

June 13, 1961

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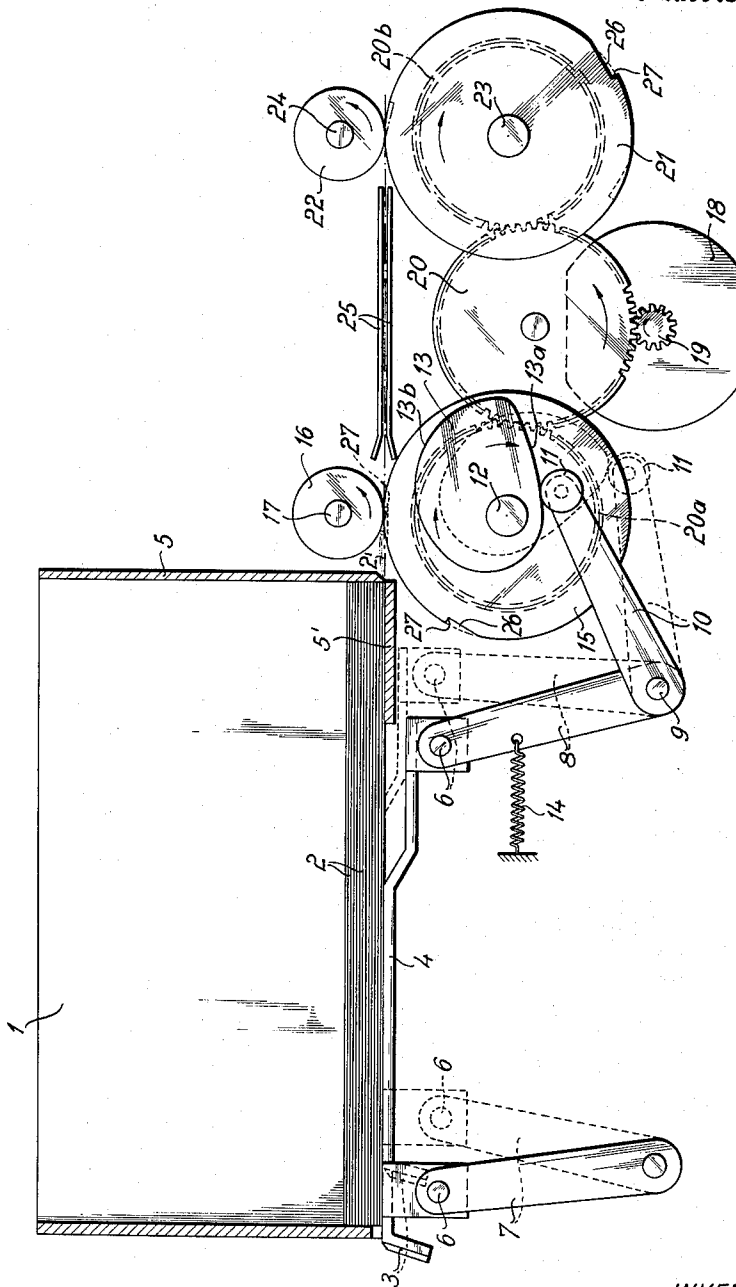
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TRANSPORTING APPARATUS FOR CARDS

