

Description

Field of the Invention

[0001] The present invention generally relates to devices for providing sets of cards, such as sets of playing cards. The present invention also relates to methods to provide sets of cards, such as sets of playing cards.

Background of the Invention

[0002] Card games are well known nowadays. Often the game is based upon the unpredictability of the order of cards being dealt or drawn from a randomly ordered deck or set of playing cards, wherein a set of playing cards comprises more than one deck of playing cards being randomly ordered at set level.

[0003] As an example, baccarat is played with a randomly ordered set of 8 decks of playing cards, in total 416 randomly ordered cards. For some games, once cards are drawn from the set, the drawn cards cannot be used anymore as such, since the order of drawing and setting aside the drawn cards can be monitored. Players can turn the cards themselves after the bet resulting in compromised, damaged, or destroyed cards. Reusing the used cards may create the opportunity for a player to predict the future sequence of cards, hence cheating.

[0004] Seen the high stakes involved, in fact any source of fraudulent playing or behaviour must be avoided. The handling time between production of a set of playing cards and using it at the playing table needs to be as little as possible to avoid to large extent the possibility for fraudulent actions.

[0005] A system for creating sets of randomly ordered playing cards is described in WO2012042823. This system comprises a plurality of playing cards collecting means to collect playing cards thereby providing a set of playing cards. Playing cards in random order are supplied to the plurality of playing cards collecting means via a route including a plurality of gates and mechanically moving elements.

[0006] Also for other cards, like collectible or trading cards, any source of fraudulent behaviour must be avoided as well. The handling time between production of a set of cards and any handling of the cards by the public needs to be as little as possible to avoid to large extent the possibility for fraudulent actions. Neither should any defect be noticeable on such kind of cards.

[0007] During production in general, it is of importance to manipulate both virgin, new cards and recycled, or reclaimed cards, such that no marks or defects are provided to these playing cards. This because any mark to the playing card can be an origin of recognition of playing cards, and hence to cheating, to having prior knowledge, or fraud. Reclaimed or recycled cards are cards which have been part of a set or deck of cards, which set or deck has been used for playing at least one card game, e.g. at a card playing table, such as a casino table.

Summary of the Invention

[0008] It is an object of the present invention to provide a device for providing sets of cards, such as sets of playing cards, for which the sequence of cards in the generated sets of cards have a higher guarantee of unpredictability, and wherein both reclaimed and virgin cards can be used.

[0009] According to a first aspect of the invention, a device for providing sets of cards is provided, the device comprising:

- a card supply means to supply a series of randomly ordered cards;
- a plurality of card storage means, in which the cards of said series of randomly ordered cards are to be stored;
- a control means adapted to randomly assign each card to one of the plurality of card storage means.

[0010] According to this first aspect of the invention, a device for providing sets of cards is provided, the device may further comprise:

- a card identifying means adapted to read the identification element of each card in said series of randomly ordered cards;
- a card sorting means, adapted to direct each of the identified cards to the assigned card storage means;

wherein a control means, such as said control means, is adapted to assign each of the identified cards to one of the card storage means and wherein

- said plurality of card storage means comprises N groups of M card storage means, N being an integer equal or more than 1, M being an integer equal or more than 2, each of said N times M card storage means is uniquely identified by a group identifier being a sign n selected from a first group of N signs and an intra-group identifier being a sign m selected from a second group of M signs;
- said control means is adapted to
 - memorize the number of cards with given identification element being provided to each of said N times M card storage means, and
 - randomly generate, for each card to be directed to said plurality of card storage means,
 - a sign Ω chosen from the second group of M signs and/or
 - a sign π chosen from the first group of N signs; and
 - assign each identified card to a card storage means for which

- the intra-group identifier m equals said sign Ω and/or the group identifier n equals said sign π ; and
- the number of cards with identification element being equal to the identified identification element of said identified card has not reached a threshold value T .

[0011] In the context of this invention, a card is not to be understood limitative as playing cards having a face side showing a rank and suit as their identification element. Cards may also be understood as e.g. game cards, casino cards, collectible cards and trading cards, i.e. cards having an identification element on the face side of the cards, different from a rank and suit, which identification element cause the card to have an own identity in the deck or set of cards to which it may belong. Also, in case of playing cards, the cards in the series of cards are not limited to cards with given rank and suit. Other functional cards, like cut cards, may be part of the series of cards. The sets of playing cards may comprise a plurality of decks of playing cards, such as 8 or 10 decks, randomly ordered at set level. For each card with given identification element, and for each of the plurality of card storage means, the threshold value T can be individually set. Preferably for all card with given identification element being part of a deck of cards, in each of the plurality of card storage means, the threshold value T is identical. Preferably for all card with given identification element being part of a deck of cards, in all of the plurality of card storage means, the threshold value T is identical. The threshold value may be 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 or any other integer.

