April 16, 1968 C. J. DONABIN 3,378,251

CARD FEEDING DEVICE

Filed May 31, 1966 4 Sheets-Sheet 1

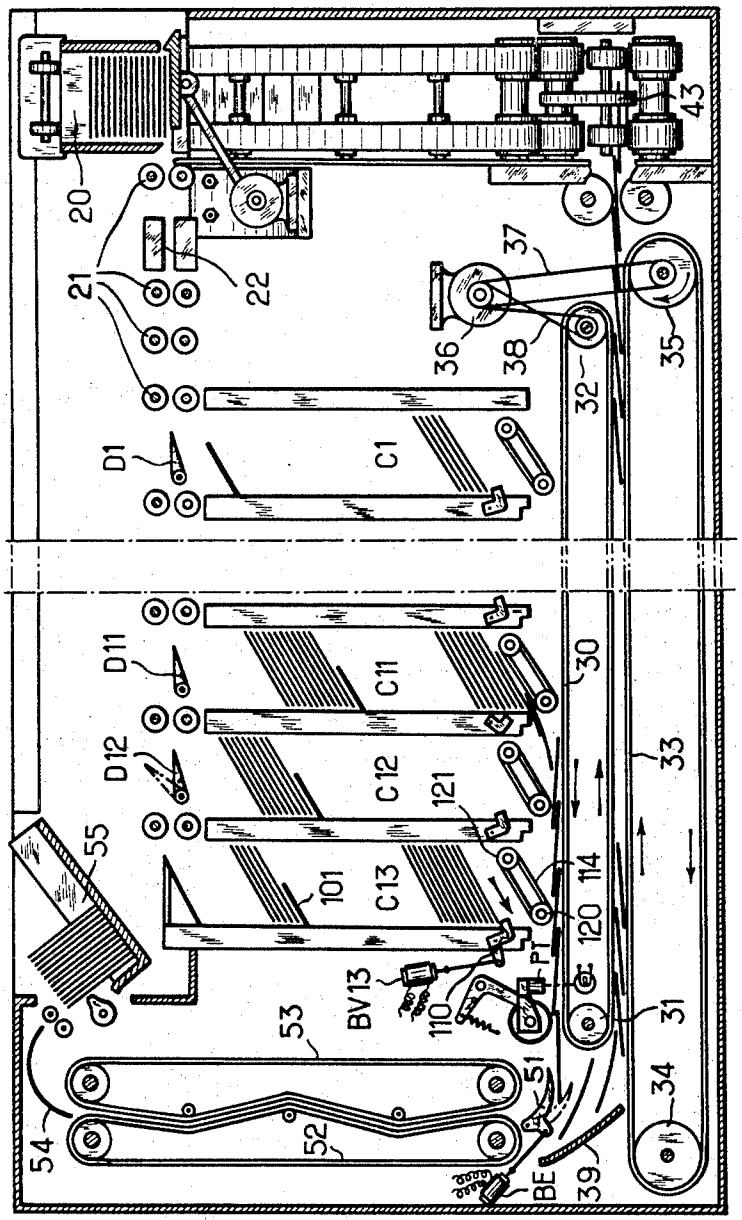


FIG. 1

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CARD FEEDING DEVICE

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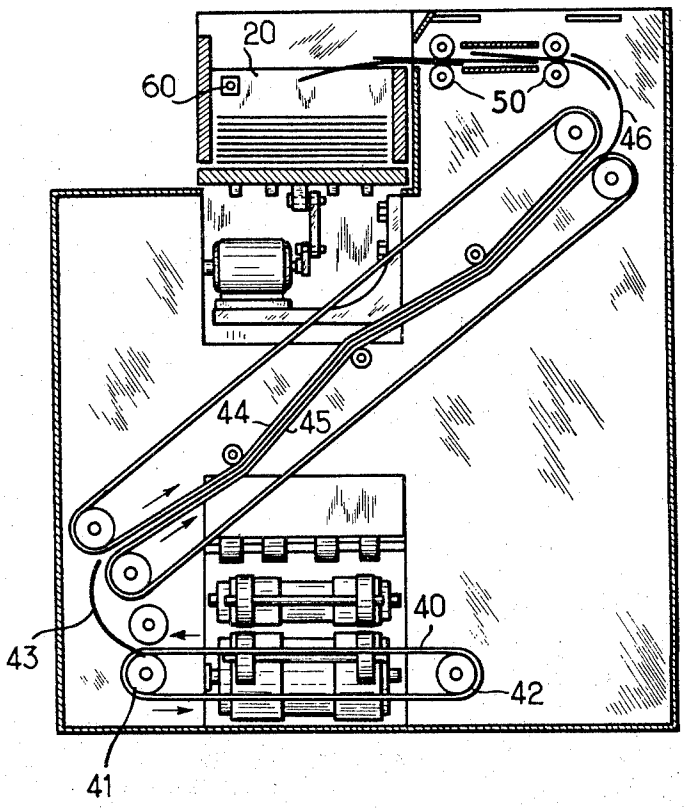


