

[54] SHEET-HOLDING DEVICE IN
SHEET-DISPENSING MACHINE

[75] Inventors: Masahiro Abe; Hiroshi Terada, both
of Himeji, Japan

[73] Assignee: Glory Kogyo Kabushiki Kaisha,
Hyogo-Ken, Japan

[22] Filed: Nov. 29, 1972

[21] Appl. No.: 310,552

[30] Foreign Application Priority Data

Nov. 29, 1971 Japan..... 46-97164
Nov. 30, 1971 Japan..... 46-112710
Nov. 30, 1971 Japan..... 46-96664

[52] U.S. Cl..... 221/6, 221/119, 221/278,
271/9

[51] Int. Cl..... B65h 3/44

[58] Field of Search..... 271/9, 158, 159; 221/6,
221/9, 14, 17, 119, 121, 122, 211, 278;
222/65, 66; 270/52, 58

[56]

References Cited

UNITED STATES PATENTS

2,594,499 4/1952 Rumph 270/58
2,729,379 1/1956 Wilcox et al..... 221/211 X
2,876,928 3/1959 Adams et al..... 221/122
2,952,376 9/1960 Orloff 221/122 X

3,130,602 4/1964 Nigrelli et al..... 271/9 X
3,322,027 5/1967 Forbes et al..... 221/278
3,361,295 1/1968 Marchant..... 221/122
3,366,276 1/1968 Fridley 222/66 X

FOREIGN PATENTS OR APPLICATIONS

431,897 7/1911 France 221/279
1,551,964 11/1968 France 221/211

Primary Examiner—Robert B. Reeves
Assistant Examiner—David A. Scherbel
Attorney, Agent, or Firm—Holman & Stern

[57] ABSTRACT

In a money dispensing machine in which notes of different denominations are stored in separate groups so that each desired amount of money may be released in a minimum number of the notes selected from such groups, a sheet holding device comprises a plurality of boxlike containers for holding the respective groups of notes in neat stacks. The containers are supported by a revoluble shaft in substantially annular arrangement in such a manner that the containers are successively revolved to a position where a note or notes of a particular denomination held in each container are carried away into the dispensing section of the machine. Several other embodiments of the invention are disclosed.

