May 7, 1968 J. VASSE 3,381,830

CARD RECEIVING COMPARTMENT

Filed April 4, 1966 2 Sheets-Sheet 1

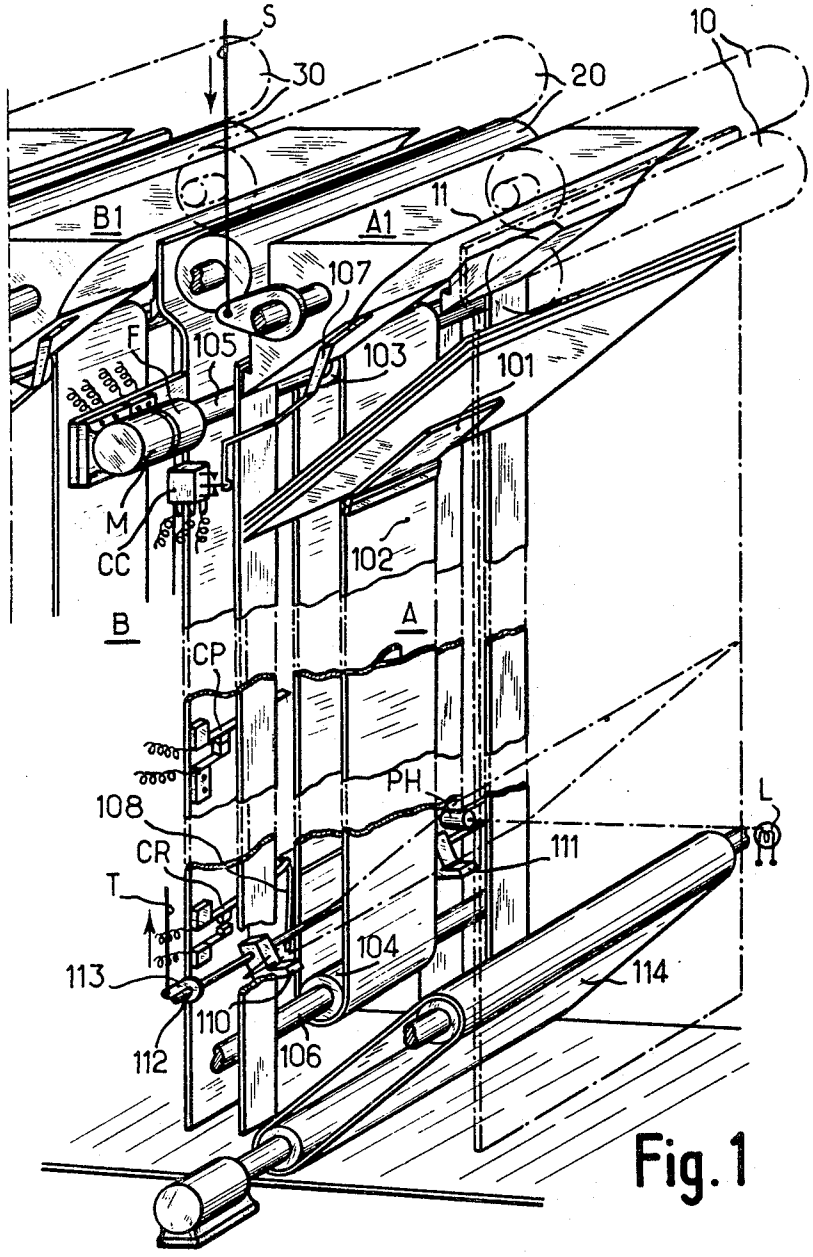


Fig. 1

Inventor:
Jacques Vasse
By Baldwin & Wright
Attorneys

May 7, 1968 J. VASSE 3,381,830

CARD RECEIVING COMPARTMENT

Filed April 4, 1966 2 Sheets-Sheet 2

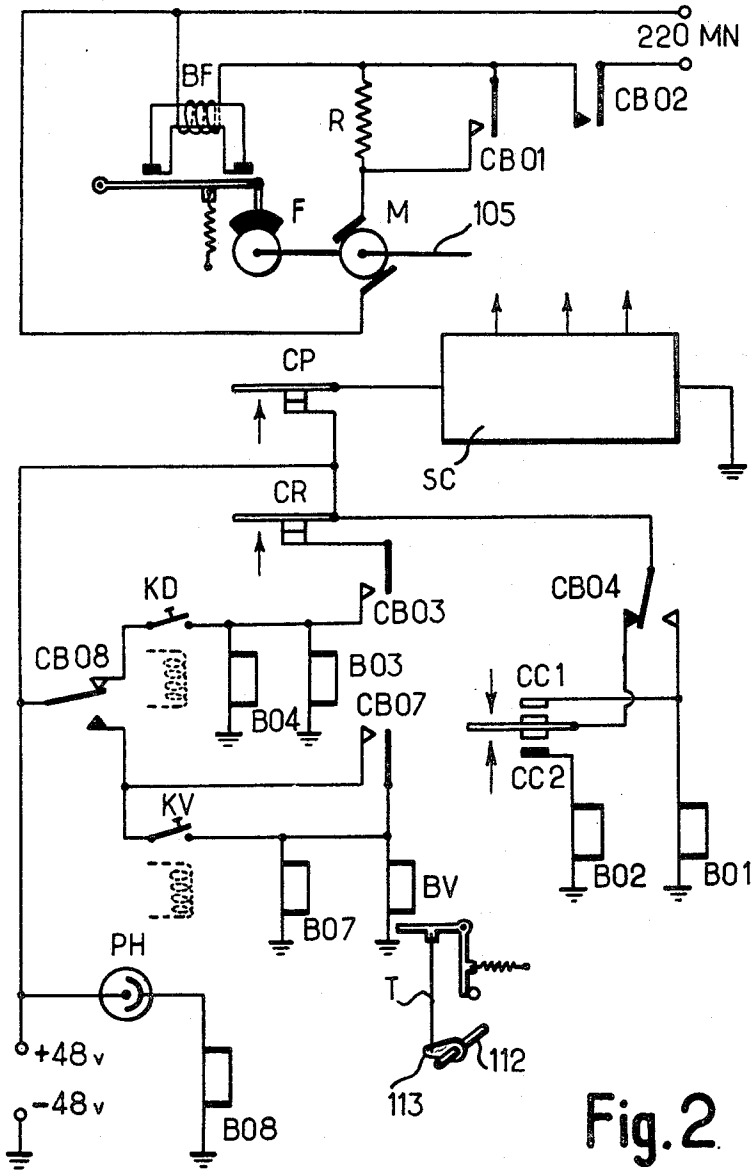


Fig. 2

Inventor:
Jacques Vasse
By Baldwin & Wight
Attorneys

United States Patent Office

3,381,830
Patented May 7, 1968

3,381,830

CARD RECEIVING COMPARTMENT

Jacques Vasse, L'Hay-les-Roses, France, assignor to Societe Industrielle Bull-General Electric (Societe Anonyme), Paris, France

Filed Apr. 4, 1966, Ser. No. 539,970
Claims priority, application France, Apr. 28, 1965, 14,925
6 Claims. (Cl. 214—6)

ABSTRACT OF THE DISCLOSURE

In a record card processing machine, such as a card sorting machine, cards arriving at the top of a card receiving compartment are conveyed toward the lower section of the compartment by one of two hinged card supports driven by a powered belt conveyor extending vertically. An electromechanical device checks the level of a top card of a stack on one card support automatically to control the conveyor movement at reduced or normal speed. After a card stack is brought to the lower section of the compartment, the latter may automatically be emptied under control of electro-optical means, even when the other support is receiving cards at the top of said compartment.

The present invention relates to improvements in card-receiving compartments in record-card machines.