[0012] According to some embodiments, the device for providing sets of cards, further may comprise:

- a card identifying means adapted to read the identification element of each card in said series of randomly ordered cards;
- a card sorting means, adapted to direct each of the identified cards to the assigned card storage means;

wherein a control means, such as said control means, is adapted to assign each of the identified cards to one of the card storage means and wherein

- said plurality of card storage means comprises N groups of M card storage means, N being an integer equal or more than 1, M being an integer equal or more than 2, each of said N times M card storage means is uniquely identified by a group identifier being a sign n selected from a first group of N signs and an intra-group identifier being a sign m selected from a second group of M signs;
- said control means is adapted to

- memorize the number of cards with given identification element being provided to each of said

N times M card storage means, and

- randomly generate, for each card to be directed to said plurality of card storage means, a sign Ω chosen from the second group of M signs and
- assign each identified card to a card storage means for which

- the intra-group identifier m equals said sign Ω ; and
- the number of cards with identification element being equal to the identified identification element of said identified card has not reached a threshold value T

[0013] According to some embodiments, a device for providing sets of cards, further may comprise:

- a card identifying means adapted to read the identification element of each card in said series of randomly ordered cards;
- a control means adapted to assign each of the identified cards to one of the card storage means;

wherein a control means, such as said control means, is adapted to assign each of the identified cards to one of the card storage means and wherein

- said plurality of card storage means comprises N groups of M card storage means, N being an integer equal or more than 1, M being an integer equal or more than 2, each of said N times M card storage means is uniquely identified by a group identifier being a sign n selected from a first group of N signs and an intra-group identifier being a sign m selected from a second group of M signs;
- said control means is adapted to

- memorize the number of cards with given identification element being provided to each of said N times M card storage means, and
- randomly generate, for each card to be directed to said plurality of card storage means, a sign π chosen from the first group of N signs; and
- assign each identified card to a card storage means for which

- the group identifier n equals said sign π ; and
- the number of cards with identification element being equal to the identified identification element of said identified card has not reached a threshold value T .

[0014] According to some embodiments, a device for providing sets of cards, further may comprise:

- a card identifying means adapted to read the identification element of each card in said series of ran-

domly ordered cards;

- a control means adapted to assign each of the identified cards to one of the card storage means;

wherein a control means, such as said control means, is adapted to assign each of the identified cards to one of the card storage means and wherein

- said plurality of card storage means comprises N groups of M card storage means, N being an integer equal or more than 1, M being an integer equal or more than 2, each of said N times M card storage means is uniquely identified by a group identifier being a sign n selected from a first group of N signs and an intra-group identifier being a sign m selected from a second group of M signs;
- said control means is adapted to
 - memorize the number of cards with given identification element being provided to each of said N times M card storage means, and
 - randomly generate, for each card to be directed to said plurality of card storage means,
 - a sign Ω chosen from the second group of M signs and
 - a sign π chosen from the first group of N signs; and
 - assign each identified card to a card storage means for which
 - the intra-group identifier m equals said sign Ω and
 - the group identifier n equals said sign π and
 - the number of cards with identification element being equal to the identified identification element of said identified card has not reached a threshold value T.

[0015] According to some embodiments, N may be equal or larger than 2, preferably N being 3. According to some embodiments, M may be larger than 2, preferably M being 2 or 3. Most preferably, N equals 3, M being 2 or 3.

[0016] The first group of N signs preferably is a group of integers, ranging from 0 to N-1 or from 1 to N, such as the group consisting of integers 1 and 2, or the group consisting of integers 1, 2 and 3. As such one may call the groups as group 1, group 2 and group 3. The second group of M signs preferably is a group of integers, ranging from 1 to M, or from 0 to M-1, such as the group consisting of integers 0 and 1, or the group consisting of integers 0, 1 and 2. As such, each card storage means may so-to-say be identified by a couple of coordinates (a,b), "a" being the group identifier n from the group of N signs and "b" being the intra-group identifier m from the group of M

signs.

[0017] "Sign" is thus to be understood in its broadest sense. It may be characters, integers, letters, colour, etc, or each sign may be a combination of one or more characters, integers, letters, such as words or names or alike. It is self-understanding that all signs in a group of signs are mutually different.

[0018] The device according to the invention may provide sets of cards, such as sets of playing cards, for which the sequence of cards in the generated sets of cards have a higher guarantee of unpredictability, and wherein both reclaimed and virgin cards can be used. The device according to the invention has the advantage that the use of a randomly generated sign or signs, e.g. a sign chosen from a group of M signs and/or a sign chosen from a group of N signs, and using also this sign or these signs to allocate the card storage means to an identified card, will cause that any possible knowledge of the sequence of cards in the series of cards being provided, will be broken. In general, as the series of cards is randomly ordered, there is no knowledge of the sequence of cards in the series of cards. However, when reclaimed cards are integrated in the series of cards, there is still a minor possibility that a person has some knowledge on the order of some or all the reclaimed cards. Using the identification element to identify the card and send the card to a card storage means which does not comprise a given number (the threshold number) of cards with this identified identification element alone, will not break the possibly known sequence of some or all the reclaimed cards.

[0019] The use of a randomly generated sign or signs and select only some of the card storage means as possible card storage means to direct the card to, may break the sequence which might be known. This because for any pair of subsequent identified cards in the series of cards, the card storage means to which they are assigned may change merely because another sign or pair of signs was randomly chosen for each of these subsequent cards. As such, the use of a randomly ordered series of cards, and additionally the use of randomly generated sign or signs to allocate a card storage means, will improve the certainty that for the sets of cards provided, the sequence is unknown and unpredictable, even when reclaimed cards are used as part of the series of cards.

[0020] According to some embodiments, the plurality of card storage means further may comprise an overflow card storage means (also referred to as card recuperation means). The control means is adapted to assign an identified card to this overflow card storage means if all N card storage means identified by said intra-group identifier equalling the sign Ω , comprises T cards with identification element being equal to the identified identification element of said identified card and/or if all M card storage means identified by said group identifier equalling the sign π , comprises T cards with identification element being equal to the identified identification element of said identified card.

