2 and controlled by the cam guide 9 and which engage by means of projections 40 behind the rear edge of the work-piece and convey the work-piece to the bottom of the stack.
 45 As soon as the bottom of the stack is reached the lever 4 is swung inwards (by means of the cam guide 9, lever 7 and shaft 6) in such a manner that the projection 40 no longer projects beyond the diameter of the rollers 2. The levers 13 are simultaneously raised and the work-piece springs against the stack
 50 owing to its own tension.

A peculiarity of the present apparatus resides in the fact that the upper edge of the
 55 stack of work-pieces must always lie at the same height. Consequently the stacking table 22 is swingably arranged, in accordance with the invention, so that its position can be adapted to suit different sizes of work-pieces. The swinging of the stacking table
 60 22 can be effected for example about the axle 23 of the band pulley 24. It is assumed in this case that a gradually advancing belt 25 runs over the stacking table 22 and that this
 65 belt can be moved in manner known per se

from the last machine shaft 12 by means of the rod 26 and pawl 27 in such a manner that at each revolution of the shaft 1 the rod 26 makes a stroke (effected by means of a cam) whereby the ratchet wheel 28 which
 70 is connected to the belt pulley 24 is moved forwards by one tooth.

At the other end of the stacking plate 22 the counter pulley 29 is adjustably journaled
 75 by means of the lever bearing 30. The adjustment of this can be effected by means of a hand-wheel 31 which is fast on the shaft 32. The bearing levers 30 are likewise fast on this shaft 32. The shaft 32 is movable in bearings arranged on the frame
 80 of the machine and can be fixed in any desired position by means of clamping screws 33 which are fitted in these bearings. In order to compensate for length the shaft 34 is mounted adjustably in any suitable form
 85 of slide.

To this stacking apparatus there can also be fitted, in manner known per se, a counting device which at periodic intervals pushes,
 90 by means of an ejector 35, the last delivered work-piece to one side of the stack, so that in this way counting and the removal of an exact number of work-pieces from the stack can easily be effected.

The method of operation of the machine
 95 is as follows—

The front edge of each arriving work-piece is introduced below the guide 14 into the triangular space formed by the surface
 100 of the roller 1 and the stack already formed. The work-piece then slides downwards with its front edge between the stack, which has previously been slightly pressed back by the parts 5, and the guide plate 36, the upper
 105 edge of which is closely adjacent to the surface of the roller 1 until the rear edge of the work-piece has left the roller 1 and the rollers 21. Then the projecting lugs 40 of the fingers 4 take over the further conveyance of the work-piece until its front edge reaches
 110 the belt 25. The projections 40 now recede below the surface of the roller, the guide 13 lifts and the backward lying edge of the work-piece, owing to its tension, comes to lie against the stack and behind the guide
 115 part 15 which immediately comes forward again.

It will be obvious that the rearward end of the sheet is first held down by the roller 21
 120 even if it is no longer clamped between the rollers 21 and 12. The escape of the rear edge of the sheet is not possible up to the point X, the point where the limiting circle for the moving path of the member 40 intersects the periphery of the rollers 21. How-
 125 ever, if the sheet has reached this point the tension is no longer sufficient to move it out of the limiting circle of the member 40 due to the fact that the rear end will be merely
 130 adjusted tangentially to the roller 12 rela-

tively to the uppermost point of the contact with the rounded end 14 of the member 13. It will, therefore, be noted that the sheet is not released from the rollers when leaving the plane denoted by the line $y-y$, and is prevented by the rollers 21 from moving upwardly to the point X. The member 13 is designed as a disk shaped guide which is pivotally mounted on the shaft 16 in order to swing about the same.

We claim:—

1. In apparatus for arranging in a stack flat flexible articles continuously delivered by a feeding apparatus, means for transferring the articles in succession from the feeding apparatus to the stack, means for simultaneously bending the articles in such a manner that, when the leading edge arrives in position, the trailing edge is bent away from the stack, and means for releasing the articles from the bending means so that the trailing edge then springs into position owing to the tension produced by the bending.

2. Apparatus for arranging in a stack flat flexible articles continuously delivered by a feeding apparatus comprising a table on which the articles are stacked, guiding means arranged in proximity to said table through which the articles are conveyed in succession and which are adapted to be in engagement with the trailing edge of the article and bend it away from the stack when the leading edge arrives in position, means for conveying the articles through said guiding means to the stack, and means for releasing said guiding means from engagement with the article when the leading edge arrives in position, so that the trailing edge springs into position against the preceding article in the stack owing to the tension produced by the bending.

3. Apparatus for arranging in a stack flat flexible articles continuously delivered by a feeding apparatus comprising a table on which the articles are stacked, a curved guide arranged in proximity to the stack over which the articles are conveyed in succession, a movable guide arranged close to said curved guide and adapted to engage the articles passing over said curved guide and to be in engagement with and bend the trailing edge away from the stack when the leading edge has arrived in position, means for conveying the articles through said guides to the stack, and means for releasing said movable guide when the leading edge arrives in position, so that the trailing edge springs into position against the preceding article owing to the tension produced by the bending.

4. Apparatus for arranging in a stack flat flexible articles continuously delivered by a feeding apparatus comprising a table on which the articles are stacked, a revoluble roller arranged in proximity to the stack

over which the articles are conveyed in succession, a movable guide arranged close to said revoluble roller and adapted to engage the articles passing over said revoluble roller and to bend the trailing edge away from the stack when the leading edge has arrived in position, means for conveying the articles between said roller and guide to the stack, and means for releasing said movable guide from engagement with the trailing edge of the article when the leading edge arrives in position, so that the trailing edge springs into position against the preceding article owing to the tension produced by the bending.