In record-card machines, such as sorting machines, collating machines, tabulators, etc., the cards which have been processed in the machine are thereafter automatically deposited in receiving compartments. The improvements made in these machines during the last few years have rendered possible processing speeds of the order of 800 to 1500 cards per minute and even more.

The machines, which previously operated at about 600 cards per minute, were generally provided with card supply magazines which could contain up to 1500 cards. It was thus possible for these machines to operate for more than two minutes without reloading.

In order that later machines may operate under working conditions comparable to the earlier conditions, it has been necessary to provide these machines with supply magazines of high capacity which can contain at least 3000 cards. Consequently, it has been found necessary to increase the card capacity of the receiving compartments in order to receive the cards processed in the machine.

When the number of cards accumulated in a receiving compartment exceeds several hundreds, this compartment is usually manually emptied by an operator in small bundles in order that there may be no danger of the cards removed from this compartment being scattered. However, in the later machines, and more particularly those in which the processing speed exceeds 1700 cards per minute, it is substantially impossible to operate in this way because, not only does this result in a considerable increase in the physical fatigue of the operator, but the manual emptying of the compartments does not leave the operator sufficient time to reload the supply magazine. Therefore, the operator is obliged to stop the machine periodically, whereby the advantage of the high processing speed of this machine is completely offset.

