(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 905 659 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
31.03.1999 Bulletin 1999/13

(51) Int. Cl.[6]: **G07F 11/14**

(21) Application number: **97307690.4**

(22) Date of filing: **30.09.1997**

(84) Designated Contracting States:
AT BE CH DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE

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(54) Card dispenser

(57) A card dispensing apparatus is disclosed and comprises a card magazine (2) and a card dispensing mechanism (5) for dispensing cards (4) from the magazine (2). The magazine (2) and the dispensing mechanism (5) are disposed such that the dispensing mechanism (5) will not be subject to the weight of the cards (4) in the magazine (2) when the magazine (2) is loaded. In a preferred embodiment, the magazine (2) presents the cards (4) to the dispensing mechanism (5) from below.

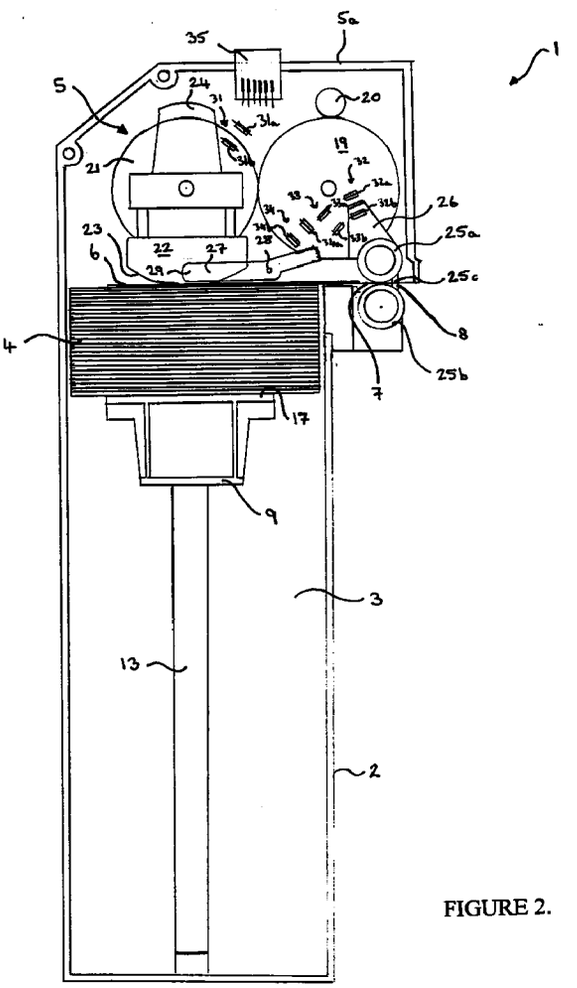

FIGURE 2.

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Description

[0001] The present invention relates to a card dispensing apparatus comprising a card magazine and a card dispensing mechanism for dispensing cards from the magazine.

[0002] Card dispensers are well known. In a typical application, a card of a specific monetary value is purchased from a dispenser and is then used to pay for goods or services.

[0003] In a conventional card dispenser, a dispensing mechanism includes a roller which rotates so as to peel a card from the bottom of a stack of cards stored in the dispenser and direct it along a path to an exit slot. Rotation of the roller is halted when the trailing edge of the card is free from the roller and the next succeeding card in the stack is about to be engaged, to prevent it from being directed towards the exit slot. A disadvantage with this arrangement is that a substantial force is required to remove one card from the bottom of the stack, especially when the dispenser is quite full, as the weight of the whole stack of cards is pressing down against the dispensing mechanism.

[0004] In addition, because of the weight of the stack, the lowest cards nearest the dispensing mechanism are compressed and occasionally adhere to each other. This results in two cards being dispensed at the same time, leading to loss of revenue, or damage to a card and jamming of the dispenser as it attempts to force two cards into the exit slot which is capable of accepting only one card at a time. This problem is exacerbated when the dispenser is still relatively full, as the substantial weight of the stack increases the likelihood that two or more cards will adhere to each other.

[0005] An attempt has been made to overcome this problem by providing a roller situated just above the exit slot. The roller rotates in a direction opposite to the direction of travel of the card during operation of the dispensing mechanism so that if the mechanism attempts to dispense more than one card at a time, the roller engages the top card and pushes it back into the stack.

[0006] The aforementioned arrangement still has a number of disadvantages, as a substantial force must still be applied by the dispensing mechanism to remove a card from the bottom of the stack as the whole weight of the stack of cards presses down against it, the cards may still adhere to each other and precise control of rotation of the roller is still necessary.

[0007] It is an object of the present invention to provide a card dispenser which overcomes or substantially alleviates the aforementioned problems.

[0008] A card dispensing apparatus according to the present invention is characterised in that the magazine and dispensing mechanism are disposed such that the dispensing mechanism will not be subjected to the weight of the cards in the magazine when the magazine is loaded. This may be conveniently achieved by arranging for the magazine to present cards to the dispensing mechanism from below. However, this is not essential and, for instance, the magazine could be arranged to present cards from the side. It will be appreciated that a gravity feed may be employed to present the cards to the dispensing mechanism. For instance, the magazine may rise at an angle to the horizontal, merely sufficient for cards to move by gravity towards the dispensing mechanism.

[0009] Preferably, biasing means is provided for biasing cards loaded into the magazine towards the dispensing means during a dispensing operation. More preferably, the biasing means comprises spring means such as one or more coil springs. The coil spring or springs may be arranged to push against the last card in the magazine. However, the preferred arrangement is for the or each spring to be coupled between a card support in the magazine and a structure near the dispensing mechanism.

[0010] A further problem with conventional card dispensers, especially those that contain cards having a significant monetary value, is that they are prone to tampering. A determined thief can insert a tool through the exit slot with the aim of 'hooking' a card in the stack and drawing it out without inserting payment.