FIG. 2

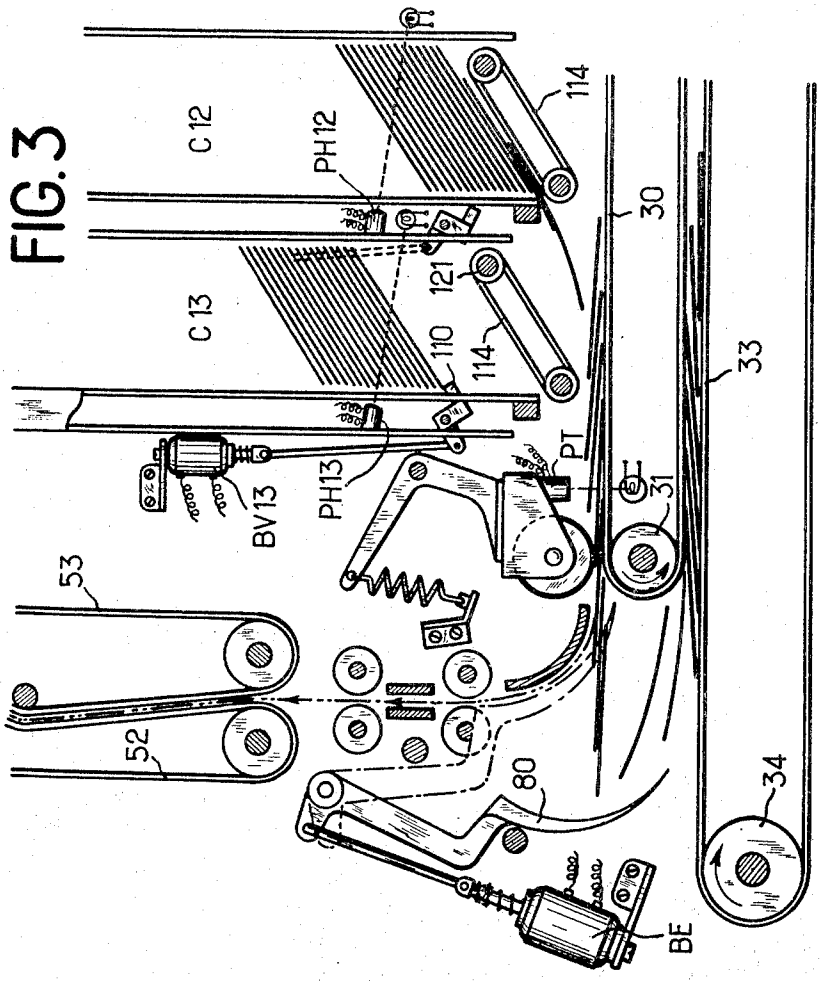
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CARD FEEDING DEVICE

Filed May 31, 1966 4 Sheets-Sheet 3

FIG. 3



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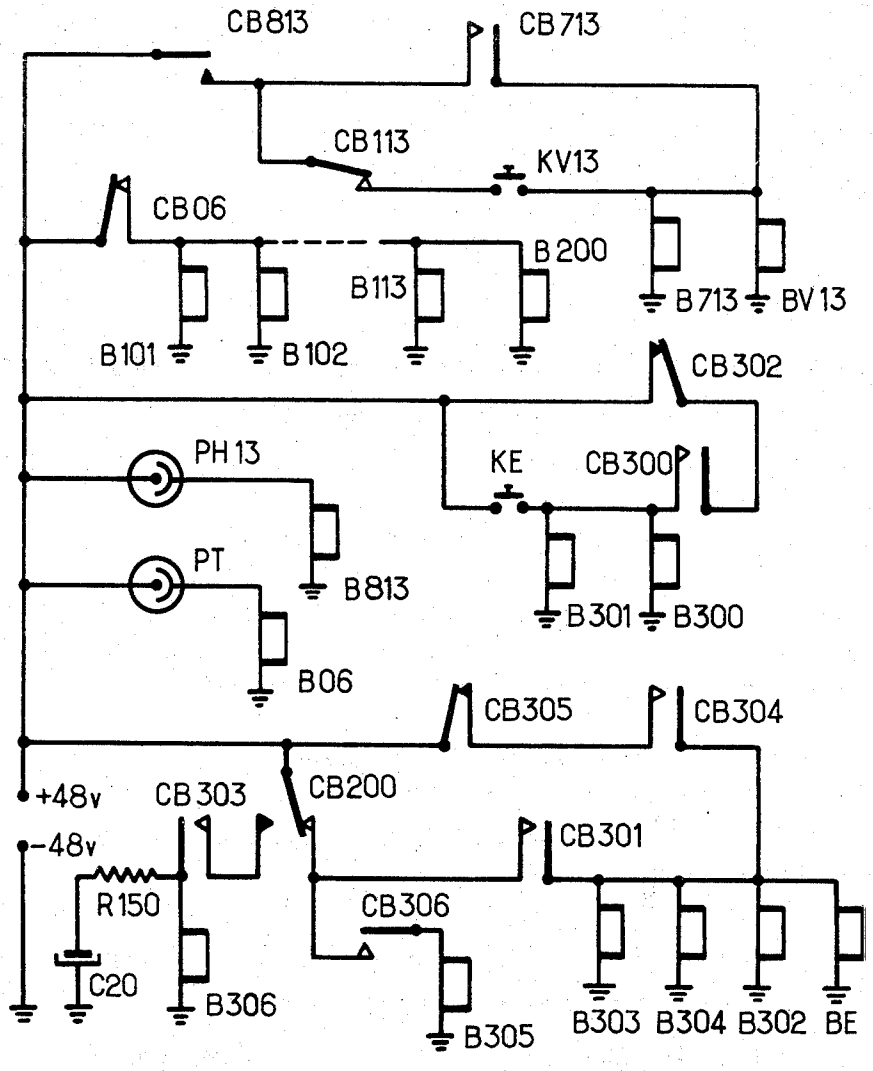


FIG. 4

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United States Patent Office 3,378,251 Patented Apr. 16, 1968

3,378,251

CARD FEEDING DEVICE

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Filed May 31, 1966, Ser. No. 553,872
Claims priority, application France, July 12, 1965, 24,371
6 Claims. (Cl. 271—3)

The present invention relates to improvements in card-feeding devices, which are more particularly applicable to record-card machines.