In order to obviate these disadvantages, there have been proposed devices for automatically extracting the cards

accumulated in the receiving compartments, the extracted cards thereafter being taken up by an appropriate conveying mechanism. In some of the said devices, the extraction of the cards accumulated in a compartment takes place through the bottom of the latter by means of an appropriate mechanical or pneumatic system. In other devices, the cards which arrive in a compartment fall on to a movable plate which is connected to a rod maintained by a spring. Under the action of the weight of the cards falling into the compartment, this plate gradually descends and, when it reaches the bottom of the compartment, it sets in action an extraction system which automatically ejects from the compartment the cards previously accumulated.

Generally speaking, these devices are very complex and bulky. Delicate adjustments are generally necessary in their construction, and they do not always operate satisfactorily, since it may happen that, as a result of a maladjustment of the device, the cards accumulated in a compartment are not all extracted, so that it is necessary for the operator to intervene and the advantages of this device are obviously reduced. Moreover, in the majority of such devices, it is essential to empty completely a compartment which contains a set of cards having a given characteristic before other cards having a different characteristic can be accumulated therein.

The present invention has for its object to obviate the disadvantages of the earlier constructions by the provision of a card-receiving compartment by means of which a stack of accumulated cards can be automatically, reliably and completely withdrawn, and which in addition affords the compartment to receive further cards without having to be emptied. The said compartment is of reduced overall dimensions, so that it may with advantage be employed in the construction of sorting machines comprising a large number of receiving compartments. Finally, the said compartment also renders possible the manual or automatic withdrawal of accumulated cards while continuing to receive other cards.

Another object of the present invention concerns, in a record-card machine, a card-receiving compartment which is characterised in that it comprises an endless conveyor extending mainly between two vertical and parallel planes, one of which is close to the separating boundary of the said compartment, while the other is outside the said compartment, two hinged card supports connected to the said conveyor and disposed at regular intervals along the said conveyor, and driving means for driving the said conveyor in a direction such that the supports descend within the compartment and rise outside it, each support being situated in a hinged-out position when it descends inside the compartment, in order to receive cards which fall into the said compartment, and in a hinged down position along the said conveyor when it rises outside the compartment.

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

FIGURE 1 is a diagrammatic perspective view, with parts broken away, of a part of a machine comprising a receiving compartment according to the invention, and

FIGURE 2 is a diagram of the electric circuits for monitoring and controlling the movements of the cards in a receiving compartment.

FIGURE 1 is intended to illustrate the main features of a receiving compartment designed in accordance with the invention. There will be seen in FIGURE 1 a part of a record-card machine, for example a sorting machine or collating machine, which comprises a number of receiving compartments such as A and B. After having been scanned by scanning devices of known type, the cards emanating from a supply magazine (not shown) are advanced in known manner along a track provided with one or more receiving compartments, by means of sets of feed rollers such as **10**, **20** and **30**. The cards are caused to fall into the receiving compartments by means of fixed or movable deflections. The deflectors A1 and B1 shown in FIGURE 1 are movable deflectors intended to send the cards into the compartments A and B respectively. These two deflectors have been shown in the inoperative state in FIGURE 1, but they may be brought into the operative state for deflecting the cards advanced along the track and causing them to fall into the receiving compartments. Thus, when the deflector A1, for example, is brought into the operative position by means of a rod S moved in the direction indicated by the arrow, the leading edge **11** of the deflector A1 is lifted and the cards, which are advanced along the track by the set of rollers **10** are then deflected and fall into the compartment A. These cards are stopped in their fall by a support or plate **101**, on which they pile up. The plate **101** is a hinged plate connected to a conveyor or endless band **102** stretched between an upper support roller **103** and a lower support roller **104**. One of these two rollers, for example the roller **103** shown in FIGURE 1, is a driving roller coupled through a driving shaft **105** to driving means which, in the described example, consist of an electric motor M associated with an electrically controlled brake F. The other roller **104** is mounted on a free shaft **106**. As the cards arrive in the compartment A and pile up on the plate **101**, the motor M, which is controlled in a manner which will hereinafter be explained, drives the endless band **102** through the driving shaft **105**, so that the plate **101** gradually descends inside the compartment A. The plate **101** descends in such manner that the upper level of the stack formed by the cards accumulated on the said plate remains substantially constant in relation to a predetermined reference level. For this purpose, the descent of the plate **101** is made dependent upon means for detecting the upper level of the cards accumulated on a plate. These level-detecting means control in a manner which will hereinafter be indicated the descent of the plate **101**, independently of the load of the cards resting on the said plate, but only under the control of the upper level of the stack of accumulated cards. In the described example, these level-detecting means consist of a feeler spring **107**, one of the two ends of which has been secured, for reasons of convenience, under the deflector A1, while the other end is fast with the movable contact blade of a two-way switch CC.