Filed Sept. 8, 1958

3 Sheets-Sheet 1

FIG. 1



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3 Sheets-Sheet 2

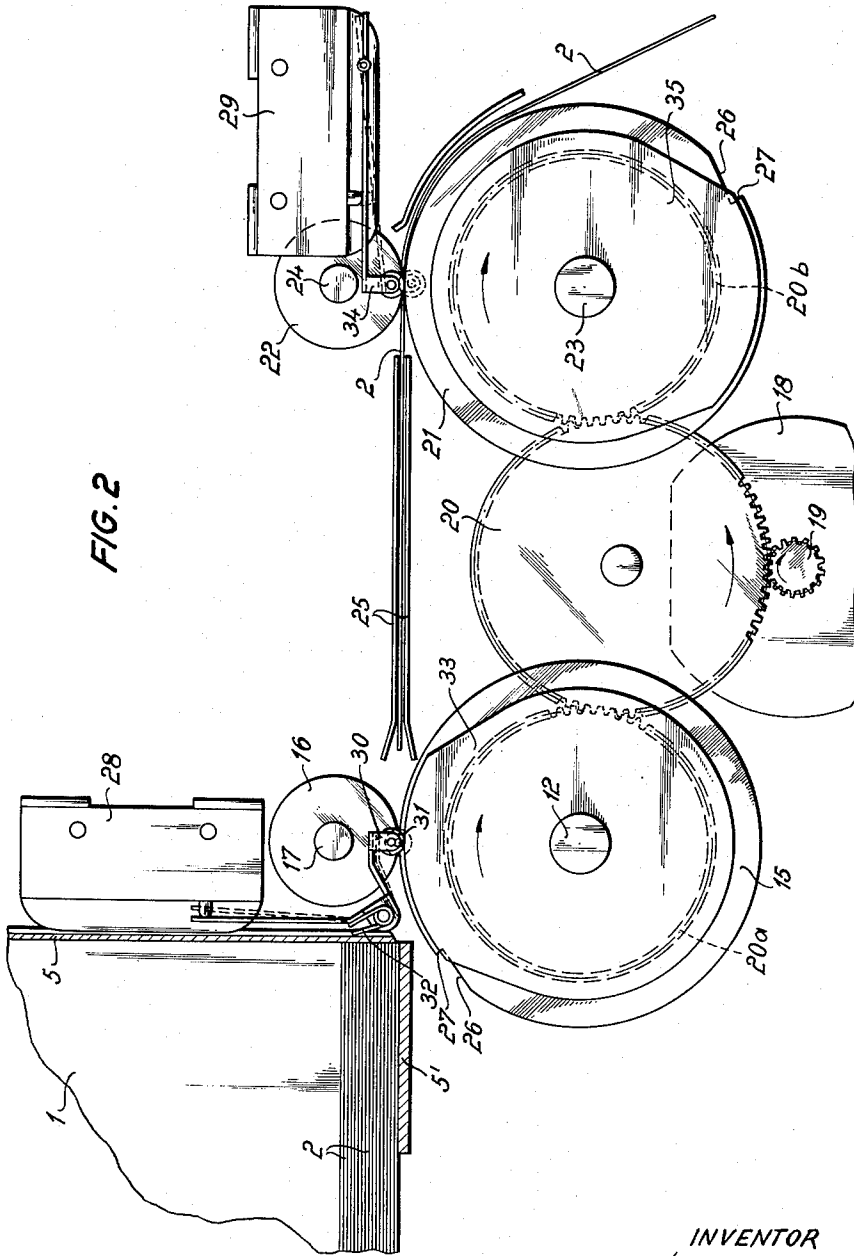


FIG. 2

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3 Sheets-Sheet 3

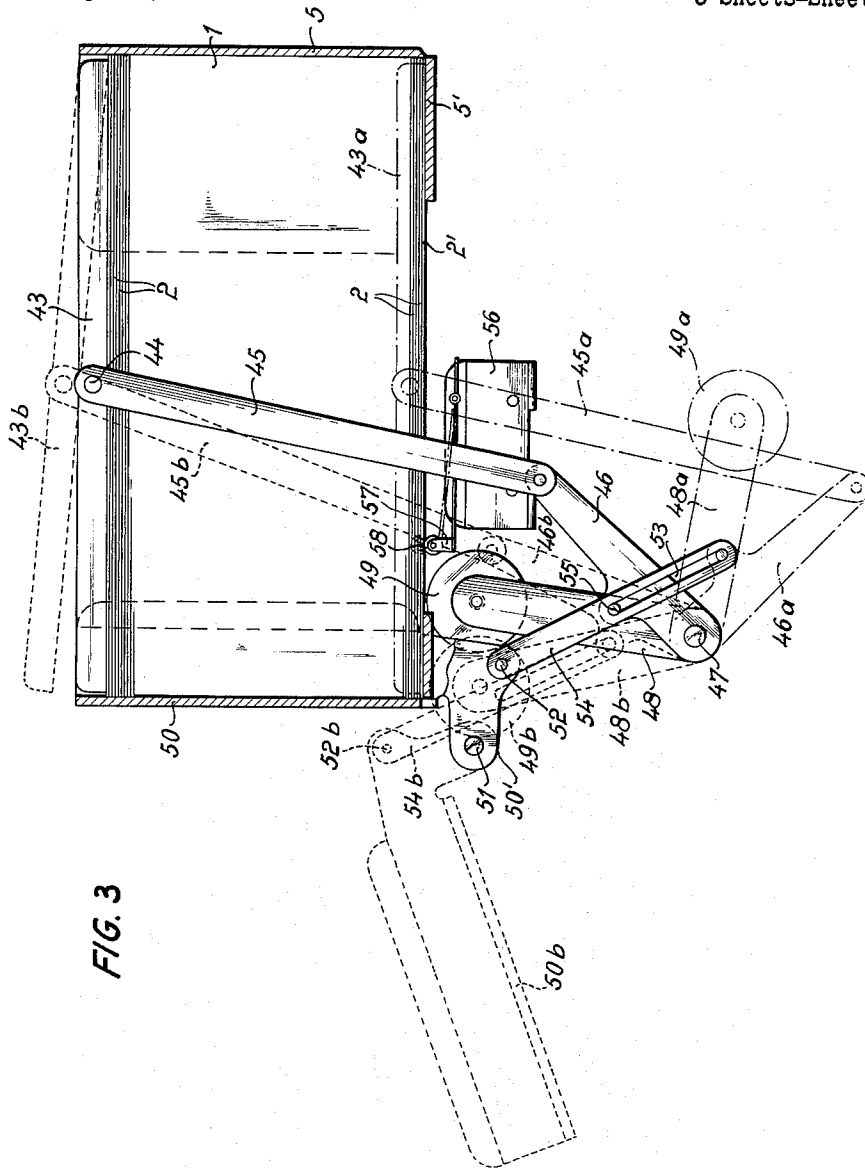


FIG. 3

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1

2,988,356

TRANSPORTING APPARATUS FOR CARDS

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16 Claims. (Cl. 271-4)

The present invention relates to a transporting apparatus for cards, and more particularly to an apparatus for transporting card blanks from a card magazine to a punching device where the cards are punched in a plurality of predetermined positions until they are finally deposited in a receiving container.

Apparatus of this type is known, but the devices of the prior art are incapable of exactly determining the position of each transported card so that slight inaccuracies in the positions of the punched holes occur which may cause improper operations in the machines which evaluate the punched cards. Slight differences between the positions of the individual cards relative to the punching means cannot be reliably avoided in the devices of the prior art.

It is one object of the present invention to overcome this disadvantage of the known apparatus of this type, and to provide a transporting apparatus which obtains delivery of each transported card to an exactly predetermined position which is the same for all transported cards. Another object of the present invention is to provide a transporting apparatus for delivering all transported cards in exactly the same relative position to a punching device.