[0021] The provision of such overflow card storage means avoids interruptions of the device in the unlikely case that an identified card, with identified identification element, does not fit any longer in any of the N card storage means characterised by its intra-group identifier being the randomly generated sign Ω and/or does not fit any longer in any of the M card storage means characterised by its intra-group identifier being the randomly generated sign π . The device, which otherwise would be interrupted, may continue its process, and assign the card to the overflow card storage means. The cards collected in this overflow card storage means may later be re-introduced in the series of cards provided by the card supply means. Also, in case a card cannot be identified or in case of any error in identification, recognition or handling of a card, this card may be directed to the overflow card storage means.

[0022] According to some embodiments, the card supply means may comprise at least one card printing unit.

[0023] Preferably the card printing unit may comprise at least a first inkjet printing unit, printing cards in random order. Alternatively the card printing unit may comprise one or more inkjet printing unit and/or one or more offset printing units.

[0024] The card printing unit provides virgin cards to the series of cards. The card printing unit may print the cards in random order, such it is not known in which sequence the different cards are in the series of cards.

[0025] According to some embodiments, the card supply means may comprise at least one card recuperation unit to provide reclaimed cards to said series of randomly ordered cards.

[0026] Reclaimed cards are cards which have already been used at least once as a card of a set of cards on a card game table, e.g. cards which have been dealt in a game, or cards which have been part of a set of cards on a card game table, but which have not been dealt.

[0027] Possibly, virgin cards and reclaimed cards are mixed or even shuffled to provide the series of cards. The possibility to use reclaimed cards causes the amount of wasted cards in a casino to be drastically reduced. According to some embodiments, the plurality of card storage means further may comprise a card recuperation means (also referred to as overflow card storage means), said control means being adapted to assign card to said card recuperation means if the control unit cannot assign the identified card to any of the other card storage means for whatever reason.

[0028] As such, reclaimed cards are gathered and may be provided back to the card recuperation unit. The card recuperation means may be identical to the card storage means, or it may be a card storage means dedicated to function as the card recuperation means.

[0029] The card supply means may comprise a card transportation means like a conveyor belt. The conveyor belt, being a continuous belt or band for transporting material from one place to another, may be an endless belt or may be a continuous belt provided from a strip of a

belt, the 2 ends of this strip being connected one to the other to form a continuous belt, e.g. by thermal welding, by means of staples, or alike. The series of cards may be provided on the conveyor belt as a train of cards, each of the cards being individualised, i.e. not in touch with any other card. The cards may be positioned on the conveyor belt by the card recuperation units and/or the card printing units.

[0030] According to some embodiments, the device may comprise a card inspection means to recognize defective cards in said series of randomly ordered cards.

[0031] Defective cards are card which have one or more defects on its face and/or backside. Such defects may be printing defects or scratches, dots, stains, small cutting defects, cracks, etc. As these cards may be recognized by its defect or defects, these cards need to be removed from the series of cards. This is in particularly the case when reclaimed cards are used as part of the series of cards. The card inspection means may comprise one or more cameras to make images of the face and optionally the backside of the cards. Optionally the cameras may be the same cameras as used by the card identifying means.

[0032] According to some embodiments, the plurality of card storage means further may comprise a card removal means, said control means being adapted to assign defective card to said card removal means.

[0033] As such, defective cards are gathered and may be disposed, avoiding these cards to be recognised during a card game being played using the sets of cards provided by the device according to the invention. The card removal means may be identical to the card storage means, or it may be a card storage means dedicated to function as the card removal means.

[0034] The card identifying means may be adapted to identify the identification element, such as suit and rank, of each card in the series of randomly ordered cards. The card identifying means may read the identification element from the card and/or may read a card identification code printed of the face side of the card, from this card surface, and may obtain, e.g. deduce, the identification element from this card identification code. Possibly, the card identifying means may read both the identification element from the card and the card identification code, the read identification element and the identification element deduced from the card identification code being compared. If these two identification elements do not match, the card may be identified as defective card, being a possible subject of fraud. The control means may check if a card with the given card identification code is a card which may be expected to be present in the series of randomly ordered cards, e.g. by comparing the card identification code with a list of card identification codes in a database of card identification codes. If the card with the card identification code is not expected to be present in the series of cards, the card may be identified as defective card, being a possible subject of fraud. The card identifying means may comprise one or more cameras, op-

tionally at least one camera sensitive for UV-light, e.g. for reading the card identification code. Optionally the identifying means comprises a lighting device, such as a UV-lighting device, e.g. for illuminating the card identification code which may be provided from UV-radiating ink.

[0035] Possibly the card identifying means and the card inspection means share the same camera or cameras. Optionally the card identifying means and the card inspection means are combined in one device, such as an optical device.

[0036] The card sorting means is adapted to bring each of the cards in the series of randomly ordered card to one of the card storage means. This card storage means is controlled by the control means. The card sorting means may be any kind of means adapted to guide and direct a card to its assigned card sorting means. It may make use of rollers and valves, or conveyor belts, such as vacuum belts, combined with interruption means to interrupt the connection of the card to e.g. the lower side of the conveyor belt, like air knives. The card sorting means may be any kind of means, as long as the cards are directed to the assigned card storage means.