The plate **101** is so articulated to the band **102** that the said plate is disposed in a hinged-out position in which the plate extends away from the band **102** in the course of its descent within the compartment A, in order to be able to collect and support cards as illustrated in FIGURE 1, and when the plate has reached the bottom of the said compartment, it is disposed in a hinged-down position so that, in the course of its upward travel along a path outside the compartment, the plate extends alongside the band **102**. After having passed around the upper roller, the plate **101** rocks under the action of its weight and then returns to its hinged-out position. The band **102** supports a second plate **108** similar to the first, and this plate is shown in the hinged-down position in FIGURE 1. The two plates **101** and **108** are disposed at regular intervals along the band **102**, so that when one of them descends within the compartment, the other rises along a path outside the compartment.

The cards descending into the compartment and supported by one of the two plates, are stopped in a waiting

position at the lower section of the compartment by retaining means which, in the described example, comprises two retaining lugs **110** and **111** connected to a pin **112** provided at one end with a lever **113** which is adapted to be actuated by means of a control rod T. In the inoperative position, the lugs normally project into the compartment A in order to retain the cards which are supported by a plate in the course of their descent and reach the lower section of the compartment. The cards being retained by the said lugs, the plate which supported them continues its movement, being driven by the band **102**, about the lower roller, commences to rise in the hinged-down position along the band **102**, and stops at a lower rising position, while simultaneously the other plate, which is hinged-out to receive the cards, is stopped in an upper position of descent. The stopping of the plates in each of these two positions, respectively, is automatically controlled by switching means which will hereinafter be described and which are subjected to the monitoring action of first plate-position-detecting means. In the described embodiment, these position-detecting means consist, for example, of a normally closed blade-type electric contact CR which is situated, for example, in the lower rising position, and the openings of which is effected by the plates **101** and **108** at each passage of the said plates through the lower rising position. FIGURE 1 shows that when the rod T is actuated in the direction indicated by the arrow, the lugs **110** and **111** are retracted and release the cards which they retained. The said cards then fall to the bottom of the compartment A and are collected by an extracting device which automatically removes them from the compartment. In the described example, this extracting device comprises an endless belt **114** stretched between two rollers driven in known manner, as described, for instance in the U.S. Patent 2,938,667, issued on May 31, 1960. It is to be understood that the extracting device illustrated in FIGURE 1 is not part of the invention and may be replaced by any other suitable extracting device, such as a knife-type device, a pneumatic device or the like.

In addition, means for detecting the presence of cards are provided to monitor the presence of cards on the retaining lugs. These means for detecting the presence of cards comprise, in the embodiment illustrated in FIGURE 1, a photoelectric cell PH arranged to receive light rays emanating from a light source L, these rays being intercepted by the cards retained by the lugs **110** and **111**.

When a plate driven by the endless band **102** reaches the upper descent position, this plate is in a position to receive the cards which are deflected by the deflector A1 and fall into the compartment A. These cards then pile up on the said plate, which descends as it receives cards, the descending movement of the plate being subjected to the control of the upper level of the stack of accumulated cards, this level being monitored as will hereinafter be explained, by means of the spring **107** and the two-way switch CC. When this plate reaches, in the course of its downward movement, an intermediate descent position which is equidistant in the compartment A from the rollers **103** and **104**, the upper half of the compartment A is full and it is arranged that, under normal conditions of use, the arrival of cards intended for the compartment A will then be stopped. This may be effected either by stopping the device for supplying cards to the machine, or by routing the cards intended for the compartment A to another predetermined compartment. The passage of a plate through the intermediate descent position is detected by second position-detecting means which, in the described example, comprises a blade-type electric contact CP arranged, for example, close to the path of upward travel of the plates, in a position equidistant from the rollers **103** and **104**, and in such manner that it may be opened at the passage of each rising plate. In FIGURE 1, the electric contacts CR and CP are disposed close to the path of upward travel of the plates. In another embodiment, it would obviously be possible to

dispose these contacts close to the path of downward travel of the plates, in which case the contact CR would be disposed at the level of the upper descent position, the contact CP being disposed at the level of the intermediate descent position and the opening of the said contacts being produced by the passage of each plate in the course of its descent within the compartment.