2 Claims, 7 Drawing Figures

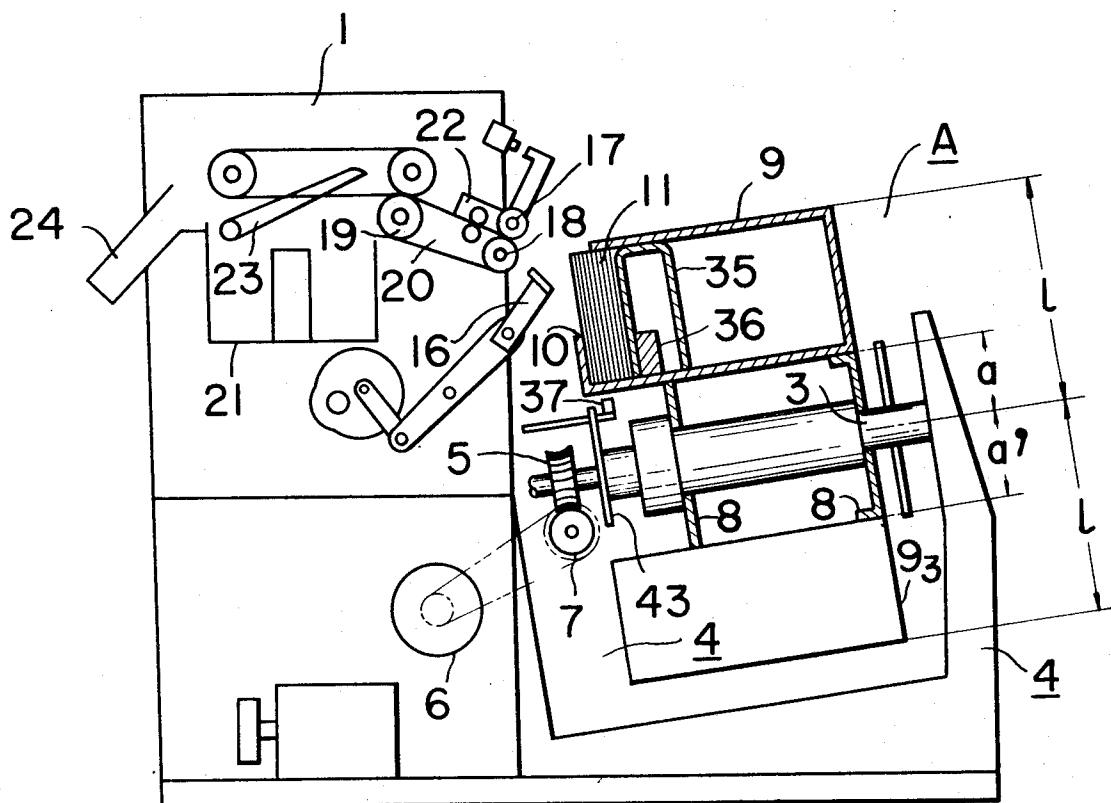


FIG. 1

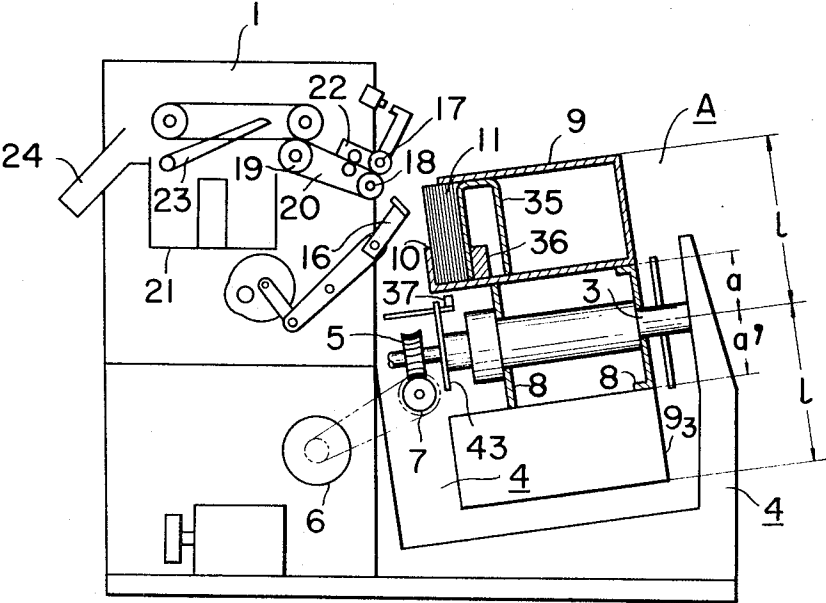


FIG. 4

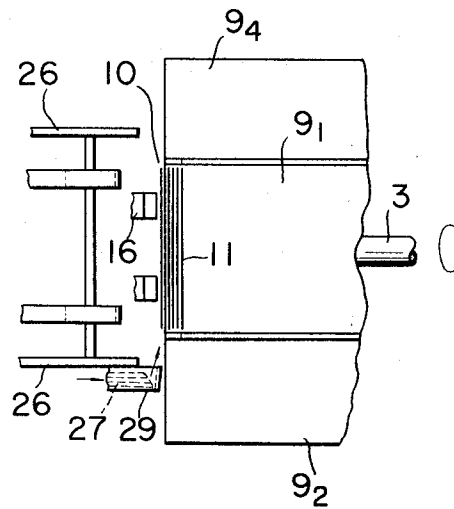


FIG. 5

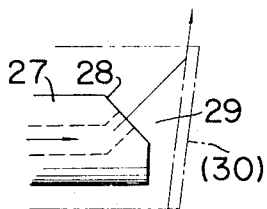


FIG. 6

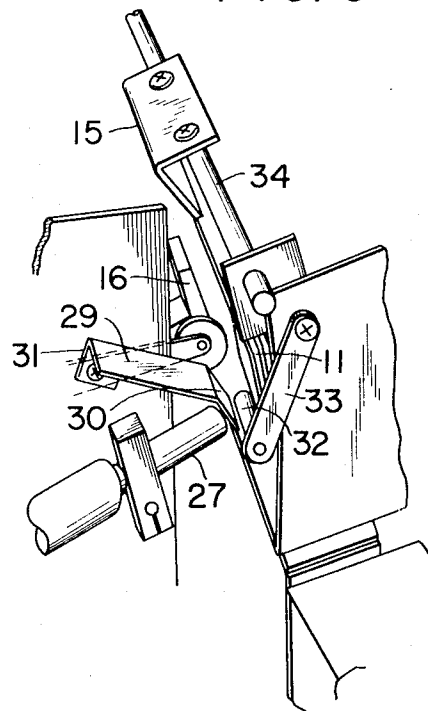
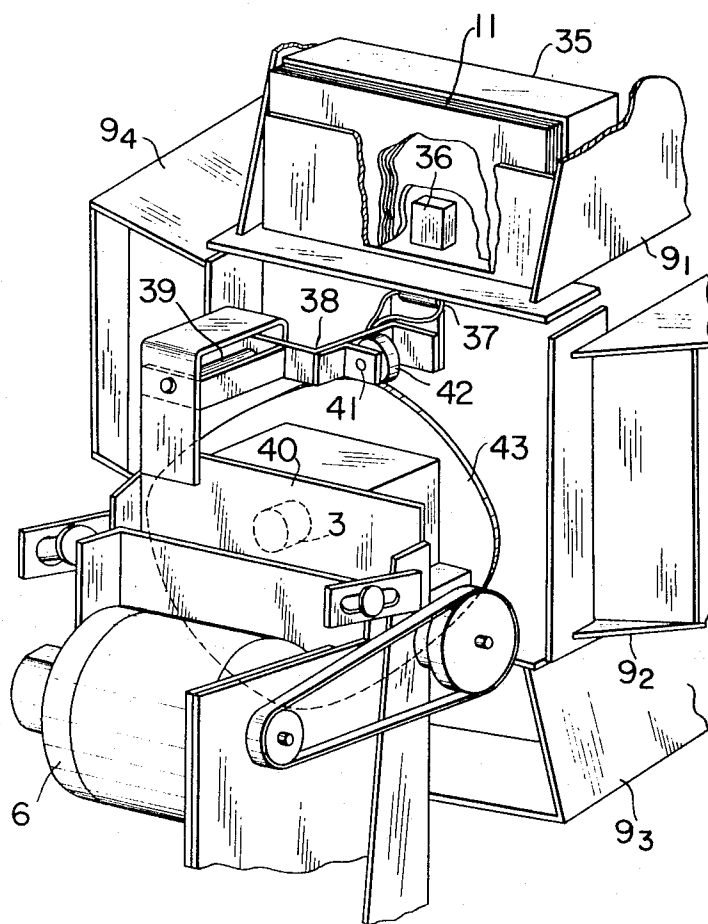


FIG. 7



SHEET-HOLDING DEVICE IN SHEET-DISPENSING MACHINE

BACKGROUND OF THE INVENTION

This invention relates generally to machines capable of dispensing a desired number of sheets selected from several groups of such sheets which may vary in size from group to group. More specifically, the invention is directed to improvements in a device for holding the different groups of sheets in the sheet dispensing machine. The sheets to be released by the sheet dispensing machine may include notes or paper money, tickets, cards and other sheets of paper or like material. It is to be understood that the notes to be released by the sheet dispensing machine as disclosed in this specification are exemplified by, and not limited to, those of the Japanese yen.

In a prior art money dispensing machine, for example, in which each desired amount of money is automatically released in a minimum number of notes of various denominations prepared in stock therein, a plurality of containers each containing a stack of notes of the same denomination have been arranged in side-by-side relationship, usually in the order of the denominations of the notes contained therein. Each time the dispensation of a certain amount of money is required, the containers containing the notes necessary for the dispensation of that amount of money have been successively moved to a position where a note or notes are automatically removed from each container to be delivered to the dispensing means of the machine.