[0011] This subsidiary problem is addressed by the provision of security means for ensuring that the next card to be dispensed is out of alignment with the card exit until it is to be dispensed. The card exit is preferably dimensioned to allow only one card to pass at a time. Preferably, the security means comprises a member configured to hold or push cards in the magazine away from the dispensing mechanism.

[0012] Preferably, an apparatus according to the present invention includes a magazine empty sensor comprising a recessed portion of a card support or pusher in the magazine and a movable member, the movable member being configured to enter the recessed portion of the card support in the absence of a card supported by the card support. The movable member may also serve as the security means when cards are present in the magazine.

[0013] Preferably, the dispensing mechanism comprises a foot for engaging a card in the magazine. The foot preferably has a surface providing enhanced the friction between the foot and a card to be dispensed. This may be achieved by forming at least the card engaging part of the foot from an elastomeric or similar material.

[0014] In prior art devices, precise control of the roller is necessary to ensure that a succeeding card is not directed towards the dispensing slot before rotation stops.

[0015] The foot is preferably configured to slide the engaged card towards a card exit slot without disturbing the next succeeding card in the magazine. This may be accomplished by forming the part of the foot which engages the card in an arc which subtends an angle which is sufficient to ensure that the foot engages a card

as it is swept over the stack but is small enough to ensure that contact with the next succeeding card is avoided.

[0016] The foot is preferably driven by a gearwheel and rotates therewith to engage a card in each revolution and slide it towards the card exit slot.

[0017] Preferably, the dispensing mechanism comprises a cam member driven by the gearwheel to engage the moveable member and cause it to press cards in the magazine away from the dispensing mechanism.

[0018] In a preferred embodiment, an additional gearwheel is provided behind the card exit slot for rotation in a direction opposite to the direction of rotation of the gearwheel driving the foot and to contact a topmost card when two cards are slid towards the dispensing slot by the foot at the same time, and push the topmost card back into the magazine.

[0019] Preferably, a motor driven gearwheel meshes with the additional gearwheel which in turn meshes with the gearwheel driving the foot and the cam member.

[0020] In the preferred embodiment, an exit gearwheel is situated adjacent the card exit slot for feeding the card through the exit slot. Preferably the exit gearwheel is rotatably driven indirectly by the motor-driven gearwheel.

[0021] An apparatus according to the present invention preferably includes a card exit gate, the gate being configured to be opened by a card being dispensed and close automatically behind a card being dispensed.

[0022] Optical sensors are preferably provided for sensing *inter alia* movement of the foot, movement of the movable member of the magazine empty sensor into the recess in the card support and opening and closing of the card exit gate.

[0023] Although reference is made to a card having a monetary value, the term "card" shall be taken to mean any planar object which may be dispensed from a dispensing apparatus of the type described.

[0024] An embodiment of the present invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a perspective view of a card dispensing apparatus according to an embodiment of the present invention;

Figure 2 is an internal side view of the apparatus of Figure 1;

Figure 3 is an internal side view of the upper portion of the apparatus of Figure 1 in its rest position;

Figure 4 is an internal side view of the upper portion of the apparatus of Figure 1 in which the top card in the stack is about to be engaged by the foot;

Figure 5 is an internal side view of the upper portion of the apparatus of Figure 1 in which the top card in the stack has been slid towards the dispensing slot by the foot;

Figure 6 is an internal side view of the upper portion of the apparatus of Figure 1 in which the card has passed part way between the exit rollers;

Figure 7 is an internal side view of the upper portion of the apparatus of Figure 1 in a hold position, after a card has been dispensed but before being taken; and

Figure 8 is an internal side view of the upper portion of the apparatus of Figure 1 with no cards in the chamber.

[0025] Referring to Figures 1 and 2 a card dispensing apparatus 1 comprises a magazine 2 having a chamber 3 for holding a stack of cards 4 and a dispensing mechanism 5 having a housing 5a, disposed above the magazine 2, for directing the top card 6 in the stack 4 along a guide path 7 towards a dispensing slot 8.

[0026] The stack 4 rests on a card support 9 slideably received within the chamber 3. The card support 9 is biased by springs (only one shown) 10 located on opposite sides of the magazine 2. The springs 10 extend between respective fixed bosses 11 on the housing 5a of the dispensing mechanism 5 and respective bosses 12 on opposite sides of the card support 9 which protrude through respective vertical slots 13 in the side walk of the magazine 2. The springs 10 urge the card support 9 and the stack of cards 4 upwardly towards the dispensing mechanism 5.

[0027] A recess 16 is formed in the upper surface 17 of the card support 9 upon which the stack of cards 4 rest.

[0028] The dispensing mechanism 5 disposed above the magazine 3 comprises a primary gearwheel 19 located above the guide path 7 rotatable in a clockwise direction by a motor-riven gearwheel 20. The primary gearwheel 19 meshes with a secondary gearwheel 21, positioned above the stack 4 for rotation in an anti-clockwise direction in response to rotation of the primary gearwheel 19 by the motor-driven gear wheel 20.

[0029] The secondary gearwheel 21 carries a foot 22 which extends radially outwardly past the periphery of the secondary gearwheel 21 and has a curved card engaging face 23. The foot 22 is made of synthetic rubber.

[0030] A cam member 24 extends radially outwardly past the periphery of the secondary gearwheel 21 radially opposite the foot 22. The cam member 24 and the foot 22 both define a circular arc when the secondary gearwheel 21 is caused to rotate and are offset from each other in an axial direction for reasons which will become apparent.