The proposed form of construction is advantageous because, since each plate is downwardly hinged along the endless band **102** during its upward travel, the space between two neighbouring compartments may be reduced to a value slightly greater than that necessary to receive the band **102**, the rollers **103** and **104** and a hinged-down plate. Thus, the overall dimensions of a compartment are minimised, and it is hence possible to consider the use of such a compartment in sorting machines having dimensions similar or even equal to those of sorting machines hitherto constructed.

There will now be described with reference to the diagram of FIGURE 2 the electric circuits which control the movement of the endless band **102** supporting the plates **101** and **108**. The circuit diagram of FIGURE 2 is a basic circuit diagram which comprises manual control contacts and relay contacts designed for use under conditions which will be 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 2 are normally supplied with direct current taken between two terminals at +48 v. and −48 v.

The electric motor M driving the band **102** through the driving shaft **105** in the described example is an asynchronous motor which, when supplied with single-phase alternating current at 220 volts taken from two terminals **220** MN through a normally closed contact CBO2 and a resistor R, rotates at a relatively low speed in order that the band **102** may move at a linear speed of the order of several millimetres per second. The resistor R is shunted by a contact CBO1 controlled by a relay BO1 which, on closing, enables the motor M to rotate at normal speed and to drive the band **102** at a higher linear speed, of the order of several centimetres per second. The motor M is mechanically coupled to a brake F controlled by an electromagnet BF whose energising coil is connected to the terminals **220** MN through the contact CBO2 of a relay BO2. When the coil of the electromagnet BF is not energised, the brake F exerts on the motor M a braking action which ceases as soon as the contact CBO2 is closed.

The two-way switch CC comprises two contacts CC–1 and CC–2 connected to the relays BO1 and BO2 respectively. In the inoperative position, the movable contact blade of this switch is maintained, under the action of the spring **107**, in contact with the contact CC–2. The relay BO2 is then energised with direct current from +48 volts, through a contact CBO4 maintained in the "off" position and the contact CC–2. Consequently, the contact CBO2 of the relay BO2 is opened and the motor M cannot be supplied with alternating current. The band **102** therefore remains stationary, as also do the plates **101** and **108**.

One of the plates is brought into the upper descent position by means of an advance control device comprising, for example, a switch KD which is manually actuated in the described example, but which could also be actuated in any other way, for example pneumatically or electromagnetically. In the absence of cards on the retaining lugs **110** and **111**, the photoelectric cell pH receives the light rays emanating from the lamp L and enables a relay BO8 to be excited with direct current. The excited relay BO8 maintains its contact CBO8 in the operative position, so that if the switch KD is depressed at this instant so as to be maintained closed for only a few instants, a direct current flows from +48 volts through the contact CBO8 and the switch KD and energises two relays BO3 and BO4. The energised relay BO3 closes its contact CBO3 and establishes a holding circuit for itself and for the relay BO4 through the closed electric contact CR and the contact CBO3. The energised relay BO4 changes over its contact CBO4 in order to energise the relay BO1. Owing to the change-over of the contact CBO4, the relay BO2 ceases to be energised and closes its contact CBO2. The coil of the electromagnet is then energised and consequently the brake F ceases to perform its braking action. The energised relay BO1 closes its contact CBO1, so that the motor M is supplied with alternating current through the closed contacts CBO2 and CBO1, and then drives the band **102** and the plates **101** and **108**. When one of the plates, for example **108**, opens the contact CR in its upward travel, the relays BO3 and BO4 cease to be energised, since the contact CR is opened, as also the switch KD. The contact CBO3 opens, while the contact CBO4 changes over again to energise the relay BO2 through the contact CC–2. The de-energised relay BO1 opens its contact CBO1. At the same time, the contact CBO2 of the energised relay BO2 opens, whereby the supply of alternating current to the motor M is interrupted. Simultaneously, the coil of the electromagnet BF ceases to be energised and then releases the brake F, which vigorously brakes the motor M. This arrangement has the object of stopping the band **102** very rapidly, so that one of the plates is stopped in the lower rising position, while at the same time the other is stopped in the upper descent position. In the case under consideration, it is the plate **101**, for example, which is stopped in the upper descent position, ready to receive the cards intended for the compartment A.

