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(54) Singulator device for postal objects coated with transparent film

(57) A singulator device for flat rectangular postal objects coated with transparent film in which a pack of postal objects is fed to a singulator system (10) provided with a motor-driven withdrawing belt (19) for withdrawing individually the postal objects from a front face of the pack and feeding them along an unloading path (L). A first barrier of n emitter/receiver sensors C (C0, C1, C2, ... C*n*) is set aligned along the unloading path and is designed to detect the movement of edges of the postal object along the unloading path and a second barrier of m emitter/receiver sensors F (F0, F1, F2, ... F*m*) is set aligned along the unloading path and is designed to detect passage of the edges of the transparent rectangular envelope containing the postal object along the unloading path. Electronic means are provided, designed to control the motion of the withdrawing belt (19) as a function of the signals coming from the first barrier and from the second barrier for creating a constant gap between the transparent rectangular envelopes of the postal objects singulated in succession.

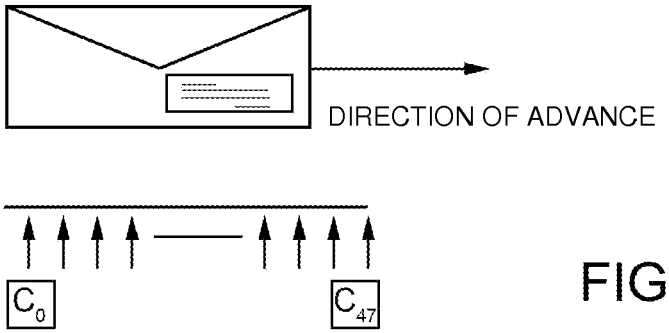

FIG. 1

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Description

[0001] The present invention relates to a singulator device for postal objects coated with transparent film.

[0002] As is known, a singulator device receives at input groups of flat rectangular postal objects grouped together in packs and feeds at output singulated postal objects, i.e., postal objects that are physically separated from one another.

[0003] For example the documents Nos. US-4,634,328(Mail Singulation System), WO91/15416 (Flat mail Singulation Apparatus), US 4,171,130 (Control of withdrawal of flat items individually from a stack) and DE 101 40 497 describe singulator devices for postal objects.

[0004] Typically, the packs of postal objects, which have an approximately parallelepipedal shape, slide along a horizontal resting surface under the thrust of a drawing system that displaces the packs towards a singulator system designed to withdraw in sequence and individually the postal objects that form a front end face of the pack. Typically, the packs move in a rectilinear direction D of advance.

[0005] The singulator system, for example, can comprise a motor-driven withdrawing belt forming a vertical plane gripping portion associated to a suction device; the postal object that forms the front face of the pack comes to bear upon the plane gripping portion, which moves individually the postal object withdrawn in a direction L transverse to the direction of advance, separating it from the pack.

[0006] The spatial separation between the singulated postal objects in sequence in the direction L is obtained by controlling the speed of the withdrawing belt and following with an optical barrier of emitter/receiver sensors the front and trailing edges of each moving object in such a way that, for example, the trailing edge (Figure 4) of one postal object 7 is spaced in the direction L with respect to the leading edge le of the object that follows it by a constant gap g. In other processing modalities a constant pitch is instead established (i.e., the distance between the leading edges of the objects is kept constant) by guaranteeing in any case a minimum gap between successive postal objects.

[0007] The aim of said control is to create a flow of singulated postal objects separated from one another by a constant/variable gap g, which moves at a controlled speed.

[0008] The process of operation of the optical barrier, of a known type, in the case of creation of a constant gap, is illustrated in Figures 1-4, represented in which is a postal object 7 that moves in a rectilinear direction L following upon its withdrawal from a pack of postal objects. A barrier of n emitter/receiver sensors C (C0, C1, C2, ...Cn) is set aligned in a rectilinear direction parallel to the direction L, and the optical paths between emitters and receivers C (C0, C1, C2, ...Cn) are interrupted by the edges of the postal object that moves in the direction L. The sensor C0 (first sensor) is closest to the withdrawal area, whereas the sensor Cn (last sensor) is furthest from the withdrawal area and located in a part of the conveying system where the speed of the objects in transit is constant and already equal to the steady running speed V.

[0009] The operating process can be summed up in three steps:

step 1 (Figure 2): waiting for obscuration of the last sensor Cn of the barrier. In this step, the motor-driven withdrawing belt moves with an acceleration ramp that is maintained until the last sensor Cn is obscured. Following upon obscuration of the last sensor Cn (the leading edge of the postal object has reached said sensor) the withdrawing belt is stopped with a controlled deceleration ramp; the postal object 7 now moves with practically constant speed V, its leading portion (edge) being already taken up by a pair of pinch rollers, which send it towards a conveying system set downstream so that it moves away from the pack of postal objects. The postal object subsequent to the one withdrawn, which forms the end face of the pack, is now stationary. All the sensors of the barrier have optical paths interrupted (Figure 3) by the receding postal object or by the stationary postal object.

Step 2 (Figure 4): Waiting for formation of a gap in the barrier. When the trailing edge te of the receding postal object is separated physically from the leading edge le of the stationary postal object, a gap is created, which enables passage of a signal between at least one emitter and at least one receiver Ci (lighting-up of sensor Ci). The withdrawing belt is still kept stationary, and computation of a time T_{COR} is triggered, which enables a recession of the trailing edge of the postal object that is moving with respect to the leading edge of the stationary postal object, which enables creation of a pre-set gap between the postal objects. The time T_{COR} is calculated on the basis of the position of the sensor lit up Ci and on the basis of the speed v of the receding postal object.