The card magazines which are used in the devices of the prior art have the disadvantage that the lowermost card which is fed to the transporting rollers, is subjected to a different pressure depending on the number of cards in the stack contained in the magazine. When the stack of cards in the magazine is very high, the pressure on the lowermost cards may be so great that two cards are engaged and fed by the card knife instead of one.

It is another object of the present invention to overcome this disadvantage of the prior art and to provide means for maintaining the same pressure on the lowermost fed card regardless of the number of cards in the stack.

In the devices of the prior art, access to the card magazine for removal and insertion of a stack of cards is difficult.

It is another object of the present invention to provide a card magazine which is easily accessible for the removal and insertion of stacks of cards.

Another object of the present invention is to provide a magazine which is constructed in such a manner that a weight resting on a stack of cards is automatically raised when a lateral wall of the magazine is removed to permit access to the interior of the card magazine.

A further object of the present invention is to provide a transporting apparatus for cards which automatically stops if no card is transported by the transporting rollers.

A related object of the present invention is to prevent stopping of the transporting mechanism in the interval between two successively fed cards.

In order to obtain transport of the cards in an exactly predetermined position, the reciprocating feeding member which removes the lowermost card from the card magazine, moves at least at the same speed, and preferably at a greater speed, than the transporting rollers to which it feeds the cards. Preferably, at least one of the transporting rollers is provided with a recess into which the reciprocating feeding means feed each card so that each

2

card is gripped by the cooperating transporting rollers in an exactly predetermined position.

In order to subject the lowermost card in the magazine to a constant feeding pressure, in addition to the weight which rests on the stack of cards to advance the same, another weight is provided which moves with the first mentioned weight but is so supported that a gradually increasing component of its weight acts on the stack of cards. Consequently, as the number of cards is reduced so that a thinner stack rests on the fed lowermost card, the pressure of the two weights on the stack of cards increases correspondingly so that the lowermost card is always subjected to the same feeding pressure regardless of the height of the stack of cards above it.

Sensing means are preferably associated with the card magazine, and with the transporting rollers to determine the presence or absence of cards. The sensing means actuate an indicating means, or stop the drive motor of the transporting means when no cards can be transported by the apparatus.

In the interval between the successive feeding of two cards to the transporting rollers, a cam holds the sensing means in inoperative position to prevent unnecessary stopping of the motor drive.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

FIGURE 1 is a side view, partly in section, of a transporting apparatus according to the present invention;

FIGURE 2 is a side view, partly in section, illustrating on an enlarged scale a sensing device applied in the transporting apparatus of the present invention; and

FIGURE 3 is a fragmentary side view, partly in section, illustrating the construction of a card magazine used in the transporting apparatus of the present invention.

Referring now to the drawings, and more particularly to FIGURE 1, a card magazine 1 is provided for holding a stack of cards 2. The card magazine 1 is constructed as will be explained hereinafter in greater detail with reference to FIGURE 3, and the respective constructive elements are omitted in FIGURE 1 for the sake of clarity.

A reciprocating feeding means is provided for feeding the lowermost card of the stack to the transporting rollers 15, 16 and includes a reciprocable member 4 supporting a card knife 3 which is adjustably mounted on member 4, and can be adjusted to such a position that its edge engages only the lowermost card of the stack. A pair of rocking levers 7 and 8 is connected by pivot pins 6 to slide member 4. Lever 8 is fixedly connected to a shaft 9 which also carries fixed thereon a cam follower lever 10 with a roller 11. A spring 14 urges levers 7 and 8 and slide member 4 into the illustrated position in which roller 11 engages the steep portion 13a of a cam 13 fixedly secured to a shaft 12. Cam 13 has a less steep cam track portion 13b. Shaft 12 is driven through a transmission including gears 20a, 20 and 19 from an electric motor 18.

When motor 18 turns cam 13 in the direction of the arrow, the card knife 3 of the reciprocating feeding member 4 will engage the lowermost card, and move the same to the right through a thin slot formed between the bottom portion 5' of the magazine and the edge of a retaining knife 5 on the magazine. This movement is rapid since cam follower roller 11 moves along the steep cam portion 13a which is about 25% to 35% of the total circumference of cam 13. When roller 11 arrives at the

end of cam portion 13a, and passes to cam portion 13b, the feed card 2' already engages the transporting rollers 15, 16. Thereupon roller 11 moves along the cam track portion 13b resulting in a slower return movement of feeding means 3, 4.

Since transporting roller 15 is fixed on the same shaft 12 as cam 13, the peripheral speed of rollers 15 and thereby also of rollers 16, is synchronized with the speed of the feeding means 3, 4 and of the fed card. In accordance with the present invention, the length of levers 8 and 10, and the shape of cam 13 is determined in such a manner that a fed card 2' moves at least at the peripheral speed of the transporting roller 15, and preferably at a slightly greater speed.

A second pair of transporting rollers 21, 22 is arranged at the other end of a guide means 25 which guides the transported cards. Transporting roller 21 is fixed on a shaft 23 which is driven through transmission gears 19, 20 and 20b. The speed of transporting rollers 15, 16 is at least equal to the speed of transporting rollers 21, 22.

Cards transported through the guide means 25, are stopped at predetermined intervals, and are punched by a punching device, not shown.