The improvements made in recent years in high-speed record-card machines such as sorting machines and collating machines, for example, have made it possible to reach processing speeds of the order of 1200 to 1500 cards per minute and even more. The introduction of these machines has led designers to provide these machines with large-capacity card supply magazines in order to reduce the frequency of theoperations necessary for loading such magazines. Consequently, having regard to the high processing speeds reached, it has been found necessary to provide large-capacity card-receiving compartments in order to collect the cards processed in the course of one passage through the machine.

In earlier machines operating at about 600 cards per minute, the receiving compartments were manually emptied by an operator who, after each passage, withdrew the cards deposited in the receiving compartments and returned them into the supply magazine, or positioned them in a card.index system. When the number of cards accumulated in a receiving compartment exceeded several hundred, this compartment was usually manually emptied in small bundles in order that the cards withdrawn from the said compartment might not be scattered. On the other hand, in new machines, and more particularly in those in which the processing speed exceeds 1500 cards per minute, the compartments cannot be emptied in this manner because not only does this result in a great increase in the physical fatigue of the operator, but manual emptying does not leave the operator sufficient time to reload the supply magazine. Consequently, the operator is obliged to stop the machine periodically, whereby the advantage of the high processing speed of the machine is completely offset.

In order to enable the operator to benefit by the advantages afforded by these machines of high processing rate, therefore, endeavours have been made to minimise the card manipulations in order to reduce the periods of stoppage of these machines. Thus, sorting machines are known in which a scanning station provided for scanning the data provided on the cards is disposed between a first group and a second, similar group of receiving compartments. In all of these sorting machines, the cards to be sorted, which are initially placed in a compartment belonging to the first group of compartments, are extracted one-by-one from the said compartment, scanned by the scanning station and sent to the receiving compartments of the second group, depending upon the data which they bear. As soon as this first passage has been completed, the controls of the machine reverse the direction of advance of the cards in order to enable them to be extracted from the receiving compartments of the second group and to be sent, after having been scanned, to the receiving compartments of the first group. As a result of the successive reversals, the cards are thus sent from the compartments of one group to the compartments of the other group and vice versa, in accordance with a predetermined sorting programme, so that it is unnecessary to manipulate the cards after each passage. However, these machines have the disadvantage that they are bulky owing

to the fact that they comprise a large number of receiving compartments. In addition, they make it necessary for the data scanned by the scanning station to be differently interments, the said machine being characterised in that a card-are advanced. Moreover, they give rise to difficulties of a logic order in their use owing to the fact that it is the cards which are last deposited in the receiver compartments which are the first to be extracted.

The present invention has for its object to obviate these disadvantages by providing a high-speed record-card machine which has small overall dimensions and in which the cards accumulated in the receiving compartments after a first processing are extracted from the said compartments and automatically taken up by a card-feeding device, either in order to be withdrawn from the machine or in order to be returned to the supply magazine for further processing.

One aspect of the present invention concerns a record-card machine in which cards coming from at least one card supply magazine are processed by a processing member and then advanced in a first direction in order to be selectively deposited in a plurality of receiving compartments, the said machine being characterised in that a card-feeding device is disposed at the bottom of the compartments to collect the cards extracted from any one of the said receiving compartments, to advance them as they are extracted, in a direction parallel to the aforesaid first direction and in the same sense, to throw them against an abutment, and thereafter to take them up in order to advance them in the same direction to one end of the said feeding device, the said machine being characterised in addition in that a lifting device is provided at the said end of the feeding device to receive the cards discharged by the said feeding device and finally to deposit them in the said supply magazine.

For a better understanding of the invention and to show how it may be carried into effect, the same will now be described, by way of example, with reference to the accompanying drawings, in which:

FIGURE 1 is a diagrammatic longitudinal sectional view of a record-card machine provided with a feeding device in accordance with an embodiment of the invention.

FIGURE 2 is a diagrammatic end view of the machine illustrated in FIGURE 1.

FIGURE 3 is a diagrammatic fragmentary view of a feeding device designed in accordance with another feature of the invention.

FIGURE 4 is a diagram of the electric circuits for monitoring and controlling the movements of cards advanced by the said feeding device.

The machine diagrammatically illustrated in FIGURES 1 and 2 is a sorting machine which is in part of known type and which comprises a number of receiving compartments, only some of which, such as C1, C11, C12 and C13, have been illustrated, obviously for the sake of simplicity.

It will be assumed by way of example that the sorting machine illustrated in FIGURES 1 and 2 comprises thirteen receiving compartments, but it is to be understood that the number of compartments may vary in accordance with the type of machine under consideration. The cards to be sorted, which are contained in a supply magazine 20 before any sorting operation, are extracted one-by-one from the said magazine when the machine is set in operation, by means of so-called knife-edge and throat gap devices of known type. Each card bears data which, in the described example, consist of preparations in a certain number of columns of the card. In their first passage through the machine, the cards extracted from the supply magazine 20, with the printed face down-

wards, are taken up and carried towards the receiving compartments C1 to C13 by means of sets of feed rollers **21**. In the course of their entrainment, the cards pass through a scanning station **22** which detects on each card the location of a perforation existing in a particular column. Depending upon the point at which this perforation might be situated in the explored column, each card carried along by the feed rollers **21** is deflected by one of twelve flaps D1 to D12 so as to fall with its printed face downwards into one of the twelve compartments C1 to C12 corresponding to twelve perforations which may exist in a card column. When there is no perforation in the explored column of a card, this card is sent into compartment C13 called the "reject" compartment. In accordance with a well-known sorting principle, when this first passage has been completed, the cards are extracted from the receiving compartments, at the lower part of the said compartments, and replaced in the supply magazine **20**, in an increasing or decreasing order depending upon the desired numerical sequence, in order to be redistributed in the receiving compartments in the course of a second passage, in accordance with the perforations made in the column next to that one which has been explored in the course of the preceding passage. The sorting of the cards thus takes place in as many passages as there are columns to be explored.