Step 3: restart. Once the time T_{COR} has expired, the withdrawing belt is activated, and the operations previously described are repeated, thus creating a flow of postal objects separated from one another with a constant gap g.

[0010] In many applications, the postal objects are coated with a transparent film, which forms a transparent envelope, the dimensions of which exceed those of the postal object.

[0011] The edges of the transparent envelope are not in fact detected by the barrier of sensors, which detect, instead, the edges of the postal object contained in this transparent envelope; for this reason, the gap calculated does not take

into account the dimensions of the envelope but only the dimensions of the postal object contained in the envelope itself. Consequently, the gap created between the edges of the transparent envelopes is frequently insufficient, and the envelopes can come into contact with one another during motion of the postal objects, thus jeopardizing conveying of the postal objects especially at the sorting exchanges.

[0012] The aim of the present invention is to provide a singulator device for postal objects that will enable spacing between the objects withdrawn to be obtained taking into account also the transparent film.

[0013] The above aim is achieved by the present invention in so far as it relates to a singulator device for flat rectangular postal objects coated with transparent film, which forms a transparent flat rectangular envelope that has at least one dimension L1 and l1 greater than the corresponding dimension L and 1 of the flat rectangular postal object, the device comprising: a singulator system provided with a motor-driven withdrawing belt; a resting surface for the packs of postal objects; and a drawing system that displaces the packs towards said withdrawing belt, which is designed to withdraw individually in a withdrawal area a postal object that constitutes a front end face of the pack; said postal object coming to bear upon a gripping portion of the withdrawing belt, which moves the object withdrawn from the pack along an unloading path transverse to the direction of advance, said singulator device being **characterized in that it comprises:** a first barrier of n emitter/receiver sensors C (C0, C1, C2, ...C*n*) arranged along the unloading path and configured for detecting passage of the postal object that moves along the unloading path; and ii) a second barrier of m emitter/receiver sensors F (F0, F1, F2, ...Fm) arranged along the unloading path and configured for detecting passage of the transparent envelope containing the postal object that moves along the unloading path; electronic means being provided, designed to control the motion of the withdrawing belt as a function of the signals coming from the first barrier and from the second barrier to create a gap between the adjacent edges of the transparent rectangular envelopes containing the postal objects singulated in succession and fed to the unloading path.

[0014] In greater detail, the first sensors comprise a last sensor C*n,* which is furthest from the withdrawal area with respect to the other sensors and said second sensors comprise at least one last sensor Fm, which is furthest from the withdrawal area with respect to the other sensors; said electronic means being configured for: performing a first verification to check whether the last sensor Cn or else (OR) the last sensor Fm has detected, respectively, the presence of a postal object or else of the transparent envelope; in the case of negative outcome from the first verification, said withdrawing belt being kept moving for withdrawing an end postal object from the pack; in the case of positive outcome there being issued a command for blocking the withdrawing belt; performing a second verification subsequent to the first, to detect the simultaneous presence (a AND b) of the following conditions: a) at least one first sensor Ci of the first barrier detects the absence of a postal object; and b) at least one second sensor Fi of the second barrier detects the absence of a transparent envelope 7e; in the case of positive outcome from the second verification, which represents opening of a gap between the postal objects or between the transparent envelopes, there being activated computation of a correction time T_{COR}, upon expiration of which the withdrawing belt is re-activated for creating a gap between the trailing edge of the postal object that is moving or else of the transparent envelope that is moving with respect to the leading edge of the stationary postal object or of the stationary transparent envelope.

[0015] The invention will now be illustrated with particular reference to the attached figures, which illustrate a preferred non-limiting embodiment thereof and in which:

- Figures 1-4 illustrate the known art;
- Figure 5 illustrates, in perspective view, a detail of the device according to the invention;
- Figure 6 illustrates operation of the device; and
- Figures 7-10 illustrate computation of the correction time $T_{COR.}$

[0016] Designated as a whole by 1 in **Figure 5** is a singulator device for postal objects 7 coated with a transparent film.

[0017] The postal objects 7 of a flat type have a rectangular shape and are characterized by a major side L and by a minor side 1. Said objects are coated with a pair of transparent films that form a flat rectangular envelope 7e, which has dimensions L1 and 11 greater than the corresponding dimensions L and 1 of the postal object.

[0018] The singulator device 1 is configured for receiving at input groups of flat rectangular postal objects grouped together in packs and feed at output singulated postal objects (i.e., postal objects physically separated from one another).

[0019] The device 1 comprises:

- a singulator system 10 (of a known type);
- a plane rectangular resting wall 12 for the packs of postal objects on which a motor-driven plane belt 13 slides; and
- a drawing system 15 (built according to known techniques), which displaces the packs along the belt 13 parallel to a direction of advance D towards the singulator system 10, which is set at one end of the rectangular resting wall 12.

[0020] The singulator system 10 is designed to withdraw individually the postal objects that form a front end face of the pack; in particular, as will be clarified hereafter, the postal object forming the front face of the pack comes to bear

upon a gripping portion 18 (represented partially) of a motor-driven withdrawing belt 19, which moves the postal object in a direction of unloading L transverse to the direction D of advance, separating it from the pack.

[0021] The drawing system 15 moreover comprises a slide 27 (represented partially), which slides under the thrust of a motor device (not illustrated) along a guide 26 parallel to the direction D and carried by the wall 12.

[0022] The slide 27 comprises a U-shaped plane pusher element 29 (messer knife) having a plane of lie transverse to the direction D and perpendicular to the resting wall 12 and to the belt 13.