The driven transporting rollers 15 and 21 are provided in the peripheral surfaces thereof with recesses 25. Each recess 26 has a gradually sloping surface, and a substantially radial shoulder 27 which faces the feeding means 3, 4 when the respective recess arrives in a position located opposite the other roller 16, or 22.

Since transporting rollers 15 and 21 are fully synchronized with the reciprocating feeding movement of feeding means 3, 4, the recesses 26 can be so arranged that a recess 26 is located in the path of each fed card 2'. Consequently each fed card is rapidly moved into the recess 26 until it abuts against the radial shoulder 27. If the feeding speed of the card is greater than the peripheral speed of the transporting rollers 15, 16, the fed card 2' slightly buckles when its leading edge abuts against shoulder 27 of the respective recess.

The recesses obtain the advantageous result that the fed card cannot hit against the peripheral surfaces of rollers 15 or 16 when the leading edge of the card is not exactly located in the tangential plane of the cooperating rollers 15, 16. If this occurs in the constructions of the known art, the card is slightly delayed, before it is gripped by the transporting rollers, and consequently is also delayed when arriving in punching position so that its punching position is not exactly determined.

In the above described arrangement of the present invention, each fed card moves into a recess 26, and is engaged by the transporting rollers 15, 16 in a clamping grip between the trailing edge of recess 26, and the peripheral surface of transporting roller 16. This position is illustrated for the pair of transporting rollers 21, 22.

Since the pair of transporting rollers 21, 22 and the pair of transporting rollers 15, 16 are both driven from the same motor 18, the peripheral speed of the pair of transporting rollers 15 and 16 can be made at least equal to the peripheral speed of the transporting rollers 21, 22 so that the recess 26 in transporting roller 21 operates in the same manner as the recess 26 in the transporting roller 15, assuring that all successively fed cards are in exactly the same position during the punching operation. Consequently all punched holes will appear in exactly the same place on each card relative to the leading edge of the same.

It will be noted that the advanced feeding position of the reciprocating feeding means 3, 4, 7, 8, 10, and the corresponding position of cam 13, are shown in FIGURE 1 in broken lines.

The above described feeding and transporting arrangement for cards would not operate properly if more than one card would be fed by the feeding means. This may

occur if a very high stack of cards 2 is contained in the magazine so that the pressure on the lowermost cards is so great that two cards are pressed into a position opposite card knife 3. On the other hand, if the weight 43, which rests on top of the stack of cards 2, would be made very small, sometimes no card may be pressed into a position opposite card knife 3.

In accordance with the present invention a constant pressure is maintained on the lowermost card, so that only a single card is engaged by the card knife 3 regardless of the number of cards in the stack of cards.

As explained above, a first weight 43 rests on top of the stack of cards and presses the lowermost card against the bottom portion 5' and against the slide member 4 of the feeding means. Weight means 43 is pivotally connected by pivot means 44 to one end of at least one lever 45 whose other end is articulated to a second lever 46. Lever 46 is fixed to a shaft 47, so that levers 45, 46 constitute a toggle lever means.

When weight means 43 moves from the higher position illustrated in solid lines to a lower position 43a illustrated in dash and dot lines, the toggle lever means assume the position 45a, 46a. However, when the toggle lever means are straightened to assume the position 45b, 46b, weight 43 will be raised to the position 43b in which it releases even a full stack of cards 2. Shaft 47 to which toggle lever 46 is fixed, carries another fixed lever 48 for turning movement therewith. At the end of lever 48, a second weight 49 is mounted.

It will be noted that in the illustrated position in which weight 43 rests on top of a full stack, lever 48 is in an almost vertical position. Consequently the major part of the weight of weight means 48, 49 is supported on shaft 47, and only a small component of the weight will act on shaft 47 in clockwise direction as viewed in FIGURE 3. This small turning movement tends to turn shaft 47, and thereby lever 46 in clockwise direction into the position 46a. Consequently this small component of the weight means 48, 49 is added to the pressure exerted by weight 43 on the stack of cards.

As the cards are successively fed, the height of the stack is reduced, and the weight 43 will move to a lower position. Lever 46 will turn in clockwise direction toward position 46a, and will effect turning of shaft 47 and weight means 48, 49 toward the position 48a, 49a. During such movement, a gradually increasing component of weight means 48, 49 will act on shaft 47 so that the turning moment on the shaft increases as weight 43 moves down, and a gradually increasing force is added to the weight of weight means 43, 45.

It is evident that weight 49, and the positions of lever 48 during movement of weight 43, can be so designed that the gradually increasing force added to the weight 43, will compensate for the reduction of the weight of the stack of cards to above the lowermost card 2'.

In other words, the feeding pressure exerted on the lowermost card which is determined by the weight means 43, 45, by the weight component of weight means 48, 49 and by the weight of the cards above the lowermost card, will remain substantially constant regardless of the height of the stack, since the increasing weight component of weight means 48, 49 will compensate the loss of pressure on the lowermost card due to the reduced number of cards above the same.

As shown in FIGURE 3, weight means 48, 49 will assume a position 48b, 49b when the toggle lever means move to the position 45b, 46b. In this position 49b, the weight 49 tends to turn the shaft 47 in counterclockwise direction, and will consequently hold the toggle lever means in the position 45b, 46b.