Since the cards are extracted from the supply magazine **20** at a rapid rate which is of the order of 2000 to 2400 cards per minute in the described example, the receiving compartments C1 to C13 are designed to be able to contain a relatively large number of cards which may reach 3000 to 4000 cards. Owing to the large card capacity of the receiving compartments, the accumulation of cards in each compartment takes place in an oblique stack in order to facilitate the subsequent extraction of the said cards through the bottom of the compartment, since it is known that the upper cards of a stack of several thousand cards accumulated in a compartment exert on the lower cards an excessive pressure which prevents the last card situated under the stack from sliding against the one which is retained above it. In order to obviate these disadvantages, it has been proposed to provide each receiving compartment with retaining devices so that the cards contained in a compartment and retained by these devices constitute a number of card stacks, the transfer of the cards from one stack to a lower stack taking place automatically and gradually as the extraction of the cards from the compartment proceeds. In a more improved form of construction which is described notably in United States patent application No. 539,970; filed on Apr. 4, 1966, under the title: "Card Receiving Compartments," each compartment is provided with an endless band which is vertically disposed and which supports a number of plates, which are disposed at regular intervals along the said band and are driven by the said band, so that the cards which fall into a compartment become stacked on a plate, gradually descending within the compartment and supported by the said plate, and are stopped at the bottom of the compartment by retaining means, while the said plate continues its movement and another takes up a position at the top of the compartment in order to receive the succeeding cards. The receiving compartments C1 to C13 of the sorting machine illustrated in FIGURE 1 have been preferably designed in accordance with this arrangement, which makes it possible to form card stacks all having the same inclination regardless of the compartment under consideration. For the constructional details of the said compartments, reference may usefully be had to the aforesaid patent application. With the obvious object of simplification, there have only been diagrammatically shown in FIGURE 1 the plates, for example such as the plate **101**, which receive the cards intended for the receiving compartments. Means described in the aforesaid patent application are provided to stop the arrival of cards in a compartment when the height of a stack formed by the cards accumulating on a plate reaches a predetermined value which is such that the number of cards accumulated on a plate does not exceed 1500 to 2000 cards. Thus, the accumulation of the cards in a compartment takes place in a series of oblique stacks all having the same inclination, each stack comprising only a relatively small number of cards, so that the said cards can readily be extracted through the bottom of the compartment. Referring to FIGURE 1, it will be seen that the cards supported by the plates and descending in the interior of the receiving compartments are stopped at the bottom of the compartments by retaining means which, in the described example, consist of retaining lugs **110** which normally project into the interior of the compartments. These lugs may be actuated by means of electromagnets BV1 to BV13, of which only one, bearing the reference BV13, has been shown in FIGURE 1, in order that the drawing may not be overcrowded. Each of the electromagnets BV1 to BV13 is associated with one of the receiving compartments C1 to C13 respectively. When an electromagnet is energised, the lug of the corresponding compartment is retracted and releases the cards which it was retaining. The cards then fall to the bottom of the compartment and are collected by an extracting device which, in the described example, consists of an endless belt **114** stretched between two driving rollers **120** and **121** and disposed parallel to the direction of inclination with which the cards are accumulated in each compartment. An extracting device of the type just described is provided in the lower part of each compartment, as shown in FIGURE 1, to receive the cards released by the lugs and to extract them from the corresponding compartments. The adhesion of the belts **114** is made such as to enable the last card situated under a stack of cards which are being extracted to slide against that one which is retained above it. Each card successively driven by a belt passes through a throat gap and leaves the compartment. The speed of rotation of the driving rollers **120** and **121** is made such as to enable a stack formed by the cards accumulated in a compartment to be extracted from this compartment at a rate in the neighbourhood of 3000 cards per minute. This relatively high rate of extraction may be more readily obtained by reason of the fact that, with the extracting device just described, a card commences to leave the compartment before the preceding card has been completely extracted, as may be observed from FIGURE 1. This manner of extracting the cards also affords the advantage of obviating the risk of the cards being brought out of order during their extraction. It is useful to note, in addition, that the form of construction of the extracting device does not constitute a feature of the invention and that it could also consist, for example, of a series of rollers having the same direction as a series of feed rollers **21** and disposed in a plane parallel to the direction of inclination of the cards in the compartment. In this case, the rollers of the extracting device may be coated with a substance which affords high adhesion, such as spongy rubber, for example.

The cards extracted from the receiving compartments in the manner just explained are taken up by a feeding device which will now be described with reference to FIGURE 1. The feeding device illustrated in FIGURE 1 comprises two endless bands disposed one above the other, namely an upper endless band **30** stretched between two rollers **31** and **32** and a lower endless band **33** stretched between two rollers **34** and **35**. The upper endless band **30** extends horizontally below the receiving compartments C1 to C13 in order to receive on its upper part the cards extracted from each of the receiving compartments. The lower endless band **33** is disposed parallel to the upper endless band **30** and in contact therewith. The bands **30** and **33** are made of a flexible material which affords a very high coefficient of friction which is intended to prevent any slipping of the cards carried along by these bands.