[0023] The pusher element 29 is designed to come to bear upon a rear face of a pack P of postal objects resting on the top surface of the belt 13 for moving the front face of the pack P towards the singulation system 10.

[0024] The device 1 comprises an electronic control unit C (illustrated schematically), which controls, amongst other things, the motion of the slide 27 and of the pusher element 29, which move from a first end of the wall 12 (not illustrated) towards a second end of the wall 12, located in the proximity of which is the singulation system 10. In this way, the packs of postal objects resting on the resting wall 12 are pushed by the pusher element 29 (messer knife) and by the belt 13, which co-operates in a synchronous way with the knife 29 (i.e., they are moved by the same mechanism) towards the singulation system 10 and advance in the direction of advance D.

[0025] The motor-driven withdrawing belt 19 extends between a pair of motor-driven pulleys 30 (just one of which is visible in the figure), which have axes perpendicular to the part 12, so as to create a pair of plane portions, one of which faces the pusher element 29 to provide the gripping portion 18. In greater detail, the withdrawing belt 19 has a plurality of through circular holes 31, which communicate with a suction system (not illustrated) set in the space delimited between the two pulleys 30.

[0026] The gripping portion 18 is thus provided by a plane portion of the belt that lies in a plane that is perpendicular to the wall 12; the direction D is moreover perpendicular to said plane.

[0027] An end postal object of the pack comes into contact with the gripping portion of the belt 19 to which it attaches thanks to the action of suction exerted by the holes 31; the motion of the withdrawing belt 19 enables displacement of the postal object attached to the belt 19 with respect to the adjacent postal object, thus separating the postal object from the pack and feeding it along an unloading path that extends in a rectilinear direction of unloading L perpendicular to the direction D.

[0028] The postal object slides along the unloading path until it sets itself between a pair of motor-driven pinch rollers 33 coated with rubber, which have axes perpendicular to the wall 12 and are designed to send the postal object towards a conveying system 34 of a known type, along which the postal object moves with practically constant speed V. The motor-driven pinch rollers 33 turn at constant speed V.

[0029] Provided according to the invention along the unloading path are:

i) a first barrier of n emitter/receiver sensors C (C0, C1, C2, ...Cn) set aligned in the direction L and having optical paths formed between respective emitters and receivers of the sensors C (C0, C1, C2, ...Cn), which are interrupted by the edges of the postal object that moves along the unloading path; the sensor C0 (first sensor) is closest to the withdrawal area (i.e., the area where the pack of postal objects is located - see also Figure 7), whereas the sensor Cn (last sensor) is furthest from the withdrawal area; and

ii) a second barrier of m emitter/receiver sensors F (F0, F1, F2, ...Fm) set aligned in the direction L and having optical paths formed between respective emitters and receivers of the sensors F (F0, F1, F2, ...Fm), which detect passage of the edges of the transparent rectangular envelope of the postal object that moves along the unloading path; the sensor F0 (first sensor) is closest to the withdrawal area (i.e., the area where the pack of postal objects is located), whereas the sensor Fm (last sensor) is furthest from the withdrawal area.

[0030] In other words, the first sensors detect the shape of the postal object contained in the transparent rectangular envelope, whereas the second sensors detect the shape of the transparent envelope.

[0031] The operations performed by the device 1 under the control of the electronic unit are illustrated with the aid of the flowchart of Figure 6.

[0032] Said operations concur in regulating the motion of the withdrawing belt 19 as a function of the signals coming from the first barrier C (C0, C1, C2, ...Cn) and from the second barrier F (F0, F1, F2, ...Fm) for creating a constant gap between the adjacent edges of the transparent rectangular envelopes containing the postal objects singulated in succession.

[0033] Initially, with the postal object already accelerated by the withdrawing belt the speed V is reached at a block 100, where a check is made to verify whether the last sensor Cn or else (logic OR operation) the last sensor Fm has detected, respectively, the presence of a postal object 7 and/or of the transparent envelope 7e (sensor Cn or else sensor Fm obscured). The detection typically occurs following upon interruption of the optical paths existing between emitter and receiver of the sensors C*n,* F*m*.

[0034] In the case of negative outcome of the check, block 100 is followed by a block 110, in which the withdrawing belt 19 is kept rotating at the speed V. From block 110 the flow then returns to block 100.

[0035] In this way, the motor-driven withdrawing belt 19 moves with constant speed V, hence withdrawing the postal object, which forms the front face of the pack, thanks to the action of gripping of the perforated belt.

[0036] In the case of positive outcome of the check (i.e., the last sensor Cn or else the last sensor Fm has detected, respectively, the presence of a postal object 7 and of the transparent envelope 7e in so far as the postal object has displaced from the pack following upon its withdrawal) block 100 is followed by a block 120, in which a command is issued for blocking the withdrawing belt 19.

[0037] In this way, following upon obscuration of the last sensor Cn or else Fm the withdrawing belt is stopped with a controlled deceleration ramp; the postal object 7 previously withdrawn from the pack moves at constant speed V drawn by the pair of pinch rollers 33, which send it towards the conveying system 34. The postal object subsequent to the one withdrawn, which now forms the end face of the pack, slows down until it stops. All the sensors C (C0, C1, C2, ... C*n*) of the first barrier and all the sensors F (F0, F1, F2, ... F*m*) of the second barrier have optical paths interrupted by the receding postal object or by the stationary postal object.