Magazine 1 has a lateral wall 50 which is movable to the position 50b in which one side of the magazine is open for access to the interior thereof. Lateral wall 50 has the bracket 50' transversely projecting therefrom which is turnably mounted on a shaft 51. A linking

5

lever 54 is connected by pivot means 52 to bracket 50', and has a slot 53 slidably guiding a pin 55 secured to lever 46. It will be noted that pin 55 is located at one end of slots 53 in position 46, and at the other end of slot 43 in position 46a. Consequently, as long as wall portion 50 is in a closed position illustrated in solid lines, the movement of the toggle lever means 46, 45 is not influenced.

When the lateral wall 50, or a corresponding closure means, is moved from the position 50 to the position 50b, pin 52 will move to position 52b and displace link lever 54 to position 54b.

If the toggle lever means are in the position 45, 46, lever 54 will be moved relative to pin 55 until the same arrives at the other end of slot 53. From there on further movement of lever 54 to position 54b will turn the toggle lever means to position 45b, 46b resulting in raising of weight means 43 to position 43b. Thereby, weight means 43 is raised to its highest position, while the lateral wall 50 is in the completely opened position 50b. It is evident that in this position of the elements, access to the interior of the magazine 1 is easily possible for the purpose of removing or inserting the stacks of cards.

In the event that no cards are contained in the card magazine, so that the toggle lever means are in the position 45a, 46a, the pin 55 is located in the other end of the slot, and movement of linking lever 54 to position 54b will immediately effect raising of the toggle lever means from position 45a, 46a first to position 45, 46, and then to position 45b, 46b. Consequently opening of the wall portion 50 will result in raising weight means 43 from the position 43a to the position 43b when it is desired to insert a new stack of cards into the magazine.

As explained above the weight means 48, 49 is in the position 48b, 49b when the closure 50 is open, so that weight 49b tends to hold the closure in position 50b, and the weight means in position 43b during insertion and removal of cards.

As shown in FIGURE 3, a switch 56 is arranged below magazine 1, and is controlled and actuated by a sensing means including a lever arm 57 with a roll 58. Sensing means 57, 58 tends to move to an operative position in which roll 58 projects into the magazine 1. Normally, a stack of cards will hold sensing means 57, 58 in inoperative position, but when all cards have been fed, the sensing means will move to its operative position, and either effect operation of an acoustic or optical indicating means by switch 56, or otherwise switch 56 is connected into the circuit of motor 18, see FIGURE 1, to stop the operation of the transporting means.

Referring now to FIGURE 2, a switch 28 is associated with the transporting rollers 15, 16, and a switch 29 is associated with transporting rollers 21, 22. Each of the switches is connected in the circuit of motor 18, and interrupts the circuit for stopping the motor when the respective switch is actuated.

Switch 28 is operated by a sensing means 30 having a roller 31 which rests on a card transported by roller means 15, 16. Sensing means 30 is turnable and is urged by a spring 32 to move to an operative position in which switch 28 is actuated. As long as there is a card between transporting rollers 15 and 16, sensing means 30 cannot move to operative position, and is ineffective. When there is no card fed to the transporting rollers, sensing means 30 will move to its operative position so that switch 28 is actuated to disconnect motor 18.

Switch 29 is associated with a corresponding sensing means 34 which will move to an operative position for disconnecting motor 18, when there is no card between the transporting rollers 21 and 22.

During the feeding of two successive cards, there is a short interval during which no card is transported by the rollers 15, 16 or rollers 21, 22. It is not desirable that the motor is disconnected during such short interval, and in accordance with the present invention a cam means

6

33 is fixed on shaft 12, and a cam means 35 is fixed on shaft 23 for turning movement with transporting rollers 15 and 21, respectively.

Each cam 33, 35 has a comparatively short cam lug, and is driven in synchronism with the operation of the feeding means and of the transporting rollers so that the cam lugs are respectively located underneath the sensing means 30, and 34, when there is an interval between successively fed cards. Cams 33 and 35 hold sensing means 30 and 34 in inoperative positions while the transporting rollers are located intermediate two successively fed cards, so that switches 28 and 29 are unactuated and the motor 18 continues to drive the apparatus.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of transporting arrangements for cards differing from the types described above.

While the invention has been illustrated and described as embodied in a transporting arrangement for transporting cards to exactly predetermined positions and including means for maintaining a constant feeding pressure on the cards, and for indicating an interruption of the card supply, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be secured by Letters Patent is:

1. Transporting apparatus for transporting cards to an exactly predetermined position, comprising, in combination, at least one pair of cooperating transporting roller means for engaging cards with the peripheral surfaces thereof and for transporting the same to said predetermined position, at least one said roller means having in the peripheral surface thereof at least one recess, said peripheral surfaces being spaced from each other when said recess is located opposite the peripheral surface of the other transporting roller so that a card in said recess is not gripped by said peripheral surfaces, said recess having a substantially radial shoulder facing in a direction opposite to the direction of movement of said reciprocable feeding means during the feeding stroke of the same; reciprocable feeding means for successively engaging the cards of a stack of cards and for feeding said cards successively to said transporting roller means; and synchronized drive means connected to and driving said feeding means and said transporting roller means for moving said feeding means in a feeding stroke toward said transporting rollers and in a return stroke away from the same, said drive means moving during said feeding stroke said feeding means and thereby a card engaged by the same at a speed slightly higher than the peripheral speed of said transporting roller means, and in such timed relationship with the turning movement of said transporting roller means that said recess is located opposite the other transporting roller, and in the path of movement of each card fed by said feeding means to said roller means so that each card passes into said recess and abuts against said shoulder while transported only by said feeding means before being engaged and gripped between the trailing edge of said recess and the peripheral surface of the other of said roller means in a clamping grip and transported by said roller means whereby the position of each transported card is exactly determined.