A motor 36 drivingly connected to the roller 35 through a belt 37 drives the lower band 33 when supplied with electric current. In addition, the said motor is drivingly connected to the roller 32 through a belt 38 to enable the upper band 30 to be driven at the same linear speed as the lower band 33. The direction of rotation of the motor 36 is such that the cards which are extracted from a receiving compartment, with the printed face lowermost, and which fall on to the upper part of the upper band 30, are driven by the said band in the same direction in which they are advanced by the feed rollers 21 so as to fall into the receiving compartments. Owing to the fact that the cards accumulated in the compartments all have the same direction of inclination in relation to the horizontal, the band is driven in such direction that the cards which are extracted from the receiving compartments in accordance with their direction of inclination can fall on to the upper band 30 without producing any violent shocks which might cause stoppage and deterioration of the cards. The linear speed of travel of the upper band 30 is of the order of 70 centimetres per second. Since the cards are extracted from the compartments at a mean rate of 3000 cards per minute, it follows that the extracted cards are carried along with overlap, with the printed face lowermost, by the band 30, each card, carried in the direction of its width, overlapping the preceding one by about 7 centimetres. This mode of feeding is diagrammatically illustrated in FIGURE 1, which shows the manner in which the cards extracted from the compartment C11 are carried along. The cards carried along on the upper part of the band 30 in the manner just described are thrown against an abutment 39 when they reach the end of the band 30 closer to the roller 31, the said stop being of such shape as to deflect the cards arriving thereat in a downward direction so that they fall with the printed face lowermost on to the upper part of the lower band 33 in the neighbourhood of the roller 31. As they fall on to the band 33, the cards are taken up by the said band and carried in the opposite direction, being immediately engaged by the roller 31 and further carried along in overlapping manner, while being gripped between the lower part of the band 30 and the upper part of the band 33. The cards thus reach the end of the feeding device which is closer to the roller 35 so as to be discharged and collected by a lifting device, which will now be described with reference to FIGURE 2.

The lifting device illustrated in FIGURE 2 is composed essentially of a first conveyor device consisting of an endless belt 40 stretched between two rollers 41 and 42 and of a second conveyor device which will hereinafter be described and which is of the type in which the cards to be fed are gripped between two endless belts whose opposed faces move parallel to one another. The endless belt 40 is disposed horizontally and perpendicularly to the bands 30 and 33 of the feeding device so as to receive the cards discharged by the latter. As will be appreciated on reference to FIGURE 2, the belt 40, which is driven in known manner in the direction indicated by the arrows, carries the cards which it receives from the conveyor device to a curved deflector 43 which so orients the cards as to engage them between the two belts 44 and 45 of the second conveyor device. FIGURE 2 also shows that the cards which are advanced by the belt 40 become engaged under a roller 47, so that they can be maintained gripped between the said roller and the belt 40 and can thus be carried by the said belt along the curved deflector 43 until they are engaged between the belts 44 and 45. The belts 44 and 45 are driven in known manner in the direction indicated by the arrows by driving means (not shown) so as to bring the cards coming from the conveyor device to a level in the neighborhood of the upper level of the supply magazine 20. Another curved deflector 46 is arranged to receive the cards which leave the second conveyor device and to orient them in such manner that they become engaged between sets of driving rollers 50 and thereafter fall with the printed face downwards into the supply magazine 20. It is useful to indicate here that the linear speed of travel of the belts 40, 44 and 45 is of the order of one metre per second, so that the cards which fall with the printed face downwards on to belt 40 are carried along in overlapping manner towards the deflector 43, each card, now fed in the direction of its length, overlapping the preceding one by about 16 centimetres. These cards are brought to the deflector 43 and so oriented that they are thereafter carried along in overlapping manner by the second feeding device as far as the deflector 46, at which they again change direction so as to be engaged between the rollers 50 and fed in such manner as to fall into the supply magazine 20 at a rate of 3000 cards per minute. The arrangement of the belts 40, 44 and 45, of the deflectors 43 and 46 and of the rollers 50 is such that the path of the cards fed in overlapping manner, from the belt 40 to the supply magazine 20, has substantially the form of a Z, as illustrated in FIGURE 2.

It is noteworthy that the mode of feeding the cards in overlapping manner as just described renders possible the feeding of cards at a very high rate, simply using inexpensive feeding members which move at relatively low linear speeds, which not only ensures high resistance to wear of the said feeding members, but also greatly reduces the danger of card stoppages.

The belts 114 of the devices for extracting the cards accumulated in the compartments C1 to C13 are simultaneously driven by the motor 36 through known means, such as a general transmission shaft, for example, which has not been shown in the figures, in order that they may not be overcrowded. In this way, as long as the motor is supplied with current, the emptying of the cards retained at the bottom of a receiving compartment takes place automatically merely on energisation of the electromagnet which actuates the corresponding retaining lug. The cards extracted and fed in the manner just described reach the supply magazine 20 at a rate of 3000 cards per minute. However, if the arrival of the cards at this rate takes place continuously for a sufficiently long time, the capacity of the supply magazine 20 is likely to be exceeded, since the extraction of the cards from the said magazine takes place at a mean rate of 2000 to 2500 cards per minute. Hence, in order to eliminate this danger, the supply magazine 20 is provided with a photoelectric cell device 60, shown in FIGURE 2, which controls the arrival of the current at the motor 36 by which the endless bands 30 and 33 and the belts 114 are driven. It is desirable to indicate in addition that the belts 40, 44 and 45 of the lifting device are continuously driven, so that any card which falls on to the belt 40 is automatically returned to the supply magazine 20 even if the endless bands 30 and 33 cease to be driven by the motor 36.