[0037] The control means may be a control cabinet in which hardware and/or software may control the functioning of the device. The control cabinet may comprise processing units, memory units, units to generate a random number of sign, communication units to communicate with other devices and/or the internet via wire or wireless, a user interface including e.g. display screens, keyboards, mice, touchpads, touchscreens, etc. The control means may control the functioning of the card supply means to supply a series of randomly ordered cards, like printers or card recuperation units. The control means may control the card identifying means by e.g. converting the images taken by the camera or cameras into the identification elements of the cards being identified. The control means may control the inspection means. The control means may control the card storage means, e.g. by keeping track for each of the card storage means of the number of cards of any given type of cards of the set of cards to be generated. The control means may control the generation of the signs Ω chosen from the second group of M signs and/or the signs π chosen from the first group of N. The control means may control the assignment of each of the identified cards to one of the card storage means, card recuperation means and/or card removal means. The control means may control the card sorting means being adapted to direct each of the identified cards to the assigned card storage means, card recuperation means and/or card removal means, which may include the control of the functioning of e.g. conveyor belts and air valves and alike. The control means may control the synchronisation of all means, units and elements of the device. The cards, being identified and having a known position in the sequence of cards, will be brought to the assigned cards collecting means. The control means, knowing which identified card at what position

in the sequence of cards is brought to which cards storage means, can generate a sequence of rank and suit and/or one or more identification elements and/or card identities, per cards storage means. As such, for each set of cards generated by the system, the sequence of the cards in the set is known.

[0038] The control means may use different criteria to direct cards with a special function within the set of cards, to a card storage means. As an example, when the device is used to make sets of playing cards and the set of playing cards comprising a cut card, the control means may only assign a cut card to a card storage means if at least a given amount of playing cards have been assigned and directed to this card storage means. This amount may be a given number of cards, or a percentage of the total number of cards in the set of cards to be collected in the card storage means.

[0039] The assignment of a card storage means may be based upon the randomly generation of a sign Ω which is to equal the intra-group identifier m of the card storage means, and the selection of a card storage means for which the number of cards with identification element being equal to the identified identification element of said identified card has not reached a threshold value T. The latter means that a group identifier n is to be designated. The designated group identifier and the randomly selected intra-group identifier m together is sufficient to assign the card storage means to an identified card.

[0040] The intra-group identifier m is to match the random generated sign Ω . During the designation of the group identifier n, there is the possibility that more than one card storage means would meet the criterion that the number of cards with identification element being equal to the identified identification element of said identified card has not reached a threshold value T. The control means may use a strategy to select the group identifier n amongst the possible card storage means.

[0041] As an example, the first group of N signs may be a group with a hierarchy between the N signs. The control means may always assign the identified card to the card storage means having its group identifier equal to the sign with the highest rank in the hierarchy, for which card storage means it is true that the number of cards with identification element being equal to the identified identification element of said identified card has not reached a threshold value T. "The number of cards with identification element being equal to the identified identification element of said identified card has not reached a threshold value T" is hereafter referred to as the "equation". The hierarchy may decrease from the first to the Nth sign in the group of N signs.

[0042] As another example, the first group of N signs may be an ordered group of N signs, each sign having its position in this group of N signs. The control means may verify for the card storage means having its group identifier equal to the sign with a given position in the order of signs, if the equation is true. This first sign in the order of N signs has the priority position at that moment,

the corresponding sign being the preferred sign. If this equation is true, this card storage means with this preferred sign is assigned to the identified card. If the equation is not true, the control means may verify for the card storage means having its group identifier equal to the sign with the first adjacent position in the order of signs, if the equation is true. This verification continues until a card storage means is found for which the equation is true, or until the card storage means with its group identifier being the sign with the Nth position is reached. If the card storage means with group identifier being the last, Nth, sign in the ordered group of N signs does not fulfil the equation, the control means verifies the equation for the card storage means having its group identifier equal to the sign with the first position in the order of signs, and continues to verify the equation for the sign with the adjacent position in the group of N signs, until a card storage means meeting the equation is reached, or until the preferred sign with the priority position in the order of signs is reached.

[0043] This sequence is continued until the card storage means with its group identifier being the preferred sign having the priority position has a complete set of cards stored. When a complete set of cards is reached by the card storage means having its group identifier being the preferred sign on the priority position, the sign with the adjacent position in the order of N signs is taken as sign with the priority position, and the assignment of card storage means to identify cards continues. When the Nth sign is the preferred sign with priority position and the cards storage means with group identifier being the Nth sign has been provided with a complete set of cards, the sign with the first position in the group of N signs is taken as preferred sign with the priority position.

[0044] The assignment of a card storage means may be based upon the randomly generation of a sign π which is to equal the group identifier n of the card storage means, and the selection of a card storage means for which the number of cards with identification element being equal to the identified identification element of said identified card has not reached a threshold value T . The latter means that a group identifier m is to be designated. The designated intra-group identifier and the selected group identifier n together is sufficient to assign the card storage means to an identified card.

[0045] The group identifier n is to match the random generated sign π . During the designation of the intra-group identifier m , there is the possibility that more than one card storage means would meet the equation. The control means may use a strategy to select the intra-group identifier m amongst the possible card storage means.

[0046] As an example, the first group of M signs may be a group with a hierarchy between the M signs. The control means may always assign the identified card to the card storage means having its intra-group identifier equal to the sign with the highest rank in the hierarchy, for which card storage means the equation is true. The

hierarchy may decrease from the first to the Mth sign in the group of M signs.