However, according to this conventional arrangement of the note containers, a considerably large space is required within the money dispensing machine for the installation of the note containers, so that the overall size of the money dispensing machine must be correspondingly increased. This disadvantage becomes even more pronounced where the notes of a number of different denominations must be prepared in the machine. Moreover, it takes an unnecessarily prolonged length of time for the note containers to return to their initial positions each time they are moved to the aforesaid position for the removal of the desired notes therefrom.

SUMMARY OF THE INVENTION

It is, therefore, an object of the present invention to provide a novel and improved sheet holding device for use in a sheet dispensing machine in which sheets of different kinds and, perhaps, of different sizes are held separately in a plurality of sheet containers which are arranged substantially annularly, in such a manner that the sheet containers are turned around a common axis to be successively brought to a sheet-removal position where a sheet or sheets are automatically removed from each sheet container to be delivered to the sheet dispensing means of the machine. Thus, the space required for the installation of the sheet containers within the sheet dispensing machine is minimized, and the length of time necessary for the transfer of the sheet containers is also greatly reduced.

Another object of the invention is to provide a sheet holding device in a sheet dispensing machine in which an air nozzle is provided to blow air toward each sheet being removed from the sheet container in the aforesaid sheet-removal position and hence to prevent two or more sheets from being simultaneously removed from the sheet container. The air nozzle is supported by

a stationary part of the sheet dispensing machine so as not to hinder the motion of the sheet containers around a common axis. Conventionally, the air nozzle has been mounted on one side of the sheet container in the sheet-removal position. According to this conventional positioning of the air nozzle, however, the sheet containers cannot be turned around a common axis without being hindered thereby. The air nozzle secured to the stationary part of the sheet dispensing machine according to this invention may be provided with means for directing the flow of air therefrom exactly toward one edge of each sheet being removed from the sheet container in the sheet-removal position.

A further object of the invention is to provide a sheet holding device in a sheet dispensing machine in which means are provided for detecting the decrease in the number of sheets held in the sheet container in the sheet-removal position, the detecting means being associated with an alarm to give notice of the need for replenishment of the sheet container. The detecting means may be made movable relative to the sheet container in the sheet-removal position so as to be held in the optimum detecting position with respect to the sheet containers of various sizes successively carried to the sheet-removal position.

It is also an object of the invention to provide a sheet holding device particularly suitable for use in a money dispensing machine designed to dispense a desired amount of money in notes selected from the notes of various denominations prepared in stock therein.

According to the present invention, briefly stated in its perhaps broadest aspects, there is provided a sheet holding device in a sheet dispensing machine capable of dispensing sheets selected from a plurality of groups of sheets of different kinds, the sheet holding device comprising a plurality of sheet containers adapted respectively for holding the sheets of different kinds in neat stacks and arranged substantially annularly to minimize the space occupied thereby in the sheet dispensing machine, each of the sheet containers having an opening through which the sheets held therein are successively removed for dispensation, and revolvable support means for supporting the sheet containers in substantially annular arrangement in such a manner that the sheet containers are successively turned to a sheet-removal position where a desired number of the sheets therein are removed through said opening for dispensation.

The novel features which are believed to be characteristic of the present invention are set forth with particularity in the appended claims. The invention itself, however, both as to its construction and mode of operation, together with further objects and advantages thereof, will be best understood from the following description of several preferred embodiments thereof taken in connection with the accompanying drawings in which like reference characters designate like parts throughout the several views.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 is a side elevation, partly in diagrammatic form and partly in vertical section, showing a sheet holding device incorporated in a sheet dispensing machine and constituting a preferred embodiment of the invention;

FIG. 2 is a perspective view showing the sheet holding device of FIG. 1 in more detail;

FIG. 3 is a partly broken away, vertical sectional view of the sheet holding device of FIG. 1;

FIG. 4 is a fragmentary, diagrammatic top plan view of another preferred embodiment of the invention;

FIG. 5 is an enlarged top plan view showing in detail an air nozzle and a guide plate illustrated in FIG. 4;

FIG. 6 is a fragmentary, enlarged perspective view showing the device of FIG. 4 in more detail; and

FIG. 7 is a fragmentary, perspective view, with parts broken away, showing still another preferred embodiment of the invention.