[0038] Block 120 is followed by a block 130, where the control unit sets itself waiting for the following logic condition:

- at least one first sensor Ci detects the absence of a postal object; and (logic AND operation)
- at least one second sensor Fi detects the absence of a transparent envelope 7e.

[0039] Said condition corresponds to the creation of a spacing (opening of the gap):

- between the trailing edge of the receding postal object and the leading edge of the stationary postal object; and
- between the trailing edge of the transparent envelope of the receding postal object and the leading edge of the envelope of the stationary postal object.

[0040] In other words, a gap is created, which enables passage of a signal between at least one emitter and at least one receiver of the sensor Ci or else Fi.

[0041] The withdrawing belt is still kept stationary and there is triggered (block 140 subsequent to block 130) computation of a correction time T_{COR}, which enables a recession of the trailing edge of the postal object that is moving or else of a transparent envelope with respect to the leading edge of the stationary postal object or of the stationary transparent envelope, which enables creation of a pre-set gap between the postal objects or between the transparent envelopes containing respective postal objects.

[0042] The correction time T_{COR} is calculated on the basis of the position of the sensor lit up C*i*, F*i* and on the basis of the speed V of the receding postal object.

[0043] Block 140 is followed by a block 150, in which the control unit waits for the correction time T_{COR} to elapse; once the correction time T_{COR} has expired, block 150 is followed by a block 160, in which a command is issued for restart of the withdrawing belt 19.

[0044] From block 160 the flow returns to block 100, and the withdrawing belt 19, and consequently the subsequent postal object withdrawn from the pack P undergo a step of acceleration that brings their speed from 0 to V in the time T_{RAMP}.

[0045] In this way, the operations previously described are repeated, thus creating a flow of postal objects separated from one another with a constant gap g.

[0046] Figures 7, 8, 9 and 10 illustrate the modalities with which the correction time is defined.

[0047] Said computation is activated following upon opening of the gap (block 140) on the basis of:

- the position of the gap (i.e., according to the position of the sensor Ci or else Fi that has first detected opening of the gap;
- the instantaneous speed of displacement V_{ATT} of the letter (LC2), which is stopping following upon blocking of the belt (see Figure 7);
- the speed V set on the postal object LC2 that is taken up by the pinch rollers and fed to the conveying system; and
- the value g of the gap set.

[0048] In this case (Figure 8), the space traversed by the postal object LC2 in deceleration is given by the area of the hatched triangle, where:

- V is the conveying speed of the postal object LC1;
- T_{RAMP} is the duration of the complete deceleration ramp applied to the postal object LC2; and
- V_{ATT} is the speed of the postal object LC2 upon opening of the gap

$$a = \frac{V}{T_{RAMP}}$$

[0049] If we designate by T_{DEC} the time that the postal object LC2 takes to pass from speed V_{ATT} *to* speed zero

$$T_{DEC} = \frac{V_{ATT}}{a}$$

during deceleration the space traversed by the postal object LC2 is:

$$S_{DEC} = \frac{V_{ATT} T_{DEC}}{2} = \frac{V^2{}_{ATT}}{2a}$$

[0050] Likewise, during the step of acceleration the space traversed by the postal object LC1 is:

$$S_{ACC} = \frac{VT_{RAMP}}{2}$$

[0051] If we designate by D_{cicn} the distance between the point of opening of the gap and the point at which the postal object LC1 is taken up by the pinch rollers, if the following relation is verified:

$$D_{CiCn} > S_{DEC} + S_{ACC}$$

we are in the condition where the correction enables arrest and complete re-acceleration of the postal object LC2.

[0052] The gap created between the postal objects LC1 and LC2 is equal to the difference of space traversed between the postal object LC1 that travels at constant speed V and the space that the postal object LC2 traverses.

$$GAP = S_{LC1} - S_{LC2}$$

$$GAP = V(T_{DEC} + T_{STOP} + T_{RAMP}) - (S_{DEC} + S_{ACC})$$

$$GAP = V(T_{DEC} + T_{STOP}) + VT_{RAMP} - \frac{V^2{}_{ATT}}{2a} - \frac{VT_{RAMP}}{2}$$

$$\texttt{Gathering}\ (T_{DEC} + T_{STOP})$$

$$V(T_{DEC}+T_{STOP})=GAP-VT_{RAMP}+\frac{V^2{}_{ATT}}{2a}+\frac{VT_{RAMP}}{2}$$

$$V(T_{DEC}+T_{STOP})=GAP+\frac{V^2{}_{ATT}}{2a}-\frac{VT_{RAMP}}{2}$$

$$T_{DEC}+T_{STOP}=\frac{GAP}{V}+\frac{V^2{}_{ATT}}{2aV}-\frac{T_{RAMP}}{2}$$

whence we can define the correction time as:

$$T_{COR}=T_{DEC}+T_{STOP}=\frac{GAP}{V}+\frac{V^2{}_{ATT}}{2aV}-\frac{T_{RAMP}}{2}$$

Claims

1. A singulator device for flat rectangular postal objects coated with transparent film, which forms a transparent flat rectangular envelope (7e) that has at least one dimension L1 and l1 greater than the corresponding dimension L and 1 of the flat rectangular postal object, the device comprising:

- a singulator system (10) provided with a motor-driven withdrawing belt (19);
- a resting surface (12,13) for the packs of postal objects; and
- a drawing system (15), which displaces the packs towards said withdrawing belt (19), which is designed to withdraw individually in a withdrawal area a postal object that constitutes a front end face of the pack; said postal object coming to bear upon a gripping portion (18) of the withdrawing belt (19) that moves the object withdrawn from the pack along an unloading path (L) transverse to the direction of advance (D),

said singulator device being **characterized in that it comprises:**

i) a first barrier of n emitter/receiver sensors C (C0, C1, C2, ...Cn) arranged along the unloading path and configured for detecting passage of the postal object that moves along the unloading path; and
ii) a second barrier of m emitter/receiver sensors F (F0, F1, F2, ...Fm) arranged along the unloading path and configured for detecting passage of the transparent envelope containing the postal object that moves along the unloading path;

there being provided electronic means designed to control the motion of the withdrawing belt (19) as a function of the signals coming from the first barrier and from the second barrier for creating a gap between the adjacent edges of the transparent rectangular envelopes containing the postal objects singulated in succession and fed to the unloading path.