5. Apparatus for arranging in a stack flat flexible articles continuously delivered by a feeding apparatus comprising a table on which the articles are stacked, a revoluble roller arranged in proximity to the stack over which the articles are conveyed in succession, a correspondingly curved movable guide arranged close to said revoluble roller and adapted to engage the articles passing over said revoluble roller and to bend the trailing edge away from the stack when the leading edge has arrived in position, means for conveying the articles between said roller and guide to the stack, and means for releasing said movable guide when the leading edge of the article arrives in position, so that the trailing edge springs into position against the preceding article owing to the tension produced by the bending.

6. Apparatus for arranging in a stack flat flexible articles continuously delivered by a feeding apparatus comprising a table on which the articles are stacked, a revoluble roller arranged in proximity to the stack over which the articles are conveyed in succession, a movable guide having an edge which abuts against the stack and holds it away from the roller and a curved surface arranged close to said revoluble roller and adapted to engage the articles passing over said revoluble roller and to bend the trailing edge away from the stack when the leading edge has arrived in position, means for conveying the articles between said roller and guide to the stack, and means for releasing said movable guide when the leading edge of the article arrives in position, so that the trailing edge springs into position against the preceding article owing to the tension produced by the bending.

7. Apparatus for arranging in a stack flat flexible articles continuously delivered by a feeding apparatus comprising a table on which the articles are stacked, a revoluble roller arranged in proximity to the stack over which the articles are conveyed in succession, a movable guide pivoted above the stack having an edge which abuts against the stack and holds it away from the roller and a curved surface arranged close to said revol-

luble roller and adapted to engage the articles passing over said revoluble roller and to bend the trailing edge away from the stack when the leading edge has arrived in position, means for conveying the articles between said roller and guide to the stack and means for turning said movable guide about its pivot when the leading edge of the article arrives in position, so that the trailing edge is released and springs into position against the preceding article owing to the tension produced by the bending.

8. Apparatus for arranging in a stack flat flexible articles continuously delivered by a feeding apparatus comprising a table on which the articles are stacked, a plurality of spaced revoluble rollers, arranged in proximity to the stack over which the articles are conveyed in succession, a movable guide arranged close to said revoluble roller and adapted to engage the articles passing over said revoluble roller and to bend the trailing edge away from the stack when the leading edge has arrived in position, swingable conveyor hooks arranged in the spaces between said revoluble rollers for conveying the articles between said roller and guide to the stack, means for engaging said conveyor hooks with and disengaging them from the articles, and means for releasing said movable guide from engagement with the trailing edge of the article when the leading edge arrives in position, so that the trailing edge springs into position against the preceding article owing to the tension produced by the bending.

9. Apparatus for arranging in a stack flat flexible articles continuously delivered by a feeding apparatus comprising a table on which the articles are stacked, a revoluble roller arranged in proximity to the stack over which the articles are conveyed in succession; means for rotating said roller, means attached to said roller for pressing the stack away from the surface of the roller as it rotates, a movable guide having an edge which abuts against the stack and holds it away from the roller and a curved surface arranged close to said revoluble roller and adapted to engage the articles passing over said revoluble roller and to bend the trailing edge away from the stack when the leading edge has arrived in position, means for conveying the articles between said roller and guide to the stack, and means for releasing said movable guide when the leading edge of the article arrives in position, so that the trailing edge springs into position against the preceding article owing to the tension produced by the bending.

10. Apparatus for arranging in a stack flat flexible articles continuously delivered by a feeding apparatus comprising a table on which the articles are stacked, means for raising and lowering the end of the table ad-

jacent to the feeding apparatus, guiding means arranged in proximity to said table through which the articles are conveyed in succession and which are adapted to be in engagement with the trailing edge of the article and bend it away from the stack when the leading edge arrives in position, means for conveying the articles through said guiding means to the stack, and means for releasing said guiding means from engagement with the article when the leading edge arrives in position, so that the trailing edge springs into position against the preceding article in the stack owing to the tension produced by the bending.

11. Apparatus for arranging in a stack flat flexible articles continuously delivered by a feeding apparatus comprising a table on which the articles are stacked, means for raising and lowering the end of the table adjacent to the feeding apparatus, guiding means arranged in proximity to said table through which the articles are conveyed in succession and which are adapted to be in engagement with the trailing edge of the article and bend it away from the stack when the leading edge arrives in position, means for conveying the articles through said guiding means to the stack, and means for releasing said guiding means from engagement with the article when the leading edge arrives in position, so that the trailing edge springs into position against the preceding article in the stack owing to the tension produced by the bending means for returning said guide into position to guide the next article, and means for moving the table a small distance after each article has been stacked on it.

12. Apparatus for arranging in a stack flat flexible articles continuously delivered by a feeding apparatus comprising a movable table on which the articles are stacked, a revoluble roller comprising a plurality of spaced roller portions arranged in proximity to the stack over which the articles are conveyed in succession, means for rotating said roller, a movable guide pivoted above the stack having an edge which abuts against the stack and holds it away from the roller and a curved surface arranged close to said revoluble roller and adapted to engage the articles passing over said revoluble roller and to bend the trailing edge away from the stack when the leading edge has arrived in position, movable conveyor hooks pivoted in the space between said roller portions for conveying the articles between said roller and guide to the stack means for extending said hooks beyond the surface of the roller to engage the articles, means for retracting said hooks when the article arrives in position, means for turning said movable guide about its pivot when the leading edge of the article arrives in position, so that the trailing edge is released and

springs into position against the preceding article owing to the tension produced by the bending and means for returning said guide into position to receive the next article.

5 In testimony whereof we affix our signatures.

ALFRED WINKLER.
MAX DÜNNEBIER.

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