DETAILED DESCRIPTION

Referring now to the drawings, and in particular to FIGS. 1 to 3 thereof, the sheet holding device A illustrated therein by way of a first preferred embodiment of the invention comprises a shaft 3 revolvably supported by a mount 4, the shaft 3 being inclined downwardly toward a sheet dispensing section 1 of well known construction for the best results. Fixedly mounted on one end of the shaft 3 is a worm wheel 5, which meshes with a worm 7 coupled to and driven by a motor 6 for imparting rotation to the shaft 3.

A pair of spaced-apart support members indicated at 8 are fixedly mounted on the shaft 3 for securely supporting a plurality of, four in this example, boxlike sheet containers 9₁, 9₂, 9₃ and 9₄ which are arranged substantially annularly with equal spacings and parallel to the shaft 3. These sheet containers are so positioned relative to the sheet dispensing section 1 that the sheets held in a stack in the uppermost sheet container, indicated at 9₁ in FIG. 2, are carried away therefrom one by one through its front opening 10 in a manner hereinafter described. It is assumed in this particular embodiment of the invention that the sheet containers 9 are adapted for holding notes 11 of 10,000-, 5,000-, 1,000-, and 500-yen denominations, respectively. It is therefore further understood that the dimensions of each sheet container 9 are so determined as to fit the size of the notes of the particular denominations contained therein.

The stack of notes 11 lying lengthwise in each sheet container 9 is urged toward the front end by a slidable weight 35 mounted therein. The lower half of the front end of each sheet container is closed, and the notes 11 are prevented from falling off the open upper half 10 of the front end by an L-shaped member 15 turnably mounted at the front end of a lid or cover 14 closing the top of each sheet container 9, the cover 14 being also turnably supported on its rear end by a pin 13, as best shown in FIG. 2. When the notes 11 are carried away from the sheet container at 9₁ into the sheet dispensing section 1, the L-shaped member 15 is turned upward to release the foremost note 11 in accordance with the prior art.

The construction of the sheet dispensing section 1 as diagrammatically illustrated in FIGS. 1 and 2 is conventional and is hereinafter described purely to make clear the advantages and features of the sheet holding device A according to this invention. The sheet dispensing section comprises a pair of turnable suction heads 16 arranged in side-by-side relationship, each of the suction heads 16 having a port at its extremity in communication through piping and valving with a suitable means such, for example, as a vacuum pump, not shown, capa-

ble of creating a desired degree of vacuum therein. In operation the suction heads 16 move into contact with the foremost note held in the sheet container at 9₁, pull the note upward therefrom by suction, and carry the same between two pairs of aligned rollers shown at 17 and 18. The note is then transported by a pair of conveyor belts 20 extending between the lower rollers or pulleys 18 and pulleys 19 and is dropped into a suitable receptacle 21 for dispensation. Detecting means are provided at 22 to make sure that the notes 11 are being conveyed one by one. In the event that two or more notes are carried simultaneously by the suction heads 16 onto the conveyor belts 20, a turnable arm 23 will be operated by the detecting means 22 to remove such notes into a separate receptacle 24.

Proceeding to the description of a mode of operation of the sheet holding device A, the motor 6 is operated to rotate the shaft 3 as dictated by a separate control, not shown, capable of operating the motor in accordance with an amount of money to be dispensed. The control for such operation of the motor 6 and hence of the shaft 3 is conventional and does not constitute a part of this invention. If it is supposed that the dispensation of 16,500 yen is now desired, the control will operate first to move the sheet container holding the notes of 10,000-yen denomination to the position indicated by the numerals 9₁ in FIG. 2. The suction heads 16 successively becomes operative to remove one 10,000-yen note therefrom in the manner previously mentioned and to carry the same to the rollers 17 and 18. Transported by the conveyor belts 20, this 10,000-yen note is dropped into the receptacle 21.