[0047] As another example, the second group of M signs may be an ordered group of M signs, each sign having its position in this group of M signs. The control means may verify for the card storage means having its intra-group identifier equal to the sign with a given position in the order of signs, if the equation is true. This first sign in the order of M signs has the priority position at that moment, the corresponding sign being the preferred sign. If this equation is true, this card storage means with this preferred sign is assigned to the identified cards. If the equation is not true, the control means may verify for the card storage means having its intra-group identifier equal to the sign with the first adjacent position in the order of signs, if the equation is true. This verification continues until a card storage means is found for which the equation is true, or until the card storage means with its intra-group identifier being the sign with the Mth position is reached. If the card storage means with group identifier being the last, Mth sign in the ordered group of M signs does not fulfil the equation, the control means verifies the equation for the card storage means having its intra-group identifier equal to the sign with the first position in the order of signs, and continues to verify the equation for the sign with the adjacent position in the group of M signs, until a card storage means meeting the equation is reached, or until the preferred sign with the priority position in the order of signs is reached.

[0048] This sequence is continued until the card storage means with its intra-group identifier being the preferred sign having the priority position has a complete set of cards stored. When a complete set of cards is reached by the card storage means having its intra-group identifier being the preferred sign on the priority position, the sign with the adjacent position in the order of M signs is taken as the sign with the priority position, and the assignment of card storage means to identify cards continues. When the Mth sign is the preferred sign with priority position and the cards storage means with intra-group identifier being the Mth sign has been provided with a complete set of cards, the sign with the first position in the group of M signs is taken as sign with the priority position.

[0049] The assignment of a card storage means may be based upon the randomly generation of a sign π which is to equal the group identifier n of the card storage means and a sign Ω which is to equal the intra-group identifier m of the card storage means. The equation is checked for the card storage means with group identifier π and intra-group identifier Ω . If the equation is true, the card storage means with group identifier π and intra-group identifier Ω is assigned to the card. If the equation is false, a new sign π which is to equal the group identifier n of the card storage means and/or a new sign Ω which is to equal the intra-group identifier m of the card storage means is randomly generated, and this until a card storage means is found for which the equation is true.

[0050] The device according to the first aspect of the invention may be used to in a method to provide sets of cards according to a second aspect of the present invention.

[0051] According to a second aspect of the invention a method for providing sets of cards is provided, the method comprising the steps of:

- providing a device for providing sets of cards according to the first aspect of the invention;
- generating a series of randomly ordered cards;
- randomly assign each card to one of the plurality of card storage means.

[0052] According to this second aspect of the invention, a method to provide sets of cards is provided, wherein randomly assigning each card to one of the plurality of card storage means comprises the steps of

a) read the identification element of a card from the series of randomly ordered cards by the card identifying means, thereby providing an identified card;

b) generate by the control means a randomly generated sign Ω chosen from the group of M signs and/or generate by the control means a randomly generated sign π chosen from the group of N signs; and

c) assign to said identified card a card storage means for which

- the card storage means has an intra-group identifier being said sign Ω and/or the card storage means has a group identifier being said sign π ; and
- the number of cards with identification element being equal to the identified identification element of said identified card, has not reached a threshold value T, and;

d) direct the card to the selected card storage means by said card sorting means;

e) repeat steps a) to e).

[0053] According to some embodiments, a method to provide sets of cards wherein randomly assigning each card to one of the plurality of card storage means comprises the steps of

a) read the identification element of a card from the series of randomly ordered cards by the card identifying means, thereby providing an identified card;

b) generate by the control means a randomly generated sign Ω chosen from the group of M signs; and

c) assign to said identified card a card storage means for which

- the card storage means has an intra-group identifier being said sign Ω and

- the number of cards with identification element being equal to the identified identification element of said identified card, has not reached a threshold value T, and;

d) direct the card to the selected card storage means by said card sorting means;

e) repeat steps a) to e).

[0054] According to some embodiments, the method to provide sets of cards wherein randomly assigning each card to one of the plurality of card storage means comprises the steps of

a) read the identification element of a card from the series of randomly ordered cards by the card identifying means, thereby providing an identified card;

b) generate by the control means a randomly generated sign π chosen from the group of N signs; and

c) assign to said identified card a card storage means for which

- the card storage means has a group identifier being said sign π ; and
- the number of cards with identification element being equal to the identified identification element of said identified card, has not reached a threshold value T, and;

d) direct the card to the selected card storage means by said card sorting means;

e) repeat steps a) to e).

[0055] According to some embodiments, the method to provide sets of cards wherein randomly assigning each card to one of the plurality of card storage means comprises the steps of

a) read the identification element of a card from the series of randomly ordered cards by the card identifying means, thereby providing an identified card;

b) generate by the control means a randomly generated sign Ω chosen from the group of M signs and generate by the control means a randomly generated sign π chosen from the group of N signs; and

c) assign to said identified card a card storage means for which

- the card storage means has an intra-group identifier being said sign Ω and a group identifier being said sign π ; and
- the number of cards with identification element being equal to the identified identification element of said identified card, has not reached a threshold value T, and;

d) direct the card to the selected card storage means by said card sorting means;

e) repeat steps a) to e).

[0056] Optionally the steps b) and c) are repeated until for the card storage means has an intra-group identifier being said sign Ω and a group identifier being said sign π , the number of cards with identification element being equal to the identified identification element of said identified card, has not reached a threshold value T.

[0057] Because the series of cards are assigned to the card storage means based upon two random selection systems, the first being the randomly ordered series of cards, the second being the randomly generated sign Ω and/or π , the sequence of cards in the provide sets of cards is not known.