FIGURE 1 further shows that the feeding device is provided with an extracting member consisting, in the described example, of a movable deflector 51 and disposed between the abutment 39 and that end of the band 30 which is closer to the roller 31. The said movable deflector 51, which is actuated by means of an electromagnet BE, can occupy two positions which are such that when the electromagnet BE is not energised the movable deflector 51 is raised to enable the cards fed by the upper band 30 to be directed against the abutment 39, while when the electromagnet BE is energised the deflector 51 is lowered to intercept the cards driven by the band 30, to deflect them and to engage them between two lifting belts 52 and 53. The belts 52 and 53, which are continuously driven in known manner at the same linear speed as the bands 30 and 33, have the function of conveying the overlapping cards which are deflected by the movable deflector 51 and of conducting them as far as a curved deflector 54, at which they are so oriented as to be stored on an emptying ramp 55. This arrangement makes it possible to extract from the machine the cards which, after having been

processed, need not be returned into the supply magazine 20 for a further passage through the said machine. The operator may thus position the cards stored on the emptying ramp 55 without having to interrupt the operation of the machine.

Referring to FIGURE 1, it will be observed that a photoelectric cell device PT is disposed at that end of the upper band 30 which is closer to the roller 31 so as to monitor the presence of cards on the upper part of the band 30, in order that cards extracted from one receiving compartment may not be mixed with other cards emanating from another receiving compartment, as will hereinafter be explained.

FIGURE 3 illustrates a part of the feeding device designed in accordance with another aspect of the invention. In this arrangement, the abutment 39 and the movable deflector 51 of the machine illustrated in FIGURE 1 are replaced by a stopping and extracting member 80 actuated by an electromagnet BE and adapted to occupy two positions. The member 80 is so shaped that when the said member is situated in the first position, represented by unbroken lines in FIGURE 3, it constitutes an abutment for returning on to the lower band 33 the cards emanating from the upper band 30, while when it is in the second position, represented by dash-dotted lines in FIGURE 3, it performs the function of a deflector for orienting the cards coming from the upper band 30 in the direction of the belts 52 and 53. FIGURE 3 also shows two photoelectric cell devices PH12 and PH13, each of which is associated with one of the two receiving compartments C12 and C13 respectively which are shown, in order to monitor the presence of cards at the bottom of each compartment. Similar monitoring devices PH1 to PH13 are generally provided in the receiving compartments of the machine illustrated in FIGURE 1, but they have not been shown in this figure for obvious reasons of simplicity.

There will now be described with reference to the diagram of FIGURE 4 the electric circuits which control the movements of the cards carried along by the feeding device. It is to be understood that this diagram constitutes only an example which is intended to show the manner in which the cards are extracted from the receiving compartments and thereafter directed either towards the supply magazine or towards the emptying ramp, but that any other mechanical, electrical or pneumatic means may be employed by those acquainted with this type of construction.

The electric circuit diagram of FIGURE 4 is a basic diagram comprising manually controlled contacts and relays designed to be employed under the conditions just described. The relay contacts are denoted by the same reference as the winding controlling them, preceded by the letter C. A contact which is normally closed when the coil of the relay controlling it is not energised is represented in this diagram by a black triangle. The relays shown in FIGURE 4 are normally supplied with direct current taken from two terminals +48 v. and −48 v.

The motor 36 of FIGURE 1 being normally energised, the endless bands 30 and 33 are driven, as also are the belts 114. The cards lowered to the bottom of the compartments are retained by the lugs 110, so that no card is extracted from the compartments. Thereafter, the photoelectric cell PT disposed at that end of the band 30 closer to the roller 31 permits energisation of a relay B06 shown in FIGURE 4. The energised relay B06 closes its contact CB06, which in turn energises a relay B200 and a series of 13 relays B101, B102 . . . B113, of which only three have been shown in FIGURE 4, for the sake of simplicity. Each relay B101 to B113 is intended to control, respectively, the arrival of current for the energisation of the coil of an electromagnet BV1 to BV13 which, in each compartment, actuates one of the lugs in order to release the cards retained at the bottom of the compartments and extract them from the said compartments. Only the emptying control device of the compartment C13 has been shown in FIGURE 4, but it is to be understood that each of the other compartments comprises an emptying control device similar to that which will now be described. The emptying control device of the compartment C13 comprises an electromagnet BV13 and a relay B713 which may be energised, from +48 v. and through two contacts CB813 and CB113, by means of a switch KV13. It is to be noted that the contact CB113 is closed owing to the fact that, as explained in the foregoing, the corresponding relay B113 is energised. If cards are retained by the lug 110 of the compartment C13, the photoelectric cell PH13 of this compartment prevents a relay B813 from being energised, so that the contact CB813 in the "off" position is closed. If the switch KV13 is then closed for a very short time, a direct current flows from +48 v., through the closed contacts CB813 and CB113, and energises the relay B713 and the electromagnet BV13. The energised relay B713 closes its contact CB713 and establishes a holding circuit for itself and for the electromagnet BV13. The energised electromagnet BV13 effects the retraction of the lug 110 of the compartment 13, which releases the cards which it previously retained. The cards extracted by means of the belt 114 from the compartment C13 are carried along by the band 30, encounter the abutment 39 and fall on to the band 33, which in turn carries them along so that they are discharged on to the lifting device, whereby they are returned to the supply magazine. In the course of their conveyance, the cards intercept a light beam impinging upon the cell PT. This cell, which no longer receives light rays, interrupts the energisation of the relay B06, so that the contact CB06 opens. The relays B200 and B101 to B113 are then de-energised and in particular the contact CB113 opens. The electromagnet BV13 and the relay B713, however, continue to be energised through the closed contacts CB813 and CB713 until the instant when the last card is extracted from the compartment C13. At this instant, the cell PH13 of the compartment C13 permits energisation of the relay B813, which opens its contact CB813. Opening of the contact CB813 then breaks the holding circuit of the electromagnet BV13 and of the relay B713. The de-energised relay B713 opens its contact CB713, while the electromagnet BV13, which is de-energised, enables the lug 110 of the compartment C13 to return into its position for retaining other cards when they descend to the bottom of the said compartment. It is to be noted that twelve other switches KV1 to KV12 (not shown) which form part, respectively, of twelve other emptying control devices, are provided to control, in a manner similar to that just described, the emptying of the cards retained by the lugs 110 of the other twelve receiving compartments C1 to C12. It is also to be noted that when cards extracted from a compartment and thereafter carried along by the band 30 cease to intercept the light rays impinging upon the cell PT, the relay B06 is energised and closes its contact CB06. Thereafter, the relays B200 and B101 to B113 are energised. More particularly, the contacts CB101 to CB113 of the relays B101 to B113 close. From this instant, it is possible by depressing one of the thirteen switches KV1 to KV13 to effect the emptying of the cards retained at the bottom of any compartment. This arrangement makes it possible to prevent cards from being extracted from one compartment while other cards, extracted from another compartment, are being carried along at the same moment by the band 30.