The motor 6 is operated again to rotate the shaft 3 so that the sheet container holding the notes of 5,000-yen denomination is moved to the position at 9₁. One of the 5,000-yen notes is taken away therefrom by the suction heads 16 and is successively dropped into the receptacle 21 through the above described procedure. Similarly, one note is removed from each of the other two sheet containers holding the notes of 1,000- and 500-yen denominations respectively. Thus, the notes totaling 16,500 yen are deposited in the receptacle 21. As the shaft 3 makes one complete revolution in this manner, the sheet containers are returned to their initial positions relative to the sheet dispensing section 1, ready for the delivery of the next desired amount of money.

FIGS. 4 to 6 illustrate another preferred embodiment of the invention, which is designed to ensure one-by-one removal of the sheets held in each of the sheet containers 9 as above explained with reference to FIGS. 1 to 3. As seen in FIG. 4, these sheet containers are arranged annularly around the shaft 3 so as to be revolved thereby. The pair of suction heads 16 also explained in connection with the first described embodiment of the invention are assumed to be turnably supported by the frame 26 of the sheet dispensing section 1 so as to be placed opposite the front opening 10 of one of the sheet containers at 9₁. An air nozzle is secured at 27 to the frame 26 by any suitable means, the air nozzle being communicated through piping and valving with a source of air in accordance with the prior art.

As shown in greater detail in FIG. 5, the front tip 28 of the air nozzle 27 is bent inwardly, that is, toward the sheets 11 exposed through the front opening 10 of the sheet container at 9₁. A guide plate 29 adapted for directing the stream of air from the air nozzle 27 toward

the exposed sheets 11 is screwed or otherwise secured at its end 31 to the frame 26, as best illustrated in FIG. 6. The opposite end 30 of the guide plate 29 is bent toward the front tip 28 of the air nozzle 27. A rod 32 on the free end of a turnable arm 33 is adapted for holding the stack of sheets 11 in position within each sheet container 9 in accordance with the prior art. Another rod 34, to which is secured the L-shaped member 15 explained already with reference to FIGS. 2 and 3, is revolvably supported by suitable means on each sheet container 9.

The second preferred embodiment of the invention being constructed as hereinbefore described, the L-shaped member 15 of the sheet container at 9₁ is turned upwardly when the foremost sheet held therein is pulled by the suction heads 16 as previously mentioned. Simultaneously, a stream of air is delivered by the air nozzle 27. The direction of this stream of air is first modified by the inwardly bent front tip 28 of the air nozzle itself and then by the bent end 30 of the guide plate 29, to aim at one edge of the foremost sheet about to be removed from the sheet container at 9₁. Only the foremost sheet is thus separated from the remaining stack of sheets in the sheet container. The sheet will thereafter be dropped into the receptacle 21 of FIG. 1 through the procedure set forth in connection with the first described embodiment of the invention.

Thus, by securing the air nozzle 27 and its guide plate 29 to the stationary frame 26 of the sheet dispensing section 1, the sheet containers 9 of the various sizes can be revolved without being hindered thereby. Moreover, the stream of air from the air nozzle 27 can be delivered at an optimum angle to the foremost sheet held in the sheet container at 9₁ thanks to its bent front tip 28 and the guide plate 29. It is also possible in this manner to reduce the overall size of the sheet dispensing machine.

A third preferred embodiment of the invention will now be described with reference to FIGS. 1 and 7. The sizes of the respective sheet containers 9₁ to 9₄ vary according to the sizes of the sheets, such as notes, held therein as previously mentioned. Since, however, the positions in which the suction heads 16 contact the foremost sheet in the sheet container at 9₁ and the positions of the rollers 17 and 18 adapted for receiving the successive sheet carried by the suction heads 16 are predetermined, the distance *l* between the axis of the shaft 3 and the top of each sheet container 9 must be unvaried. The distance *a* between the axis of the shaft 3 and the bottom of each sheet container 9 changes from container to container if the sizes of the respective sheet containers are different.