2. Transporting apparatus for transporting cards to an exactly predetermined position under a punching device, comprising, in combination, at least one pair of cooper-

ating transporting roller means for engaging cards with the peripheral surfaces thereof and for transporting the same to said predetermined position, at least one of said transporting roller means having in the peripheral surface thereof at least one recess, said peripheral surfaces being spaced from each other when said recess is located opposite the peripheral surface of the other transporting roller so that a card in said recess is not gripped by said peripheral surfaces; reciprocable feeding means for successively engaging the cards of a stack of cards and for feeding said cards successively to said transporting roller means, said feeding means including a cam follower lever; and synchronized drive means including a drive motor, a shaft driven from said motor, and transmission means connecting said shaft with at least one of said transporting roller means, said drive means further including a cam means fixed to said shaft and having a cam track engaged by said cam follower lever, said cam track having a steeper portion for moving said feeding means in a rapid feeding stroke toward said transporting rollers, and a less steep portion for moving said feeding means in a slower return stroke away from said roller means, said drive means moving during said feeding stroke said feeding means and thereby a card engaged by the same at a speed slightly higher than the peripheral speed of said transporting roller means, and in such timed relationship with the turning movement of said transporting roller means that said recess is located opposite the other transporting roller, and in the path of movement of each card fed by said feeding means to said roller means so that each card passes into said recess and abuts on a wall portion of the same while transported only by said feeding means before being gripped and transported by said peripheral surfaces behind said recess whereby the position of each card transported by said roller means is exactly determined.

3. In a device of the type described, in combination, a card magazine for holding a stack of cards; feeding means including a member for engaging the lowermost card of the stack and for removing the same from the stack; first weight means movably mounted in said magazine for resting on a stack of cards therein so as to urge the lowermost card of the stack into a position for engagement by said member, said first weight means moving from a higher position to a lower position as the number of cards in the stack is reduced by said feeding means; and a second weight means operatively connected to said first weight means for movement with the same and being arranged in such a manner as to exert an increasing downwardly directed force on said first weight means as said first weight means moves from said higher position to said lower position, said force of said second weight means increasing in such a manner that a substantially uniform pressure is exerted on the lowermost card by said first weight means, said second weight means and the cards above said lowermost card, regardless of the number of cards above said lowermost card.

4. In a device of the type described, in combination, a card magazine for holding a stack of cards; feeding means including a member for engaging the lowermost card of the stack and for removing the same from the stack; a shaft; first weight means including lever means fixedly connected to said shaft and a first weight attached to said lever means and movably mounted in said magazine for resting on a stack of cards therein so as to urge the lowermost card of the stack into a position for engagement by said member, said first weight moving from a higher position to a lower position as the number of cards in the stack is reduced by said feeding means; and second weight means fixedly connected to said shaft for turning movement with the same and having a center of gravity spaced from the axis of said shaft, an increasing weight component of said second weight means acting on said shaft and thereby on said first weight means as said first weight moves from said higher position to said lower position, said weight component increasing in such

a manner that a substantially uniform pressure is exerted on the lowermost card by said first weight means, said second weight means and the cards above said lowermost card, regardless of the number of cards above said lowermost card.

5. In a device of the type described, in combination, transporting roller means for engaging cards with the periphery thereof for transporting the same; a card magazine for holding a stack of cards; feeding means including a member for engaging the lowermost card of a stack and for feeding the same to said transporting roller means so that said cards are successively fed to said transporting roller means; synchronized drive means connected to said transporting roller means and to said feeding means for moving said feeding means and the lowermost card engaged by the same at a feeding speed at least equal to the peripheral speed of said transporting roller means; weight means movably mounted in said magazine for resting on a stack of cards therein so as to urge the lowermost card of the stack into a position for engagement by said member, said weight means moving from a higher position to a lower position as the number of cards in the stack is reduced by said feeding means; and compensating means operatively connected to said weight means for exerting an increasing pressure on said cards as said weight means moves from said higher position to said lower position, said pressure being increased in such a manner that a substantially uniform pressure is exerted on said lowermost card by said weight means, said compensating means, and the cards above said lowermost card regardless of the number of cards above said lowermost card.

6. In a device of the type described, in combination, transporting roller means for engaging cards with the periphery thereof for transporting the same; a card magazine for holding a stack of cards; feeding means including a member for engaging the lowermost card of a stack and for feeding the same to said transporting roller means so that said cards are successively fed to said transporting roller means; synchronized drive means connected to said transporting roller means and to said feeding means for moving said feeding means and the lowermost card engaged by the same at a feeding speed at least equal to the peripheral speed of said transporting roller means; first weight means movably mounted in said magazine for resting on a stack of cards therein so as to urge the lowermost card of the stack into a position for engagement by said member, said first weight means moving from a higher position to a lower position as the number of cards in the stack is reduced by said feeding means; and second weight means operatively connected to said first weight means for movement with the same and being arranged in such a manner as to exert an increasing downwardly directed force on said first weight means as said first weight means moves from said higher position to said lower position, said force of said second weight means increasing in such a manner that a substantially uniform pressure is exerted on the lowermost card by said first weight means, said second weight means and the cards above said lowermost card, regardless of the number of cards above said lowermost card.