2. The device according to Claim 1, wherein the first sensors comprise a last sensor C*n,* which is furthest from the withdrawal area with respect to the other sensors and said second sensors comprise at least one last sensor Fm, which is furthest from the withdrawal area with respect to the other sensors;
said electronic means being configured for:

- performing a first verification (100) to check whether the last sensor Cn or else (OR) the last sensor Fm have detected, respectively, the presence of a postal object (7) or else of the transparent envelope (7e); in the case

of negative outcome of a first verification, said withdrawing belt (19) being kept moving for withdrawing an end postal object from the pack; in the case of positive outcome from the first verification there being issued a command for blocking (120) the withdrawing belt (19);

- performing a second verification (130) subsequent to the first (100) to detect the simultaneous presence (a AND b) of the following conditions:

a) at least one first sensor Ci of the first barrier detects the absence of a postal object; and

b) at least one second sensor Fi of the second barrier detects the absence of a transparent envelope (7e);

in the case of positive outcome from the second verification (130), which represents opening of a gap between the postal objects or between the transparent envelopes, there being activated computation of a correction time T_{COR}, upon expiration of which (150) the withdrawing belt is re-activated (160) for creating a gap between the trailing edge of the postal object that is moving or else of the transparent envelope that is moving with respect to the leading edge of the stationary postal object or of the stationary transparent envelope.