At this instant, cards can be supplied by starting the supply device of the machine which controls the advance of the cards along the track. The cards intended for the compartment A, which are deflected by the deflector A1, fall into the compartment A and pile up on the plate **101**. As the cards accumulate, the height of the stack of cards thus formed increases and, since the plate **101** is stationary, the upper cards of the stack ultimately lift the spring **107**, the effect of which is to break the contact between the movable blade of the switch CC and the contact CC–2. This results in de-energisation of the relay BO2, which closes its contact CBO2. The coil of the electromagnet BF is then energised and the brake F ceases to exert its braking action. At the same time the motor M is supplied with alternating current through the contact CBO2 and the resistor R, and drives the band **102** at reduced speed. However, the driving of the band **102** has the effect of lowering the plate **101** within the compartment, as also the stack of cards accumulated on this plate. Owing to the descent, the upper cards of the stack of accumulated cards cease to lift the spring **107**, with the result that contact is restored between the movable blade of the switch CC and the contact CC–2. The relay BO2 is re-energised and opens its contact CBO2, whereby the supply of alternating current to the motor M is interrupted, while the brake F, which is released by de-energisation of the coil of the electromagnet BF, vigorously brakes the motor M. Thus, the descent of the plate **101** within the compartment A and from the upper descent position is determined by the arrival of the cards which are deflected by the deflector A1 and fall into the compartment A. As cards arrive, the plate **101** descends until contact is established between the movable blade of the switch CC and the contact CC–2, and thus makes place for the following cards. The upper level of the stack of cards accumulated on the plate **101** thus remains substantially constant and in the neighborhood of the upper descent position. However, it may happen that cards intended for the compartment A fall into the said compartment at very short

intervals of time, of the order of 20 to 30 milliseconds. In order to avoid danger of jamming due to this high rate of arrival of cards in the compartment, the switch CC is so designed that when the descent of the plate **101** is not sufficiently fast to leave the necessary space at the top of the pile for the cards which arrive, the spring **107** is lifted by the cards arriving and establishes contact between the movable blade of the switch CC and the contact CC–**1**. Under these conditions, a direct current coming from +48 volts through the "off" contact CBO**4** and the contact CC–**1**, energises the relay BO**1**. The relay BO**2** is not energised, because CC–**2** is open. Consequently, the contact CBO**2** is closed and energisation of the coil of the electromagnet BF prevents the brake F from exerting its braking action. Simultaneously, since the contact CBO**1** of the energised relay BO**1** is also closed, the motor M is supplied with alternating current and rotates at normal speed, thus driving the band **102** at a sufficient speed for the plate **101** to descend rapidly within the compartment and for the accumulated cards to cease to establish through the spring **107** the contact between the movable blade of the switch CC and the contact CC–**1**. Breaking of this contact results in de-energisation of the relay BO**1**, and the contact CBO**1** opens. From this instant, depending upon the position of the movable blade of the switch CC, the motor M stops, or it is supplied with alternating current through the contact CBO**2** and the resistor R, and it then drives the band **102** at reduced speed.

As the plate **101** descends within the compartment, the plate **108** rises while hinged-down along the band **102**. The driving of the plate **108** then enables the contact CR to close again. At the instant when the plate **101** reaches its intermediate position of descent, the plate **108**, in its rising movement, opens the contact CP. In the closed position, this contact CP permits direct current to be supplied from +48 volts to a signalling and control device SC of known type, which consists of one or more relays, for example, and which, when the contact CP opens, indicates on the one hand that the upper half of the compartment A is full, and on the other hand brings about either the stopping of the card supply device of the machine or the routing of the cards intended for the compartment A to another predetermined compartment. In the described example, it will be assumed that, at the moment the contact CP opens, the signalling and control device SC causes stopping of the card supply device of the machine. From this instant, the cards cease to arrive in the compartment A, and the plate **101**, the descent of which was subject to the arrival of the cards, stops in the intermediate descent position.

The cards accumulated on the plate **101** and stopped in the intermediate descent position may be lowered to the lower section of the compartment A by depressing the switch KD for only a few instants, provided however that no card is already retained by the lugs **110** and **111**. In the absence of cards on the said lugs, the photoelectric cell PH permits energisation of the relay BO**8**, which thus maintains its contact CBO**8** in the "on" position. Depression of the switch KD then initiates a process similar to that already described with reference to the positioning of a plate in the upper descent position. Without entering into details, it will simply be recalled that in this operation the motor M drives the band **102**. The plate **101** driven by the band **102** descends toward the bottom of the compartment, deposits the stack of cards which it was supporting on the retaining lugs **110** and **111**, passes around the lower roller, rises in the hinged-down position along the band **102**, and opens the contact CR in passing, the effect of which is to stop the motor M and to stop the plate **101** in the lower rising position. It is to be noted that during the period when the plate **101** is being driven, the plate **108** which is driven by the band **102**, is simultaneously moved so as to be stopped in an upper descent position, ready to receive in turn the cards intended for the compartment A.