7. In a device of the type described, in combination, a card magazine for holding a stack of cards, said card magazine including a lateral wall movable from a normal position to an opened position permitting lateral access to the interior of said magazine for removal and insertion of cards; feeding means including a member for engaging the lowermost card of the stack and for removing the same from the stack while said lateral wall is in said normal position; weight means movably mounted in said magazine for resting on a stack of cards, said weight means moving from a higher position to a lower position as the number of cards in the stack is reduced by said feeding means; and linkage means connecting said lateral wall with said weight means for moving said weight means to a raised position above said higher posi-

tion releasing said stack of cards when said lateral wall is moved to said opened position, said weight means and said lateral wall tending to remain in the position in which said lateral wall is open and said stack of cards is released by said weight means whereby access to the interior of said magazine and removal and insertion of stacks of cards are facilitated.

8. In a device of the type described in combination, a card magazine for holding a stack of cards, said card magazine including a lateral wall movable from a normal position to an opened position permitting lateral access to the interior of said magazine for removal and insertion of cards; feeding means including a member for engaging the lowermost card of the stack and for removing the same from the stack while said lateral wall is in said normal position; weight means movably mounted in said magazine for resting on a stack of cards, said weight means moving from a higher position to a lower position as the number of cards in the stack is reduced by said feeding means; linkage means connecting said lateral wall with said weight means for moving said weight means to a raised position above said higher position releasing said stack of cards when said lateral wall is moved to said opened position whereby access to the interior of said magazine and removal and insertion of stacks of cards are facilitated; transporting roller means for engaging cards removed by said feeding means from the stack, and for transporting the cards; and synchronized drive means connected to said transporting roller means and to said feeding means for moving said feeding means and thereby a card engaged by the same at a speed at least equal to the peripheral speed of said transporting roller means.

9. In a device of the type described, in combination, a card magazine for holding a stack of cards, said card magazine including a lateral wall movable from a normal position to an opened position permitting lateral access to the interior of said magazine for removal and insertion of cards; feeding means including a member for engaging the lowermost card of the stack and for removing the same from the stack while said lateral wall is in said normal position; a shaft; first weight means including a pair of toggle levers and a first weight attached to one of said toggle levers, the other of said toggle levers being fixedly connected to said shaft, said first weight being movably mounted in said magazine for resting on a stack of cards therein and moving from a higher position to a lower position as the number of cards in the stack is reduced by said feeding means; second weight means fixedly connected to said shaft for turning movement therewith, an increasing weight component of said second weight means acting on said shaft and thereby on said first weight means as first weight moves from said higher position to said lower position, whereby a substantially uniform pressure is exerted on the lowermost card regardless of the number of cards above said lowermost card; and a linkage means connecting said lateral wall with said toggle lever means for moving said toggle lever means to a straightened position when said lateral wall is moved to said opened position whereby said first weight is raised to a raised position above said higher position and access to the interior of said magazine and removal and insertion of stacks of cards are facilitated.

10. An apparatus as set forth in claim 9 and wherein said shaft turns said second weight means when said toggle lever means moves to said straightened position so that said second weight means assumes a position in which a weight component thereof tends to hold said first weight means in said raised position.

11. In a device of the type described, in combination, a card magazine for holding a stack of cards; feeding means including a member for engaging the lowermost card of the stack and for removing the same from the stack; weight means movably mounted in said magazine

for resting on a stack of cards therein so as to urge the lowermost card of the stack into a position for engagement by said member, said weight means moving from a higher position to a lower position as the number of cards in the stack is reduced by said feeding means; compensating means operatively connected to said weight means for exerting an increasing pressure on said cards as said weight means moves from said higher position to said lower position, said pressure being increased in such a manner that a substantially uniform pressure is exerted on said lowermost card by said weight means, said compensating means, and the cards above said lowermost card regardless of the number of cards above said lowermost card; a sensing means located below said card magazine movable between an inoperative position located outside of said magazine and an operative position projecting from below into said magazine, and tending to assume said operative position, said sensing means being held in said inoperative position by the lowermost card of the stack so that said sensing means moves to said operative position when no card is located in said magazine, said sensing means being adapted to be connected with an indicating means for actuating the same when said sensing means moves to said operative position.

12. In a device of the type described, in combination, a card magazine for holding a stack of cards; feeding means including a member for engaging the lowermost card of the stack and for removing the same from the stack; a motor for driving said feeding means; weight means movably mounted in said magazine for resting on a stack of cards therein so as to urge the lowermost card of the stack into a position for engagement by said member, said weight means moving from a higher position to a lower position as the number of cards in the stack is reduced by said feeding means; compensating means operatively connected to said weight means for exerting an increasing pressure on said cards as said weight means moves from said higher position to said lower position, said pressure being increased in such a manner that a substantially uniform pressure is exerted on said lowermost card by said weight means, said compensating means, and the cards above said lowermost card regardless of the number of cards above said lowermost card; a sensing means located below said card magazine movable between an inoperative position located outside of said magazine and an operative position projecting from below into said magazine, and tending to assume said operative position, said sensing means being held in said inoperative position by the lowermost card of the stack so that said sensing means moves to said operative position when no card is located in said magazine; switch means connected into the circuit of said motor and being controlled by said sensing means for disconnecting said motor when said sensing means moves to said operative position.