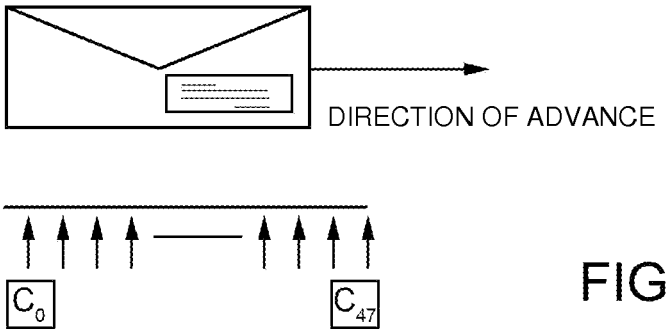


FIG. 1

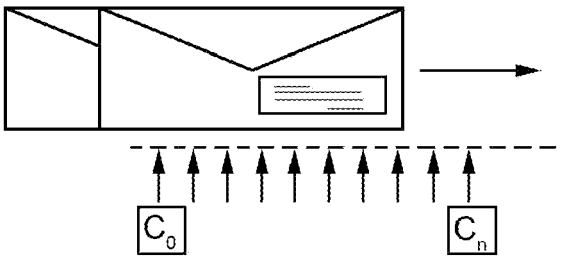


FIG. 2

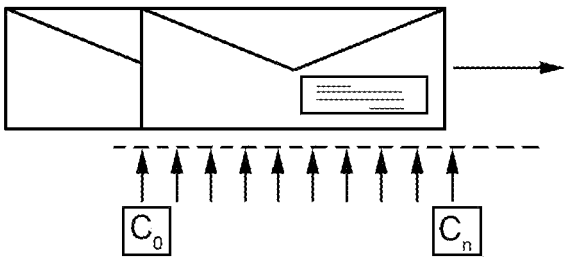


FIG. 3

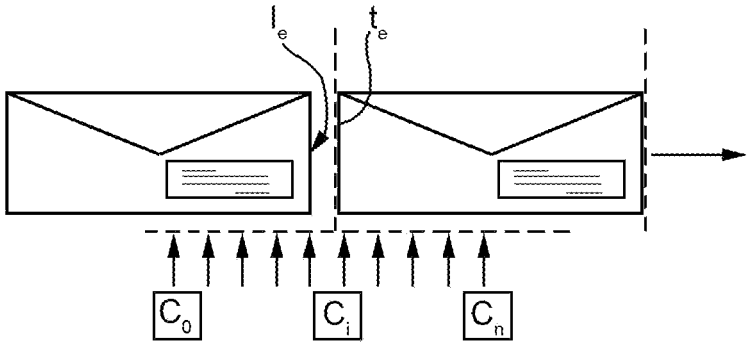
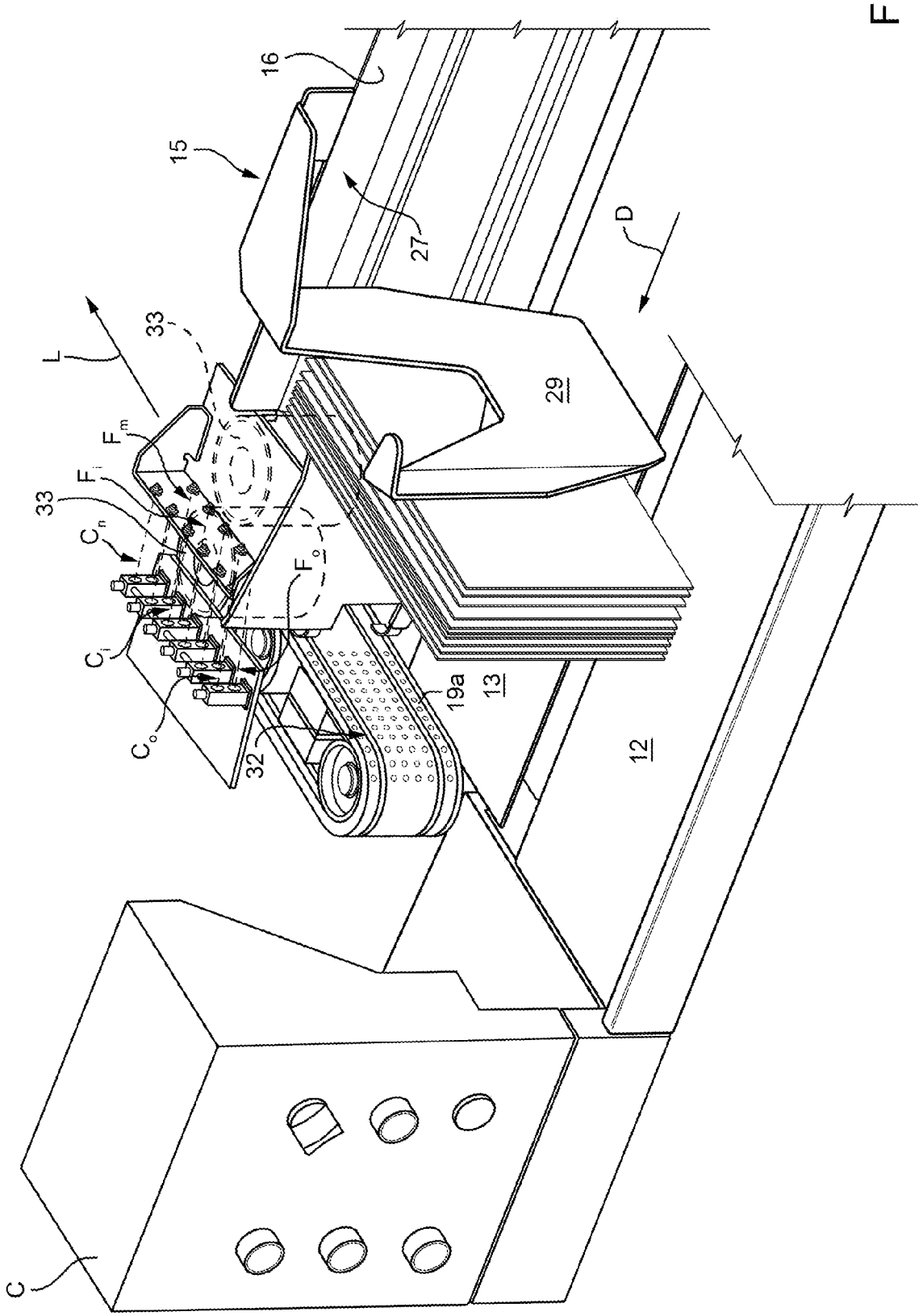