[0031] An exit roller 25a, driven by the motor driven gearwheel 20 through the primary gearwheel 19, is situated in the guide path 7 above the exit from the dispensing slot 8. The roller 25a is rotatably mounted on a pivotable frame 26 which incorporates an exit gate 25c which extends over the dispensing slot 8. The roller 25a is in contact with a pair of spaced idler rollers 25b situated in front of and just below the dispensing slot 8 (see

Figure 1) and the exit gate 25c fits in the space between the idler rollers 25b when in its closed position.

[0032] A dipper arm 27 is mounted on a pivot 28 on the housing 5a of the dispensing mechanism 5 offset from its centre of gravity and has a member 29 which rests on, and is supported by, the top card 6 in the stack 4. The dipper arm 27 is positioned in axial alignment with the circular arc defined by the cam member 24 during rotation and can engage the upper surface of the member 29 and push it and the stack of cards 4 downwardly in the chamber 3 against the spring bias 10. When the chamber 3 is empty, the member 29 drops into the recess 16 in the upper surface 17 of the card support 9 under its own weight.

[0033] Optical sensors 31, 32, 33, 34 are mounted within the dispensing mechanism 5 and transmit signals to a controller (not shown) connected to the dispenser 1 via an electrical terminal block 35 protruding through the housing 2. Each optical sensor 31, 32,33,34 comprises a light beam emitting device 31a,32a,33a,34a which directs a beam of light to an associated detector 31b,32b,33b,34b. When the beam is broken by part of the apparatus of the dispensing mechanism passing into the space between the light beam emitting device 31a,32a,33a,34a and its associated detector 31b,32b,33b,34b, a signal is sent by the optical sensor 31,32,33,34 to the controller.

[0034] Optical sensor 31 detects the position of the foot 22 as it rotates during a dispensing cycle. The foot 22 includes a protrusion which passes between the light beam emitting device 31a and the detector 31b of the optical sensor 31 when it reaches its parked position (as shown in Figure 3). When the beam is broken, the optical sensor 31 sends a signal to the controller which deactivates the motor to stop rotation of the motor driven gearwheel 20.

[0035] Optical sensors 32,33 positively determine when the exit gate 25c is open. The pivotable frame 26 has a portion which is normally located in the space between the light beam emitting device 32a and detector 32b of optical sensor 32 so that the beam is not detected when the gate 25c is closed. When the exit gate 25c opens, the frame 26 pivots. As it does so, the portion moves out of the space between the light beam emitting device 32a and detector 32b of optical sensor 32, so that the beam is now detected, and instead breaks the beam between the light beam emitting device 33a and detector 33b of optical sensor 33. A signal is therefore sent by both optical sensor 32 and optical sensor 33 to the controller to provide a positive indication that the exit gate 25c is open. When the exit gate closes, the frame 26 pivots back. The movement of the frame 26 is again detected by the optical sensors 32,33 and both send a signal to the host controller to provide positive indication that the gate 25c is closed. If the gate 25c remains open for an extended period of time, either because a card has been left in the dispensing slot or a fraud attempt is in progress, the controller may activate an alarm condition.

[0036] The optical sensor 34 works in the same way as the optical sensors 31,32,33, described above, to detect excess movement of the dipper arm 27 as the member 29 drops into the recess 16 in the card support 9 when the last card has been dispensed. When the member 29 drops into the recess 16, the other end of the dipper arm 27 pivots upward and breaks the beam between the beam emitting device 34a and detector 34b of optical sensor 34. A signal is transmitted by the optical sensor 34 to the machine indicating that the chamber 3 is empty and requires refilling with a fresh stack of cards 4.

[0037] The operation of the card dispenser will now be described with reference to Figures 3 to 8. Figure 3 shows the dispensing mechanism 5 in its normal rest or parked position with three cards remaining in the magazine 2. The dipper arm 27 has been engaged by the cam member 24 which has pushed the dipper arm 27 and the stack of cards 4 downwardly in the chamber 3 against the spring bias 10 so that the top card 6 is approximately 4mm below the level of the guide path 7 and dispensing slot 8. This makes it very difficult for a thief to remove a card from the chamber 3 by fraudulent means involving the insertion of a tool through the dispensing slot 8.

[0038] Figure 4 shows the dispensing mechanism 5 a short period after activation when the secondary gearwheel 21 has rotated in an anti-clockwise direction by approximately 180 degrees and the foot 22 is just about to come into contact with the top card 6 in the stack 4.

[0039] It can be seen that the dipper arm 27 has been released by the cam member 24. As a result, the force urging the cards 4 downwardly in the chamber 3 against the spring bias 10 has been removed and they have moved upward so that the top card 6 is level with the guide path 7 and dispensing slot 8.

[0040] Figure 5 shows the dispensing mechanism after the secondary gearwheel 21 has rotated further to a position in which the top card 6 in the stack 4 has been contacted by and pushed along the guide path 7 by the foot 22 to a position in which the card 6 is about to pass between the exit roller 25a and the pair of spaced idler rollers 25c. As mentioned above, the foot 22 is axially offset from the cam member 24 so that the foot 22 does not come into contact with the dipper arm 27 as it rotates and engages the top card 6.

[0041] As will be appreciated from Figures 5 and 6, the curved card engaging face 23 of the foot 22 is of a length which is sufficient to engage the top card in the stack and direct it along the guide path 7 but is short enough to clear the next succeeding card in the stack as the secondary gearwheel 21 continues to rotate. This ensures that only one card is directed along the guide path 7 towards the dispensing slot 8 with each revolution of the secondary gearwheel 22.

[0042] As the card passes between the exit roller 25a and the pair of idler rollers 25b, the front edge of the

card pushes against the exit gate 25c which causes the frame 26 of which it is a part to pivot upwardly out of the way. Once the card has been taken from the dispensing mechanism 5, the exit gate 25c drops back into its closed position.