13. A transporting apparatus for cards, comprising, in combination, a pair of transporting rollers having cooperating peripheral surfaces for gripping and transporting cards, at least one of said transporting rollers having in the peripheral surface thereof a recessed surface portion, said peripheral surfaces being spaced from each other when said recessed surface portion is located opposite the peripheral surface of the other transporting roller so that a card is not gripped by said recessed surface portion and said peripheral surface of the other transporting roller; feeding means for successively feeding cards to said pair of transporting rollers; and drive means connected to and driving at least said one of said transporting rollers and said feeding means, said drive means moving said feeding means and thereby a card engaged and fed by the same at a feeding speed slightly higher than the speed of said peripheral surfaces of said transporting rollers and in such timed relationship with the turning movement of said transporting rollers that said recessed surface portion is located opposite the peripheral

surface of the other transporting roller and in the path of movement of each card fed by said feeding means so that each fed card passes between said recessed surface portion and the peripheral surface of said other transporting roller and abuts with its leading edge on said recessed surface portion while being transported only by said feeding means before the card is engaged and gripped between said peripheral surfaces behind the trailing end of said recessed surface portion and further transported by said transporting rollers whereby the position of each transported card is exactly determined.

14. A transporting apparatus for cards, comprising in combination, a pair of transporting rollers having cooperating peripheral surfaces for gripping and transporting cards, at least one of said transporting rollers having in the peripheral surface thereof a recessed surface portion having a substantially radial shoulder leading in the direction of rotation of said one transporting roller and a trailing sloping portion, said peripheral surfaces being spaced from each other when said recessed surface portion is located opposite the peripheral surface of the other transporting roller so that a card is not gripped by said recessed surface portion and said peripheral surface of the other transporting roller; feeding means for successively feeding cards to said pair of transporting rollers; and drive means connected to and driving at least said one of said transporting rollers and said feeding means, said drive means moving said feeding means and thereby a card engaged and fed by the same at a feeding speed slightly higher than the speed of said peripheral surfaces of said transporting rollers and in such timed relationship with the turning movement of said transporting rollers that said recessed surface portion is located opposite the peripheral surface of the other transporting roller and in the path of movement of each card fed by said feeding means so that each fed card passes between said recessed surface portion and the peripheral surface of said other transporting roller and abuts with its leading edge on said radial shoulder so as to buckle slightly while being transported only by said feeding means before the card is engaged and gripped between said peripheral surfaces behind the trailing sloping portion of said recessed surface portion and further transported by said transporting rollers whereby the position of each transported card is exactly determined.

15. A transporting apparatus for cards, comprising, in combination, a pair of transporting rollers having cooperating peripheral surfaces for gripping and transporting cards, at least one of said transporting rollers having in the peripheral surface thereof a recessed surface portion having a substantially radial shoulder leading in the direction of rotation of said one transporting roller and a trailing sloping portion, said peripheral surfaces being spaced from each other when said recessed surface portion is located opposite the peripheral surface of the other transporting roller so that a card is not gripped by said recessed surface portion and said peripheral surface of the other transporting roller; reciprocable feeding means for successively feeding cards to said pair of transporting rollers in a feeding stroke; and drive means connected to and driving at least said one of said transporting rollers and said feeding means, said drive means moving said feeding means at a higher speed during the feeding stroke than during the return stroke of said reciprocating feeding means so that a card fed by the same moves at a feeding speed slightly higher than the speed of said peripheral surfaces of said transporting rollers and in such timed relationship with the turning movement of said transporting rollers that said recessed surface portion is located opposite the peripheral surface of the other transporting roller and in the path of movement

of each card fed by said feeding means so that each fed card passes between said recessed surface portion and the peripheral surface of said other transporting roller and abuts with its leading edge on said radial shoulder so as to buckle slightly while being transported only by said feeding means before the card is engaged and gripped between said peripheral surfaces behind the trailing sloping portion of said recessed surface portion and further transported by said transporting rollers whereby the position of each transported card is exactly determined.

16. A transporting apparatus for cards, comprising, in combination, a pair of transporting rollers having cooperating peripheral surfaces for gripping and transporting cards, at least one of said transporting rollers having in the peripheral surface thereof a recessed surface portion having a substantially radial shoulder leading in the direction of rotation of said one transporting roller and a trailing sloping portion, said peripheral surfaces being spaced from each other when said recessed surface portion is located opposite the peripheral surface of the other transporting roller so that a card is not gripped by said recessed surface portion and said peripheral surface of the other transporting roller; reciprocable feeding means for successively feeding cards to said pair of transporting rollers in a feeding stroke; and drive means connected to and driving at least said one of said transporting rollers and said feeding means, said drive means including rotary cam means connected to said one transporting roller for rotation therewith, and operatively connected to said reciprocable feeding means for moving said feeding means at a higher speed during the feeding stroke than during the return stroke of said reciprocating feeding means so that a card fed by the same moves at a feeding speed slightly higher than the speed of said peripheral surfaces of said transporting rollers and in such timed relationship with the turning movement of said transporting rollers that said recessed surface portion is located opposite the peripheral surface of the other transporting roller and in the path of movement of each card fed by said feeding means so that each fed card passes between said recessed surface portion and the peripheral surface of said other transporting roller and abuts with its leading edge on said radial shoulder so as to buckle slightly while being transported only by said feeding means before the card is engaged and gripped between said peripheral surfaces behind the trailing sloping portion of said recessed surface portion and further transported by said transporting rollers whereby the position of each transported card is exactly determined.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 2,988,356

June 13, 1961

Lorenz Maier

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

In the grant, lines 2 and 12, and in the heading to the printed specification, line 4, for "Firma Kienzie Apparate G.m.b.H.", each occurrence, read -- Firma Kienzle Apparate G.m.b.H. --.

Signed and sealed this 27th day of February 1962.

(SEAL)

Attest:

ERNEST W. SWIDER

Attesting Officer

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Commissioner of Patents