Owing to the presence of cards on the retaining lugs **110** and **111**, the light rays emanating from the source L are intercepted and the photoelectric cell PH can no longer cause energisation of the relay BO**8**, which changes over its contact CBO**8** into the "off" position. The cards retained by the lugs **110** and **111** can then be released to the bottom of the compartment by actuation of the said lugs by means of an emptying control device which, in the described example, consists of a switch KV. On closing of the switch KV for only a few seconds, a direct current flows from +48 volts through the contact CBO**8** in the "off" position and the closed switch KV, so as to energise the relay BO**7** and the energising coil of an electromagnet BV. Energisation of the coil of the electromagnet BV results in actuation of the retaining lugs through the control rod T, so that the freed cards then fall on to the endless belt **114** at the bottom of the compartment, which belt, as a result of its drive, automatically removes them from the compartment. The relay BO**7** energised as a result of the closing of the switch KV closes its contact CBO**7** and establishes a holding circuit for itself and for the coil of the electromagnet BV. This arrangement has the object of maintaining the lugs **110** and **111** in the retracted position until all the previously retained cards have been extracted from the compartment. When all these cards have been extracted, the photoelectric cell PH again receives light rays and enables the relay BO**8** to be energised. The relay BO**8** then changes over its contact CBO**8** into the "on" position whereby the coil of the electromagnet BV is de-energised and the relay BO**7** is brought into the unoperated state. The de-energised relay BO**7** opens its holding contact CBO**7**, while the lugs **110** and **111** cease to be maintained in the retracted position owing to the de-energisation of the coil of the electromagnet BV.

The apparatus just described affords high operating reliability owing to the fact that, as long as the cards of a stack originally retained by the lugs have not all been extracted from the compartment, the relay BO**8** remains de-energised and maintains its contact CBO**8** in the "off" position, thus preventing depression of the switch KD from causing descent of another stack of cards supported by a plate originally stopped in the intermediate descent position. In addition, the apparatus just described enables the compartment to receive cards from the instant when a plate is in the upper descent position and until the instant when this plate reaches the intermediate descent position, even if other cards are already present on the retaining lugs. Moreover, it is possible to control the automatic extraction of the cards originally retained at the lower section of the compartment, while the compartment continues to receive cards from the top. This procedure obviously renders possible an appreciable reduction of the periods of stoppage of the machine, since the machine can operate while the receiving compartments are being emptied.

Of course, various modifications may be made to the embodiment which has just been described by way of example. Thus, the band supporting the plates may be replaced by wires, chains or similar elements, and the electric circuit referred to by way of example may be replaced by any other equivalent circuit, such as a transistorised circuit, for example. In the described example, the driving roller by which the band is driven is actuated by a motor associated with a brake. This arrangement renders possible a correct descent of the plates even when the latter support a very small number of cards. However, in a machine in which a large number of compartments similar to that described are employed, for example in a sorting machine, each driving roller may be actuated from a general transmission shaft and through gearings and a clutch controlled similarly to the motor M in the described example, it being possible for the mechanism to be provided with a brake which may be omitted if the said gearings are such that the mechanism is not reversible.

1. In a record-card machine provided with a card-receiving compartment to receive cards in its upper part, a card feed arrangement comprising:

an endless conveyor stretched vertically between two rollers,

motor driving means arranged to drive the said conveyor in only one direction, which determines on the said conveyor an ascending portion and a descending portion,

two supports disposed at opposite points along the conveyor, each support being secured to the said conveyor by means of a hinge which enables it to occupy a hinged-out position for supporting cards when it is in the descending portion of the conveyor and a hinged-down position, along the conveyor, when it is situated in the other portion,

position-detecting means disposed along the conveyor to be actuated on passage by supports driven by the conveyor when one of the said supports reaches, at the top of the compartment, an upper card-receiving position,

switching means designed to control the driving means, under the control of the detection means, so as to interrupt the movement of the conveyor and of the supports when a support reaches the upper card-receiving position,

level-detecting means situated at the top of the compartment, these means comprising a reversing contact including a centre blade which is connected to a voltage source and normally in contact with a lower blade, the said centre blade being coupled to a feeler member arranged to be actuated by the upper portion of the cards accumulated on a card support, and in which the switching means comprise:

a first relay connected to the said lower blade,

a second relay connected to the upper blade of the said reversing contact, and

a supply circuit for a motor driving one roller of the conveyor, comprising in series a normally closed contact controlled by the said first relay and a resistor shunted by a normally open contact controlled by the said second relay, the arrangement being such that when the height of the cards exceeds a first level, the first relay is no longer energised and its contact recloses and thus brings about the driving of the motor at reduced speed through the said resistor, while if the height of the said cards reaches a second level the second relay is energised and closes its contact so as to short-circuit the said resistor and to permit driving of the said motor at normal speed.