[0043] Figure 6 shows the dispensing mechanism 5 after further rotation of the secondary gearwheel 21. The foot 22 is no longer in contact with the top card 6 which has partially passed between the exit roller 25a and the spaced idler rollers 25b. The driven exit roller 25a now feeds the card 6 further through the dispensing slot 8 and then stops at a predetermined point when a large proportion of the card 6 has passed through, as shown in Figure 7. The card 6 is now ready to be taken. The secondary gearwheel 21 continues to rotate until it reaches its parked position as shown in Figure 3.

Claims

1. A card dispensing apparatus comprising a card magazine (2) and a card dispensing mechanism (5) for dispensing cards (4) from the magazine (2), **characterised in that** the magazine (2) and dispensing mechanism (5) are disposed such that the dispensing mechanism (5) is not subjected to the weight of the cards (4) in the magazine (2) when the magazine (2) is loaded.

2. An apparatus according to claim 1, wherein the magazine (2) presents cards (4) to the dispensing mechanism (5) from below.

3. An apparatus according to claim 1 or 2, including biasing means for biasing cards (4) loaded into the magazine (2) towards the dispensing mechanism (5) during a dispensing operation.

4. An apparatus according to claim 3, wherein the biasing means comprises spring means (10).

5. An apparatus according to claim 4, wherein the spring means includes a coil spring (10).

6. An apparatus according to any preceding claim, including a card exit slot (8) and security means (24, 27) for ensuring that the next card to be dispensed is stored out of alignment with the slot (8) until it is to be dispensed.

7. An apparatus according to claim 6, wherein the security means (24,27) comprises a member (27) configured to push or hold cards (4) in the magazine (2) away from the dispensing means (5).

8. An apparatus according to any preceding claim, including a magazine empty sensor comprising a recessed portion (16) of a card support (9) in the magazine (2) and a movable member (29), the movable member (29) being configured to enter the recessed portion (16) of the card support (9) in the absence of a card supported by the card support (9).

9. An apparatus according to any preceding claim, wherein the dispensing mechanism (5) comprises a foot (22) for engaging a card (6) in the magazine (2).

10. An apparatus according to claim 9, wherein the foot is configured to slide the engaged card (6) towards a card exit slot (8) without disturbing a succeeding card in the magazine(2).

11. An apparatus according to any preceding claim, including a card exit gate (25c), the gate (25c) being configured to be opened by a card (6) being dispensed and close automatically behind a card (6) being dispensed.

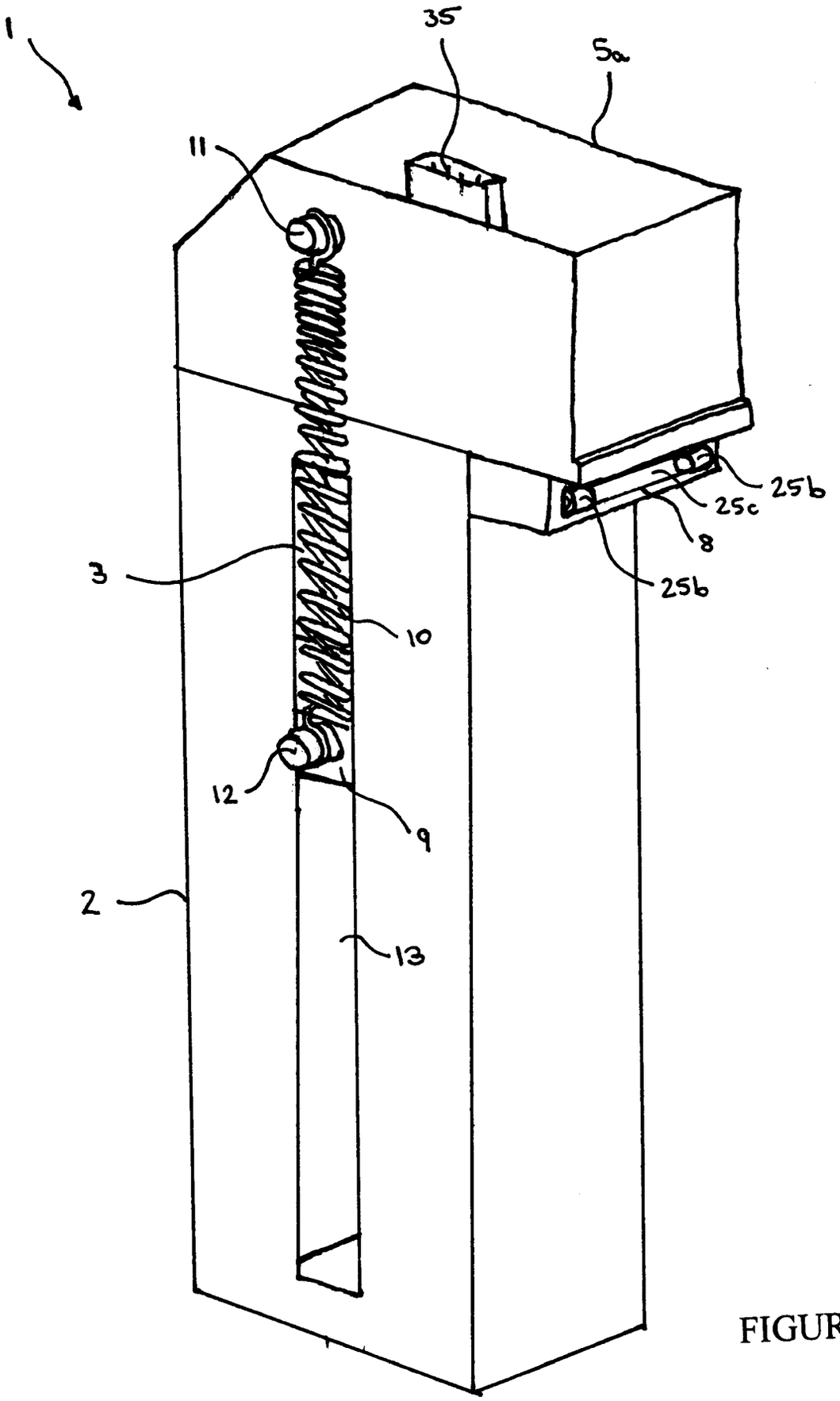

FIGURE 1.