[0058] According to some embodiments, the device may be a device wherein the plurality of card storage means further comprises an overflow card storage means, the control means being adapted to assign an identified card to this overflow card storage means if all N card storage means identified by said intra-group identifier equalling the sign Ω comprises T cards with identification element being equal to the identified identification element of said identified card and/or if all M card storage means identified by said group identifier equalling the sign π comprises T cards with identification element being equal to the identified identification element of said identified card. In the method in step c), the overflow card storage means may be assigned to the identified card if all card storage means identified by said sign Ω comprises T cards with identification element being equal to the identified identification element of said identified card, or if all card storage means identified by said sign π comprises T cards with identification element being equal to the identified identification element of said identified card, or if all card storage means identified by said sign π and said sign Ω comprises T cards with identification element being equal to the identified identification element of said identified card.

[0059] As such, the interruption of the process is avoided due to cards which can no longer be directed to any of the card storage means identified by the sign Ω .

[0060] According to some embodiments, when generating a series of randomly ordered cards, the cards stored in overflow card storage means may be introduced in the series of randomly ordered cards. The disposal of cards in the overflow card storage means is thereby avoided. According to some embodiments, between step a) and b) an inspection means may be used to recognize defective cards in the series of randomly ordered cards, in step c) the card removal means is assigned to said defective card.

[0061] The defects may function as traces enabling cards to be recognised by defrauding persons, e.g. during a card game. Hence the evacuation of defective cards from the sets of cards may reduce the risk on fraud during the use of the set of cards being generated in the card storage means.

[0062] The control means may comprise counters to

count and memorise or store, for each card storage means and for each card with a given identification element in the set of cards to be generated, the number of cards with given identification element being provided to each of said card storage means. According to some embodiments, complete sets of cards may be removed from the card storage means. A complete set of cards means a set of cards comprising for each card with a given identification element, a predefined number or threshold number T of these cards. For the card storage means from which the set of cards is removed, for each card with given identification element, the control means resets the number of cards with said identification element to 0. For the card storage means from which the set of cards is removed, for each counter of cards with a given identification element, the control means resets the counters of the cards with the identification element to 0.

[0063] According to some embodiments, the generated series of randomly ordered cards may comprise at least reclaimed cards.

[0064] As such the number of cards being disposed is reduced.

[0065] According to some embodiments, the generated series of randomly ordered cards may comprise at least virgin printed cards, preferably provided by an inkjet printing device.

[0066] By using inkjet printing devices, the randomness of the cards in the series of cards can be increased, as the sequence of the cards being printed can be based upon a randomly generating printing instructions for the identity of the cards to be printed.

Brief Description of the Drawings

[0067] Fig. 1 illustrates schematically a device according to the first aspect of the invention.

Detailed Description of Embodiment(s)

[0068] A device 100 for providing sets of cards is schematically shown in figure 1. The device 100 comprises a card supply means, which in this embodiment comprises an ink jet printer 101 and two card recuperation units 102 and 103 and a conveyor belt 104. These printer and card recuperation units provide playing cards 200 on a conveyor belt 104, with the face side of the cards facing the conveyor belt surface. The conveyor belt 104 brings the series of randomly ordered cards, being a train of playing cards 200, to a vacuum belt 105; where the cards are sucked to the belt of the vacuum belt 105 with their back-side facing the belt of the vacuum belt 105. As such the face side of the cards 200 is visible for the cameras 106 and 107.

[0069] The cameras 106 and 107 are part of a card identifying means, which a card identifying means is adapted to read the identification element of each card in said series of randomly ordered cards; the images of the cameras 106 and 107 are provided to the control

means 108, where the rank and suit of each card is identified from the images taken. Optionally the images of the cameras 106 and/or 107 are used by a card inspection means, checking the cards for defects. To check for defects on the backside of the cards, optionally a further camera (not shown) is provided above the conveyor belt 104 immediately before the point where the cards are passed from the conveyor belt 104 to the vacuum belt 105.

[0070] The device 100 further comprises six card storage means, in which the identified cards of said series of randomly ordered cards are to be stored. The six card storage means are each identified by a group sign and an inter-group sign. There are three groups (hence $N=3$) identified by the letters A, B or C. Each group comprises two card storage means (hence $M=2$), identified by either 0 or 1. As such, there are six card storage means, being card storage means A0, A1, B0, B1, C0 and C1. Two further card storage means 111 and 112 are provided. Card storage means 111 is used as card removal means, the control means being adapted to assign defective card to this card removal means 111. Card storage means 112 is used as card reclaiming means, the control means being adapted to assign card to this card reclaiming means 112 for which the control means cannot assign any of the six card storage means, being A0, A1, B0, B1, C0 and C1.

[0071] As an example, for each card which is not a defective card, the control means generates a random sign π selected from the group consisting of A, B and C. The control means checks to which of the two card storage means $\pi 0$ or $\pi 1$ the identified card can be assigned. Such identified card can be assigned to a card storage means if the number of cards present in the card storage means with the identified identification element has not reached a threshold value T. as an example, in each card storage means a set of cards is generated comprising 8 decks of playing cards. An identified card with a given identification element can be assigned to a card storage means if the number of cards present in the card storage means with the identified identification element has not reached 8. As an example, the control unit selecting the card storage means from the two card storage means $\pi 0$ or $\pi 1$, may start with the card storage means with lowest ranking inter group sign (hence 0), and assigns the identified card to the card storage means $\pi 0$ if the threshold number for cards with this identification element has not been met. If the threshold value has been met, the control unit checks the number of cards with the given identification element in $\pi 1$. The control unit assigns the identified card to the card storage means $\pi 1$ if the threshold number for cards with this identification element has not been met. If also for $\pi 1$ the threshold value is reached, the control means assigns the card to the card reclaiming means 112. If the card was a defective card, the card is assigned by the control means to the card removal means 111.