2. In a record-card machine provided with a card receptacle for receiving cards through its upper part, a card feed arrangement comprising:

an endless conveyor stretched vertically between two rollers,

driving means electrically controlled to drive the said conveyor in a single direction which determines on the said conveyor an ascending portion and a descending portion,

two supports arranged at opposite points along the conveyor, each support being secured to the said conveyor through a hinge which enables it to occupy a hinged-out position for supporting cards when it is situated in the descending portion of the conveyor and a hinged-down position along the said conveyor when it is situated on the other portion,

level-detecting means disposed at the top of the said receptacle and consisting of a first reversing contact comprising an upper blade and a centre blade normally in contact with a lower blade, the said centre blade being connected to a voltage source and being coupled to a feeler member arranged to be actuated by the upper portion of the cards accumulated on a support, and

switching means comprising:

a first relay connected to the lower blade of the said reversing contact,

a second relay connected to the upper blade of the said contact, and

a supply circuit for the driving means of the conveyor comprising in series a normally closed contact controlled by the said first relay and a resistance shunted by a normally open contact controlled by the said second relay, the arrangement being such that when the height of the cards exceeds a first level the first relay is no longer energised and its contact effects, on closing, the drive of the driving means at reduced speed through the said resistor, while if the height of the said cards reaches a second level the second relay is energised and closes its contact in order to short-circuit the said resistor and to permit the drive of the said driving means at normal speed.

3. A card-feed arrangement according to claim 2, wherein a normally closed release contact is disposed in proximity to the conveyor and in such manner as to be opened on passage by one of the supports driven by the conveyor, at the instant when a support arrives at the top of the compartment in the upper card-receiving position, and in which the switching means comprise a third relay connected to the voltage source through the said release contact, the said third relay being adapted to actuate a second reversing contact connected between the voltage source and the centre blade of the first reversing contact, the centre blade of the said second reversing contact being connected to the voltage source, the "break" blade being connected to the centre blade of the first reversing contact and the "make" blade being connected to the second relay, the arrangement being such that when a support arrives in the upper receiving position the said release contact effects on opening the de-energization of the third relay, so that the second reversing contact changes over to effect energization of the first relay, through the centre blade and the lower blade of the first reversing contact, in order to stop the drive of the conveyor by the driving means.

4. A card feed arrangement according to claim 3, wherein a normally closed contact for controlling the interruption of the card feed is arranged in proximity to the conveyor and in such manner as to be opened on passage by one of the supports, at the instant when a support in the course of its descent reaches an intermediate descent position equidistant from the rollers of the conveyor, a device for controlling the card supply means being connected to the voltage source through the said stop control contact for effecting the card supply when the said contact is closed, and for stopping the said supply when the said contact is open, at the instant when a support has reached the said intermediate descent position.

5. A card feed arrangement according to claim 4, wherein card retaining means are disposed at the lower section of the compartment to retain, in a waiting position, cards which have been lowered by a support driven by the conveyor, the said retaining means being controlled by an emptying control device to permit releasing to the bottom of the compartment, of the cards retained in the waiting position, in which compartment means for the detection of the presence of cards are disposed at the lower section of the compartment to detect the presence of cards in the waiting position, and in which the switching means comprises a fourth relay connected to the voltage source through the said means for the detection of the presence of cards in order to be energized only when no card is present in the waiting position, the said fourth relay being adapted to actuate

a make-and-break contact whose centre blade is connected to the voltage source and whose "break" blade is connected to the said emptying control device in order to enable voltage to be applied to the emptying device when the fourth relay is de-energized owing to the presence of cards in the waiting position.

6. A card feed arrangement according to claim 5, wherein a feed control contact is connected between the third relay and the "make" contact of the contact controlled by the fourth relay in order to bring about the energization of the third relay, when no card is present in the waiting position, and to bring about the drive of the conveyor in order to enable cards accumulated on a support to be lowered to the said waiting position.

References Cited

UNITED STATES PATENTS

1,969,994	8/1934	Stevenson	198—35
2,815,870	12/1957	Laub	214—6

OTHER REFERENCES

German printed application 1,043,954, Nov. 13, 1958.

ROBERT G. SHERIDAN, *Primary Examiner.*

GERALD M. FORLENZA, *Examiner.*

R. J. SPAR, *Assistant Examiner.*