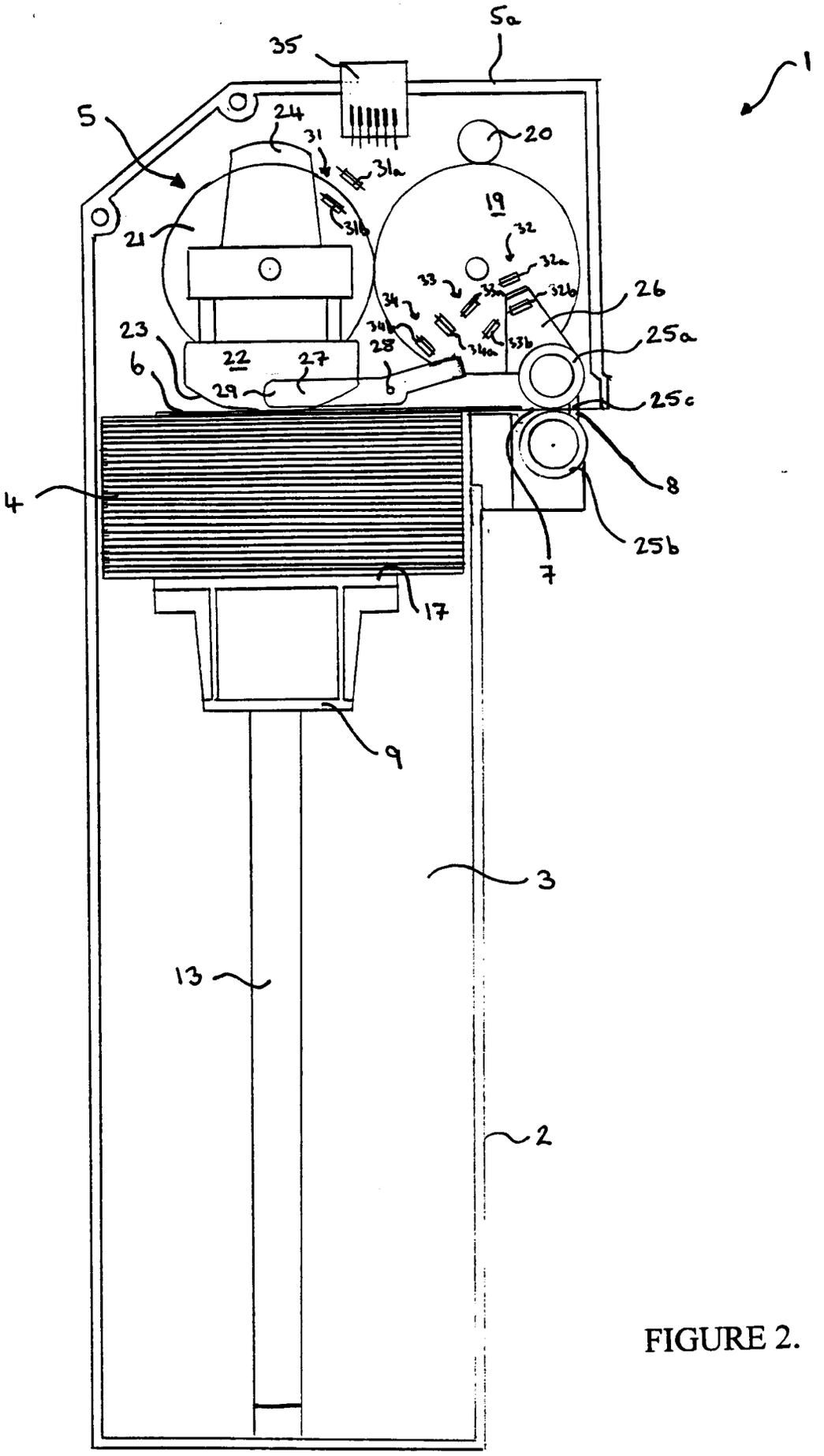
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FIGURE 2.