[0072] As another example, similarly the control unit

generates a random sign Ω selected from the group consisting of 0 and 1. The control unit, sequentially, checks if the card can be assigned to the card storage means A Ω , B Ω or C Ω , and assigns the card to the first card storage means having a number of cards with the given identification element being less than the threshold value. If for all these card storage means the threshold value is reached, the control means assigns the card to the card reclaiming means 112. If the card was a defective card, the card is assigned by the control means to the card removal means 111.

[0073] It is understood that any other way to generate the sequence of the card storage means within a group of card storage means may be used. It is understood that any other way to generate the sequence of the groups for which the card storage means with a given intra-group identifier is checked, may be used.

[0074] Once the identified card is assigned to one of the six card storage means, the card reclaiming means 112 or the card removal means 111, the card sorting means will direct each of the identified cards to the assigned card storage means. in this example, the vacuum belt 105 will pass the cards along the card storage means, the card reclaiming means 112 and the card removal means 111. An activatable detaching means, such as an air knife or a couple of air knives 120, one air knife being present at each side of the vacuum belt, will timely pulse an air stream causing the vacuum between vacuum belt 105 and card being interrupted. As such, the card will fall into the assigned card storage means A0, A1, B0, B1, C0 or C1, the card reclaiming means 112 or the card removal means 111. The synchronisation of the moving of the vacuum belt and the pulsation of the air knives 120 may be controlled by control means 108.

[0075] Although the present invention has been illustrated by reference to specific embodiments, it will be apparent to those skilled in the art that the invention is not limited to the details of the foregoing illustrative embodiments, and that the present invention may be embodied with various changes and modifications without departing from the scope thereof. The present embodiments are therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein. In other words, it is contemplated to cover any and all modifications, variations or equivalents that fall within the scope of the basic underlying principles and whose essential attributes are claimed in this patent application. It will furthermore be understood by the reader of this patent application that the words "comprising" or "comprise" do not exclude other elements or steps, that the words "a" or "an" do not exclude a plurality, and that a single element may fulfil the functions of several means recited in the claims. Any reference signs in the claims shall not be construed as limiting the respective claims concerned.

The terms "first", "second", third, "a", "b", "c", and the like, when used in the description or in the claims are introduced to distinguish between similar elements or steps and are not necessarily describing a sequential or chronological order. Similarly, the terms "top", "bottom", "over", "under", and the like are introduced for descriptive purposes and not necessarily to denote relative positions. It is to be understood that the terms so used are interchangeable under appropriate circumstances and embodiments of the invention are capable of operating according to the present invention in other sequences, or in orientations different from the one(s) described or illustrated above.

Claims

1. A device for providing sets of cards, comprising:

- a card supply means to supply a series of randomly ordered cards
- a plurality of card storage means, in which the cards of said series of randomly ordered cards are to be stored;
- a control means adapted to randomly assign each card to one of the plurality of card storage means.

2. A device for providing sets of cards according to claim 1, further comprising:

- a card identifying means adapted to read the identification element of each card in said series of randomly ordered cards;
- a card sorting means, adapted to direct each of the identified cards to the assigned card storage means;

wherein the control means being adapted to assign each of the identified cards to one of the card storage means; and wherein

- said plurality of card storage means comprises N groups of M card storage means, N being an integer equal or more than 1, M being an integer equal or more than 2, each of said N times M card storage means is uniquely identified by a group identifier being a sign n selected from a first group of N signs and an intra-group identifier being a sign m selected from a second group of M signs;
- said control means is adapted to

- memorize the number of cards with given identification element being provided to each of said N times M card storage means, and
- randomly generate, for each card to be

directed to said plurality of card storage means,

- a sign Ω chosen from the second group of M signs and/or
- a sign π chosen from the first group of N signs; and

◦ assign each identified card to a card storage means for which

- the intra-group identifier m equals said sign Ω and/or the group identifier n equals said sign π ; and
- the number of cards with identification element being equal to the identified identification element of said identified card has not reached a threshold value T.

3. A device according to claim 2, wherein N is larger than 2, preferably N being 3.

4. A device according to any one of the claims 2 to 3, wherein M is 2 or 3.

5. A device according to any one of the claims 1 to 4, wherein the card supply means comprises at least one card printing unit.

6. A device according to any one of the claims 1 to 5, wherein the card supply means comprises at least one card recuperation unit to provide reclaimed cards to said series of randomly ordered cards.

7. A device according to any one of the claims 1 to 6, wherein the device comprises a card inspection means to recognize defective cards in said series of randomly ordered cards.

8. A device according to claim 7, wherein the plurality of card storage means further comprises a card removal means, said control means being adapted to assign defective card to said card removal means.