If it is now desired to withdraw from the machine cards extracted from a compartment, instead of directing them to the supply magazine, it is desirable to depress a switch KE before depressing one of the thirteen switches KV1 to KV13 which effect the emptying of the cards retained at the bottom of any compartment. As may be appreciated from FIGURE 4, depression of the switch KE has the effect of energising two relays B300

and B301, which then close their respective contacts CB300 and CB301. The contact CB300, on closing, enables a direct current to flow from +48 v., through a normally closed contact CB302 and the contact CB300, so as to continue to energise the relays B300 and B301 when the switch KE is released. If, during this time, cards are carried along by the band 30 and intercept the light beam arriving at the cell PT, the contact CB06 of the unenergised relay B06 is open and does not permit energisation of the relays B200 and B101 to B113. More particularly, the unenergised relay B200 holds its contacts CB200 in the "off" position. In this case, it will simply be indicated that the electromagnet BE is not energised and that the movable deflector 51 is so positioned as to enable the cards carried along by the band 30 to be directed against the abutment 39. When the cards carried along by the band 30 cease to intercept the light rays impinging upon the cell PT, the relay B06 is energised and closes its contact CB06. Thereafter, the relays B200 and B101 to B113 are energised and more particularly the contact CB200 of the relay B200 changes over into the "on" position. Owing to the fact that the contact CB301 of the energised relay B301e is closed, a direct current flows from +48 v. through the contacts CB200 and CB301 and energises three relays B302, B303, B304, as also the electromagnet BE. The energised relay B304 closes its contact CB304 and enables a direct current to flow from +48 v. through a normally closed contact CB305 and the contact CB304 so as to energise the relays B302, B303, B304 and the electromagnet BE. The energised relay B302 opens its contact CB02, which has the effect of breaking the holding circuit of the relays B300 and B301. The contact CB300 of the de-energised relay B300 opens. The contact CB301 of the de-energised relay B301 also opens, but the relays B302, B303, B304 and the electromagnet BE continue to be supplied with current through the closed contacts CB305 and CB304. The energised relay B303 closes its contact CB303. The also energised electromagnet BE actuates the movable deflector 51, which then takes up a position for deflecting towards the belts 52 and 53 the cards which are to be extracted from a receiving compartment. If, for example, it is desired to extract from the machine the cards retained at the bottom of the compartment C12, it is merely necessary to depress the switch KV12 for a very short time. The process which is then initiated is similar to that produced by depression of the switch KV13. Without entering into the operating details, it will be recalled that depression of the switch KV12 has the effect of releasing the cards previously retained at the bottom of the compartment C12. The latter which are then driven by the band 30, and intercept in their travel the light beam impinging upon the cell PT, are thereafter deflected by the movable deflector 51 and are then carried along by the belts 52 and 53 so as to be finally stored on the emptying ramp 55. During the time when the cards are passing under the cell PT, the relay B06 is de-energised and opens its contact CB06. Consequently, the relays B200 and B101 to B113 are not energised, and more particularly the contact CB200 is changed over into the "off" position. It is to be noted that during this time the relays B302, B303, B304 and the electromagnet BE, which were previously energised, continue to be supplied with current through the contacts CB305 and CB304. The contact CB303 of the energised relay B303 is closed, so that a direct current flows from +48 v. through the contacts CB200 and CB303 and energises a relay B306. At the same time, this current charges a capacitor C20 which is connected in parallel with the relay B306, through a resistor R150. The energised relay B306 closes its contact CB306. When all the cards extracted from the compartment C12 have ceased to pass under the cell PT, the relay B06 is re-energised and closes its contact CB06, which permits energisation of the relays B200 and B101 to B113. The contact CB200 of the energised relay B200 again changes over, so that a direct current now flows from +48 v. through the contacts CB200 and CB306 and energises a relay B305. It is desirable to point out here that, as a result of the change-over of the contact CB200, the relay B306 can no longer receive current emanating from +48 v., but it nevertheless continues to be supplied by the discharge of the capacitor C20. This arrangement makes it possible to maintain the contact CB06 closed for a sufficient time to permit energisation of the relay B305. The energised relay B05 opens its contact CB305. Since the contacts CB301 and CB305 are open, the relays B302, B303, B304 and the electromagnet BE cease to be energised. The de-energised relay B302 closes its contact CB302, while the contacts CB303 and CB304 of the de-energised relays B303 and B304 open. At the same time, the de-energised electromagnet BE enables the movable deflector 51 to return into the position for permitting the cards which will thereafter be carried along by the band 30 to be sent against the abutment 39. The discharge of the capacitor C20 lasts about 20 milliseconds, whereafter, since the relay B306 is no longer energised, the contact CB306 opens and the relay B305, which has been brought into the "off" condition, closes its contact CB05.