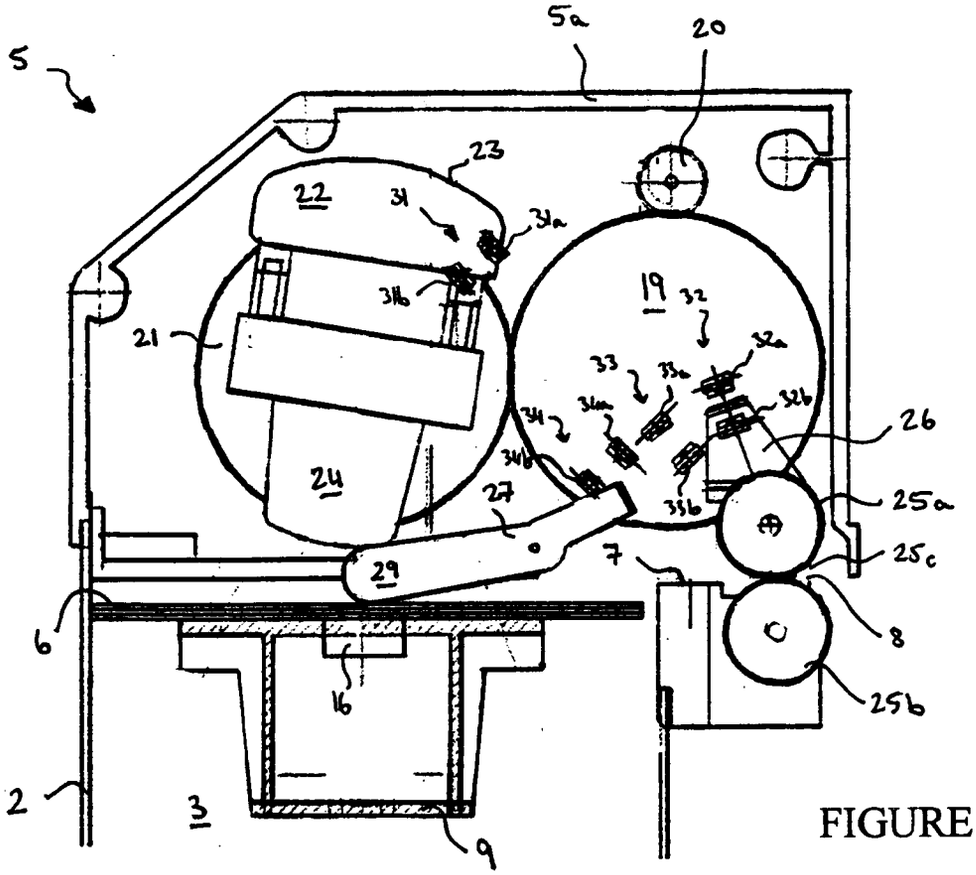

FIGURE 3.

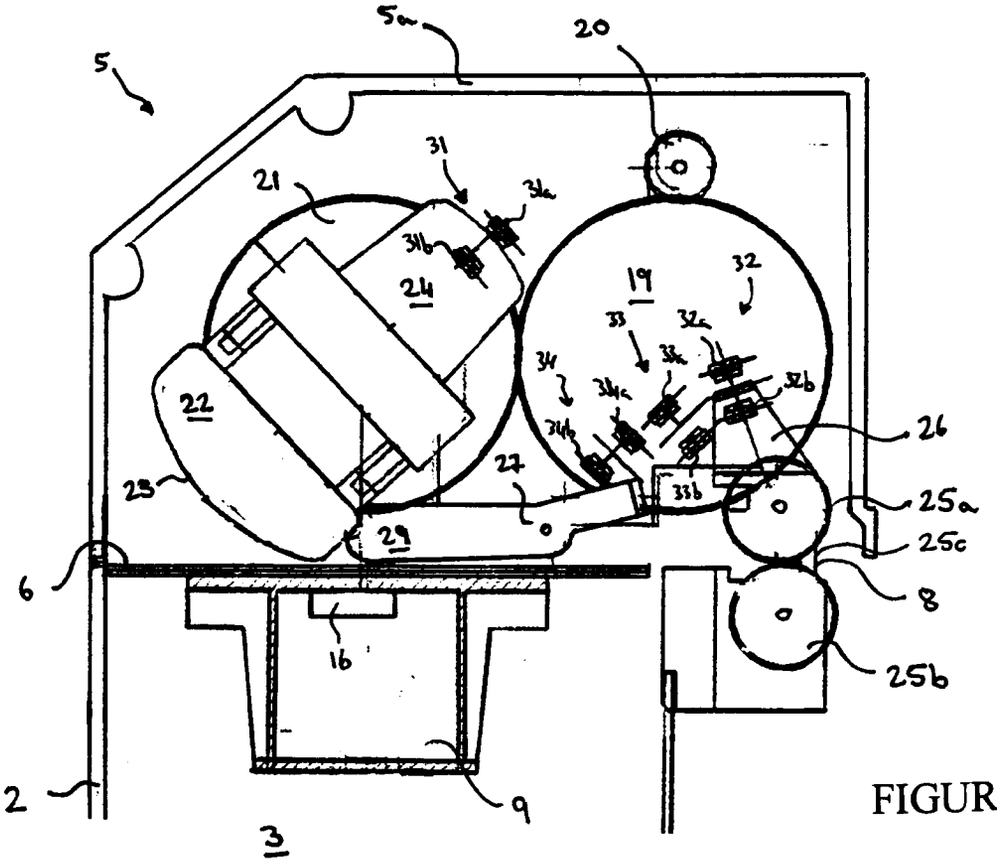

FIGURE 4.