FIG. 4

FIG. 5



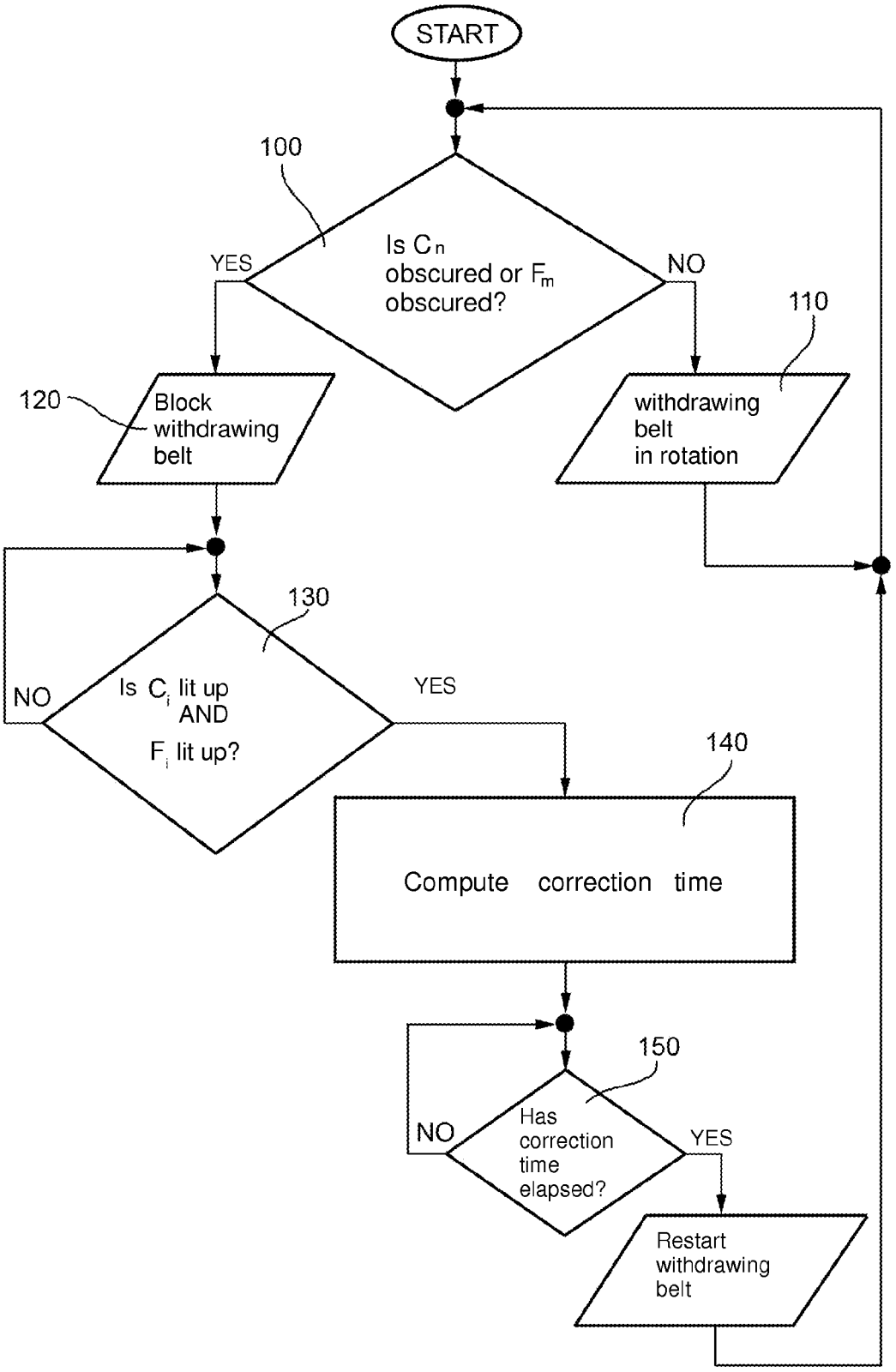

START
100
Is Cn obscured or Fm obscured?
YES
NO
110
120
Block withdrawing belt
withdrawing belt in rotation
130
NO
Is Ci lit up AND Fi lit up?
YES
140
Compute correction time
150
NO
Has correction time elapsed?
YES
Restart withdrawing belt