It should be pointed out that in the described example it is desirable, whenever it is desired to extract from the machine cards which have been retained in the bottom of any compartment, to depress the switch KE before depressing the switch controlling the extraction of the cards from the compartment under consideration.

The characteristic points of the invention will be more clearly apparent from the following claims.

I claim:

1. In a record-card machine comprising a plurality of receiving compartments, a card-feeding system adapted to carry along cards extracted from a supply magazine towards the said compartments along a first feeding path and in a direction parallel to their smaller dimension, and a plurality of card extracting devices each disposed below one of the said receiving compartments, the combination comprising:

a card-feeding device comprising an upper endless band extending horizontally below the receiving compartments to collect the cards extracted from any one of the compartments, and a lower endless band disposed below the upper endless band and in contact therewith,

driving means for continuously driving the upper endless band at a speed such as to enable the cards extracted from a compartment to be carried in the form of a string of partially overlapping cards along a second path parallel to the first path and in the same direction, towards one end of the said path,

an abutment disposed close to the said end, at an appropriate distance for intercepting the cards continuing their movement, the lower endless band extending horizontally below the said abutment to receive the intercepted cards and to carry the partially overlapping cards, between two bands and in the opposite direction, towards the other end of a third feed path, and

a lifting device disposed close to the other end to receive the cards discharged at this other end and to carry them to the said supply magazine, in which they are deposited.

2. The combination according to claim 1, comprising a card receiving ramp, a movable deflecting member disposed between the upper endless band and the abutment, means for actuating the said deflector in order to bring it either into a deflecting position for deffecting the cards carried along by the upper endless band, or into a rest position to enable the cards carried along by the upper band to pass under the deflector so as to encounter the abutment, and a second lifting device extending substan-

tially vertically and comprising two endless belts disposed in contact with one another, the said second device being arranged to take up the cards deflected by the deflector, when the latter is in the deflecting position, the said cards being gripped between the two belts and carried along in the form of a partially overlapping string, with a rising movement, so as to be finally discharged on to the said receiving ramp.

3. The combination according to claim 1, comprising a card receiving ramp, and in which the abutment is adapted to occupy either a return position for intercepting the cards carried along by the upper endless band, or a deflecting position for deflecting the cards carried along by the said band, the said combination comprising means for actuating the abutment so as to bring it to the return position or to the deflecting position, and a second lifting device extending substantially vertically and comprising two endless belts disposed in contact with one another, the said second device being arranged to take up the cards deflected by the abutment when the latter is brought into the deflecting position, the said cards being gripped between the two belts and carried along in the form of a string in partially overlapping form, with a rising movement, so as to be finally discharged on to the said receiving ramp.

4. In a record-card machine comprising a plurality of receiving compartments, a card feeding system adapted to carry to the said compartments cards extracted from a supply magazine, along a first feed path and in a direction parallel to their smaller dimension, and a plurality of card extracting devices each disposed below one of the said receiving compartments, the combination comprising:

a card feeding device comprising an upper endless band extending horizontally below the receiving compartments to receive the cards extracted from any one of the compartments, and a lower endless band disposed below the upper endless band and in contact therewith,

driving means for continuously driving the upper endless band at a speed such as to enable the cards extracted from a compartment to be carried in the form of a string of partially overlapping cards along a second path parallel to the first path and in the same direction, to one end of the said path,

an abutment disposed close to the said end, at an appropriate distance for intercepting the cards which continue their movement, the lower endless band extending horizontally below the said abutment to receive the intercepted cards and to carry the partially overlapping cards, between the two bands and in the opposite direction, to the other end of a third feed path,

a lifting device disposed close to the said other end to receive the cards discharged at this other end and to carry them to the said supply magazine, in which they are deposited,

a plurality of control means each associated with one card extracting device to control the extraction of the cards from the receiving compartments, and

means for detecting the presence of cards disposed close to the upper endless band and towards the end of the second path for detecting the presence of cards on the said band, the said detecting means being connected to the control means in order to prevent the extraction of cards from a receiving compartment when cards extracted from another compartment are being carried along by the upper endless band.

5. The combination according to claim 4, comprising a card receiving ramp, a movable deflecting member disposed between the upper endless band an the abutment, means for actuating the said deflector in order to bring it either into a deflecting position for deflecting the cards carried along by the upper endless band or into a rest position to enable the cards carried along by the upper band to pass under the deflector so as to encounter the abutment, and a second lifting device extending substantially vertically and comprising two endless belts positioned in contact with one another, the said second device being arranged to take up the cards deflected by the deflector when the latter is in the deffecting position, the said cards being gripped between the two belts and carried along in the form of a string in partially overlapping form, with a rising movement, so as to be finally discharged on to the said receiving ramp.

6. The combination according to claim 4, comprising a card receiving ramp and in which the abutment is adapted to occupy either a return position for intercepting the cards carried along by the upper endless band or a deflecting position for deflecting the cards carried along by the said band, the said combination comprising means for actuating the abutment so as to bring it to the return position or to the deflecting position, and a second lifting device extending substantially vertically and comprising two endless belts disposed in contact with one another, the said second device being arranged to take up the cards deflected by the abutment when the latter is in the deflecting position, the said cards being gripped between the two and carried along in the form of a string partially overlapping form with a rising movement, so as to be finally discharged on to the said receiving ramp.

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