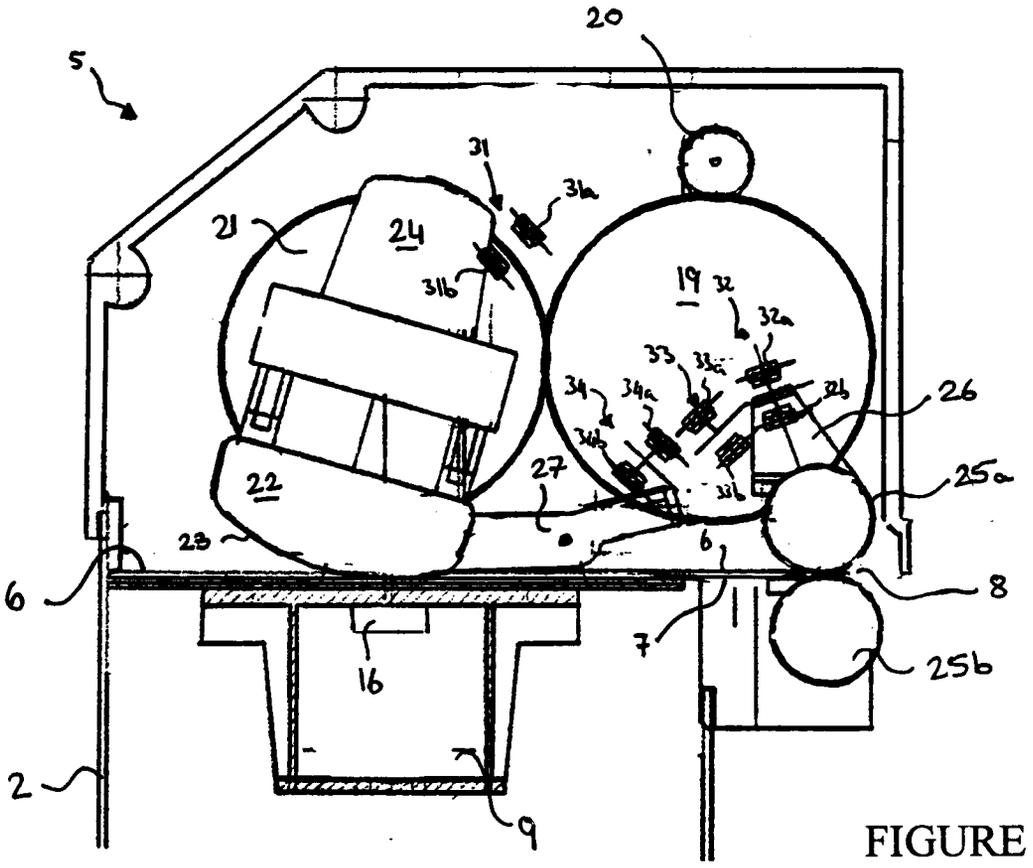

FIGURE 5.

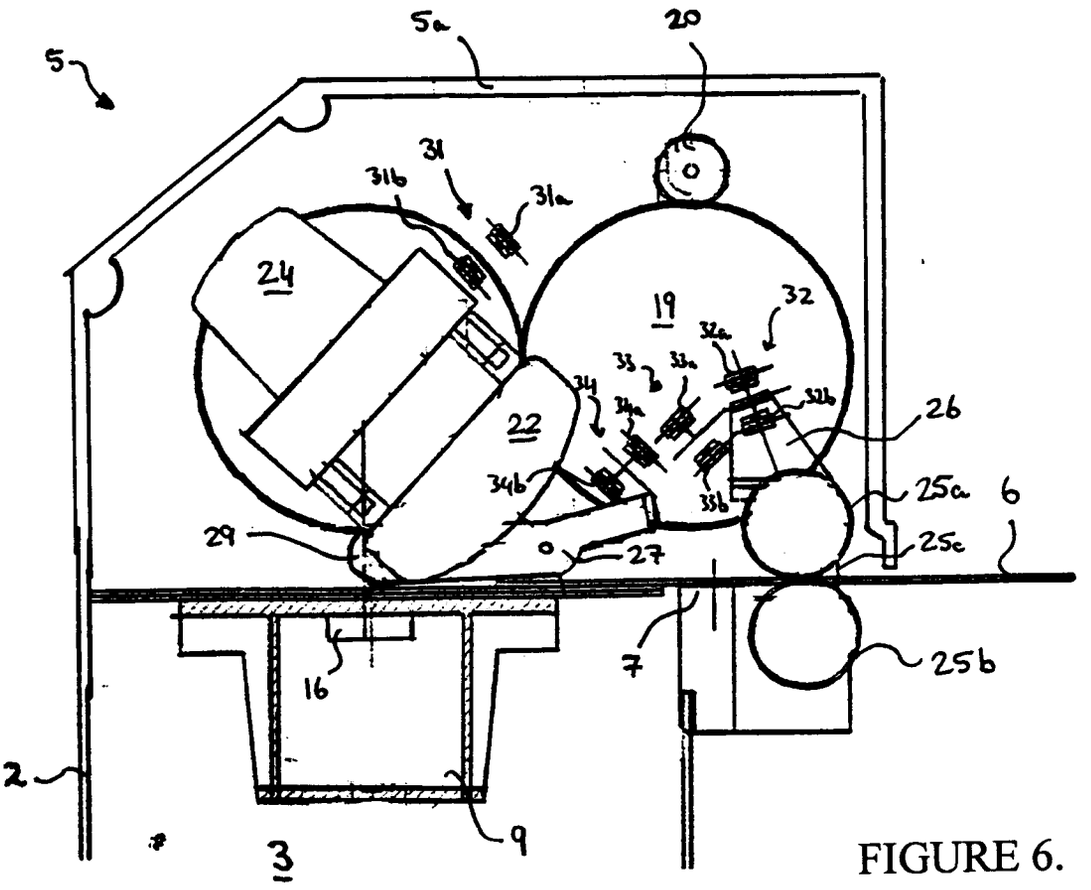

FIGURE 6.