FIG. 6

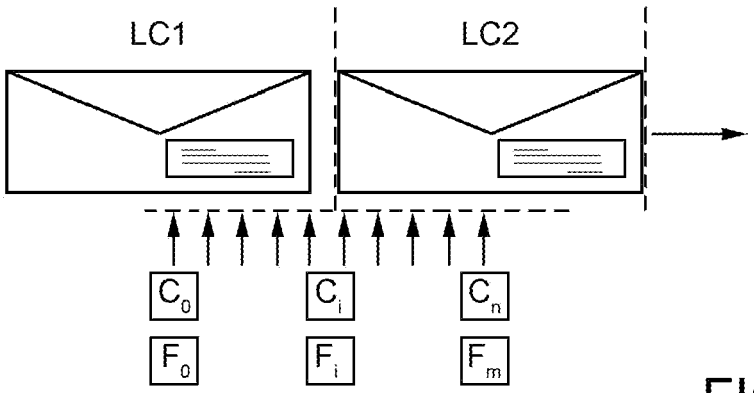


FIG. 7

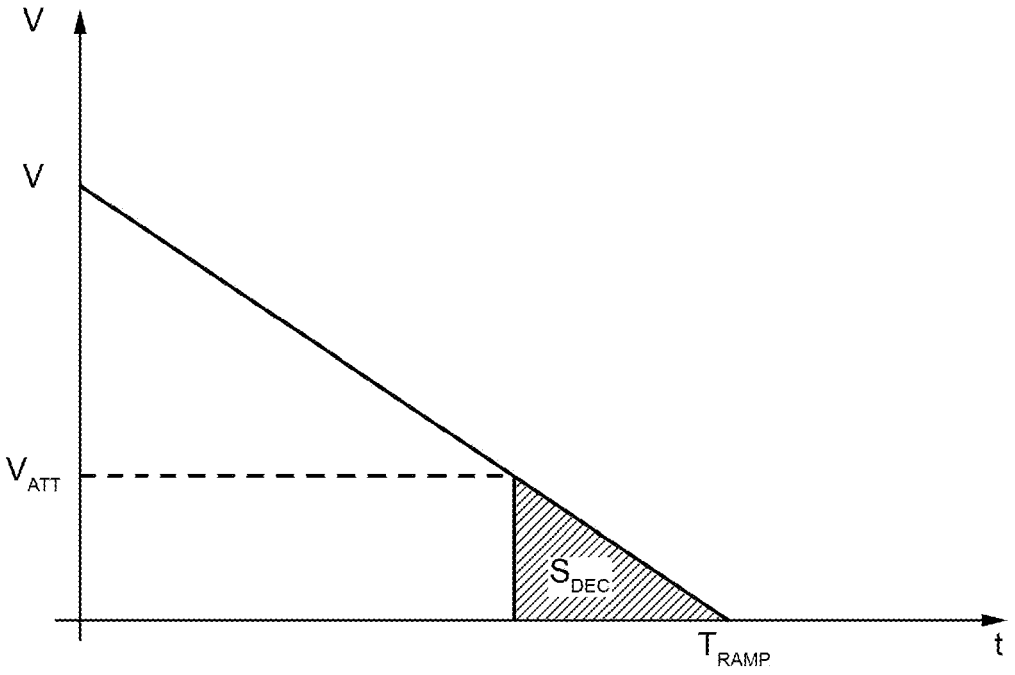


FIG. 8

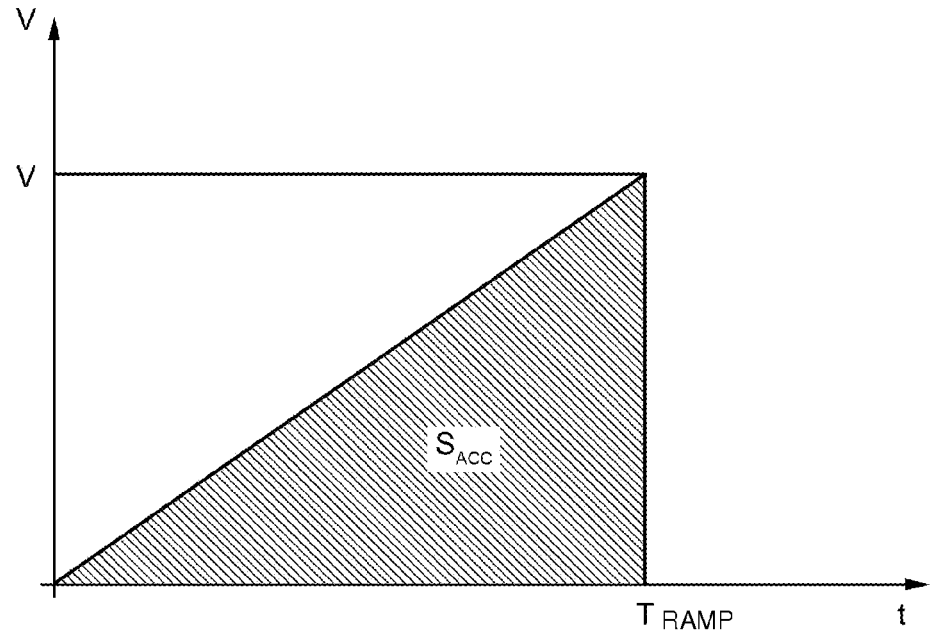


FIG. 9

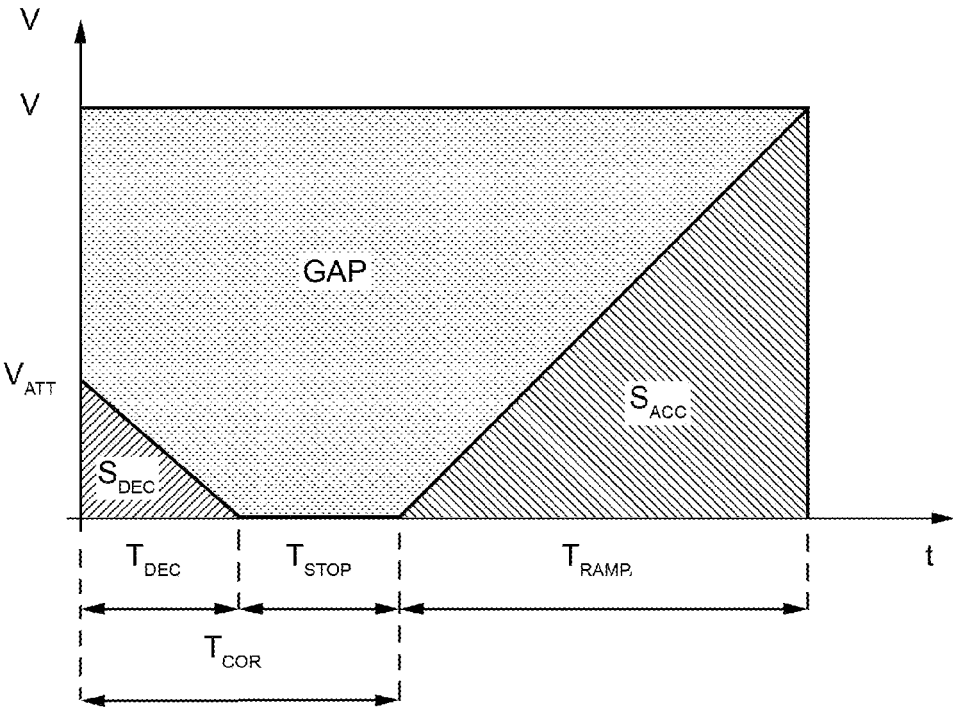


FIG. 10

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EUROPEAN SEARCH REPORT

Application Number
EP 10 42 5246

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 4 077 620 A (FRANK WERNER ET AL) 7 March 1978 (1978-03-07) * column 4, line 1 - column 5, line 36; figure 1 * -----	1,2	INV. B07C1/04 B65H3/38
A	DE 101 40 497 C1 (SIEMENS DEMATIC AG [DE]) 13 March 2003 (2003-03-13) * paragraphs [0020] - [0027]; figure 1 * -----	1,2	
A	FR 2 783 442 A1 (POSTE [FR]) 24 March 2000 (2000-03-24) * pages 3,6,7; figure 1 * -----	1,2	

TECHNICAL FIELDS SEARCHED (IPC)

B07C
B65H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	20 January 2011	Golombek, Gregor

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20-01-2011

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4077620 A	07-03-1978	AU 507887 B2	28-02-1980
		AU 2369377 A	05-10-1978
		BE 852893 A1	18-07-1977
		CA 1049948 A1	06-03-1979
		IT 1113526 B	20-01-1986
DE 10140497 C1	13-03-2003	NONE	
FR 2783442 A1	24-03-2000	DE 69908155 D1	26-06-2003
		DE 69908155 T2	25-03-2004
		EP 1115507 A1	18-07-2001
		WO 0016915 A1	30-03-2000

EPO FORM P0459

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Patent documents cited in the description

- US 4634328 A **[0003]**
- WO 9115416 A **[0003]**
- US 4171130 A **[0003]**
- DE 10140497 **[0003]**