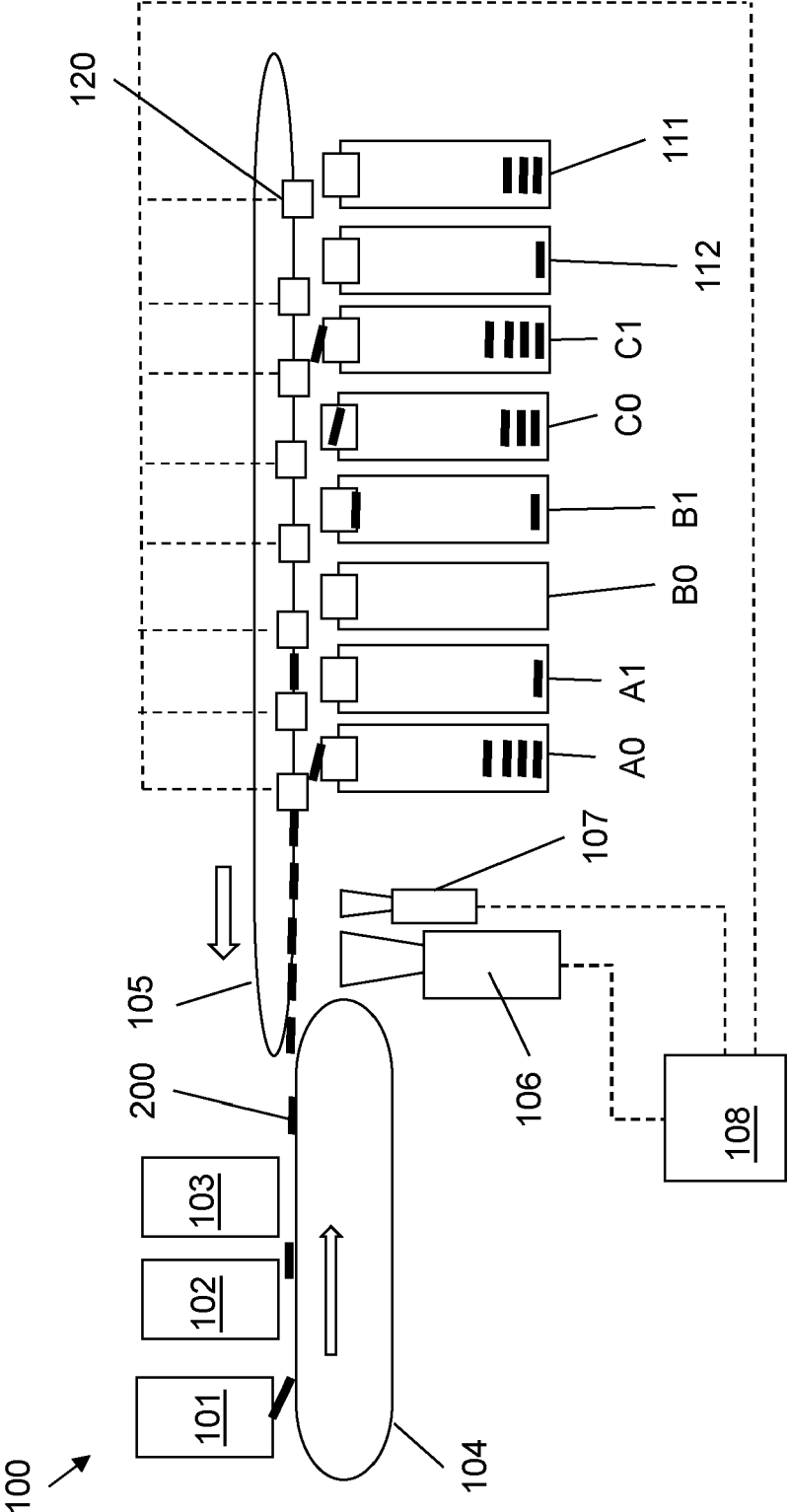
9. A method for providing sets of cards, comprising:

- providing a device for providing sets of cards according to any one of the preceding claims;
- generating a series of randomly ordered cards;
- randomly assign each card to one of the plurality of card storage means.

10. A method to provide sets of cards according to claim 9, wherein the provided device is a device according to any of the claims 2 to 4, randomly assigning each card to one of the plurality of card storage means comprises the steps

- a) read the identification element of a card from the series of randomly ordered cards by the card identifying means, thereby providing an identified card;
- b) generate by the control means a randomly generated sign Ω chosen from the group of M signs and/or generate by the control means a randomly generated sign π chosen from the group of N signs; and
- c) assign to said identified card a card storage means for which
- the card storage means has an intra-group identifier being said sign Ω and/or the card storage means has a group identifier being said sign π ; and
 - the number of cards with identification element being equal to the identified identification element of said identified card, has not reached a threshold value T, and;
- d) direct the card to the selected card storage means by said card sorting means;
- e) repeat steps a) to e).

11. A method according to any one of the claims 9 to 10, wherein the device is a devices according to claim 8, and wherein between step a) and b) an inspection means is used to recognize defective cards in the series of randomly ordered cards, in step c) the card removal means is assigned to said defective card.
12. A method according to any one of the claims 9 to 11, wherein complete sets of cards are removed from the card storage means and wherein for the card storage means from which the set of cards is removed, for each card with a given identification element, the control means resets the number of cards with said identification element to 0.
13. A method according to any one of the claims 9 to 12, wherein the generated series of randomly ordered cards comprises at least reclaimed cards.
14. A method according to any one of the claims 9 to 13, wherein the generated series of randomly ordered cards comprises at least virgin printed cards, preferably provided by an inkjet printing device.





EUROPEAN SEARCH REPORT

Application Number

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