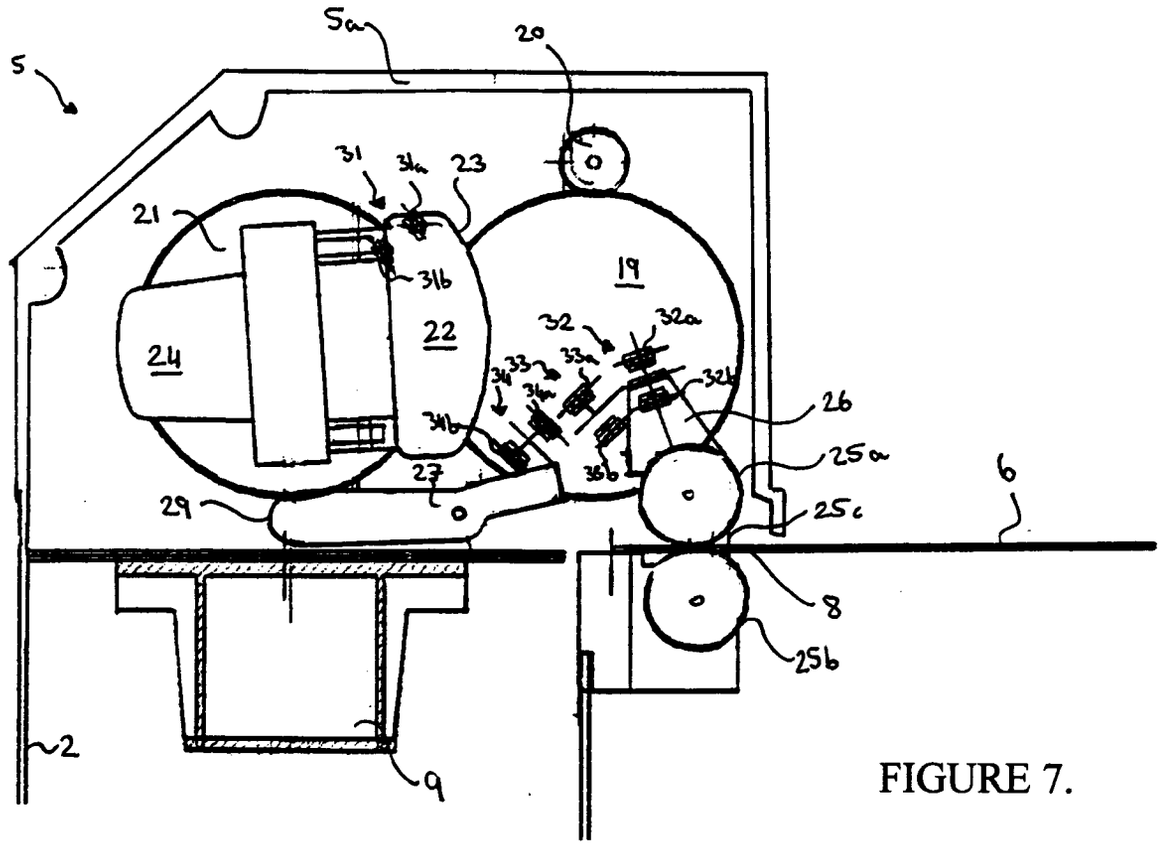

FIGURE 7.

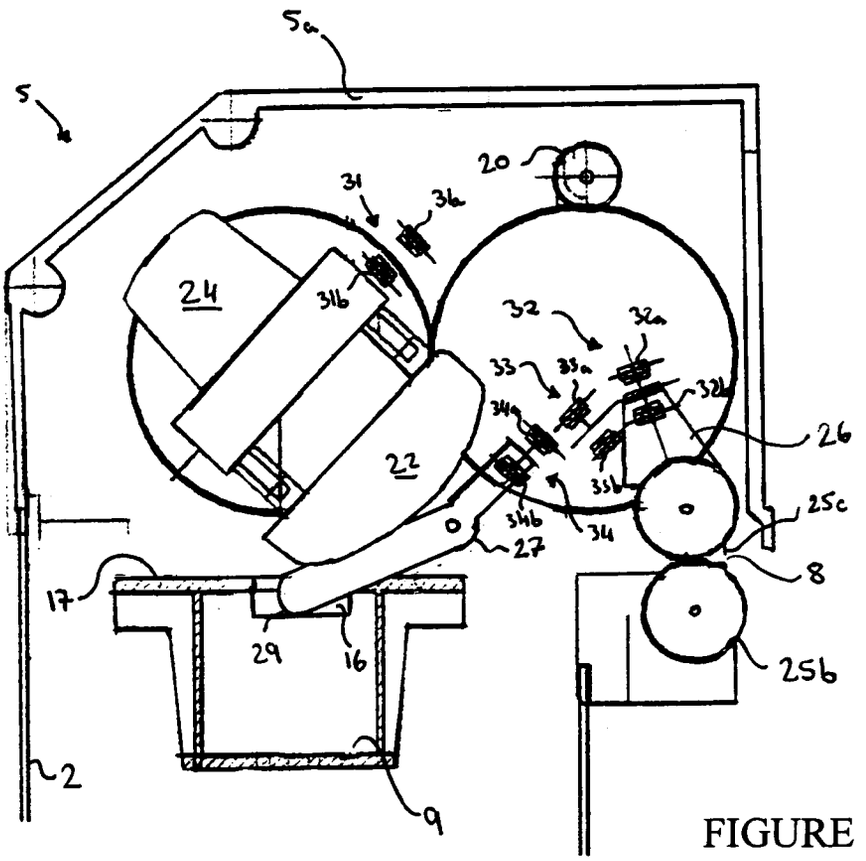

FIGURE 8.

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EUROPEAN SEARCH REPORT

Application Number
EP 97 30 7690

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)
X A	CH 675 863 A (DIETMAR HABLICH) * claim 1; figure 1 * ---	1-4 5-11	G07F11/14
A	DE 212 218 C (EFUBAG GMBH) 13 November 1907 * claim 1; figure 1 * ---	1-11	
A	DE 143 476 C (LEO SPIEGEL) 25 April 1902 * claim 1; figure 2 * ---	1-11	
A	EP 0 319 046 A (MARTINI ALEXANDRE) * claim 1; figure 3 * ---	1-11	
A	FR 2 672 275 A (MOREAU JACQUES) * claim 1; figure 1 * -----	1-11	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)
G07F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	5 March 1998	Kirsten, K

CATEGORY OF CITED DOCUMENTS

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