The slidable weight 35 within each sheet container 9 is hollowed as best shown in FIG. 1, and a permanent magnet 36 is housed therein so as to be in contact with the bottom surface of the sheet container. In a position suitably close to the bottom of the sheet container at 9₁, a reed switch 37 is fixedly mounted on one end of an L-shaped arm 38 and is electrically connected to an alarm of suitable type not shown in the drawings. The other end of the L-shaped arm 38 is turnably supported by a shaft or rod 30 extending parallel to the first mentioned shaft 3, the shaft 39 being supported by a stationary part 40 of the dispensing section 1. Still another shaft 41 is secured at 41 to the L-shaped arm 38 so as to be parallel to the second mentioned shaft 39, and a

cam follower 42 is rotatably mounted on this third shaft 41.

A cam wheel 43 is fixedly mounted on the first shaft 3 adjacent the front end thereof. The aforesaid cam follower 42 is in contact with the periphery of the cam wheel 43 whereby, as the shaft 3 rotates, the reed switch 37 moves up and down with the cam follower 42 in accordance with the contour of the cam wheel. It is important to note that the cam wheel 43 is so contoured as to move the switch 37 to the optimum position with respect to the bottom of the sheet container at 9₁ and to prevent the switch 37 from making contact with the sheet containers during revolution thereof.

In this third embodiment of the invention, constructed substantially as hereinbefore described, the slidable weight 35 in each sheet container 9 slides toward the front opening 10 thereof due to the inclination of the sheet container as the number of sheets held therein gradually decreases. When the sheet number reaches a predetermined limit, the magnet 36 within the slidable weight 35 comes sufficiently close to the switch 37 to actuate the same by its magnetism. The alarm electrically connected to this switch 37 will then become operative to warn the need for replenishment of the sheet container at 9₁ by means of a noise, visual effect, or the like. The limit of the sheet number at which the alarm is thus operated can be arbitrarily determined by proper preadjustment of the position of the switch 37 with respect to the course of movement of the magnet 36.

If the sheet container at 9₃, for example, must be brought to the position at 9₁ following the delivery of a sheet or sheets from the sheet container shown at 9₁ in the drawings, the motor 6 is set in motion as aforesaid to rotate the shaft 3. During this revolution of all the sheet containers 9, the switch 37 is retracted or lowered closer to the shaft 3 by the cam follower 42 following the contour of the cam wheel 43, thereby avoiding contact with the bottoms of the sheet containers. When the sheet container which has been at 9₃ is turned to the position at 9₁ for the delivery of the sheets held herein into the sheet dispensing section 1, the switch 37 may be raised to the optimum position with respect to the predetermined course of motion of the magnet within the slidable weight 35 of the particular sheet container now at 9₁. As indicated in FIG. 1, the switch 37 may be displaced through a distance corresponding to the difference between *a* and *a'* while the sheet container which has been at 9₃ is turned to the position at 9₁ as in the foregoing.

We claim:

1. A sheet-dispensing machine for dispensing sheets selected from a plurality of groups of sheets of different kinds such as a plurality of groups of monetary sheets of different monetary kinds and comprising:

a plurality of sheet-containers each for containing sheets of a specific monetary kind and having a sheet-dispensing end from which the sheets contained therein may be dispensed up to a predetermined limited quantity, said sheet-containers having dimensions corresponding to the dimension of the sheet of a respective monetary kind to be contained therein;

holding means operatively disposed in each container for continuously holding the sheets contained therein in a closely contacting parallelly-arranged stack and being adapted to follow the movements

of said stack in a direction toward the dispensing ends of each container as sheets are successively dispensed therefrom to a completion position when said predetermined limited quantity of dispensed sheets has been attained;

5 support means for supporting said sheet-containers in a substantially angular array so that successive containers in the array contain sheets having a monetary value of a pre-selected sequence of monetary values;

10 rotatable driving means for rotating said support means so as to bring the sheet-dispensing ends of sequentially selected ones of said sheet-containers to a sheet-dispensing position where a desired number of sheets container therein can be dispensed;

15 detecting means for detecting the decrease in the number of sheets contained in each of said sheet-containers as sheets are successively dispensed therefrom, said detecting means including magnetic means operatively associated with each of said sheet-containers and being adapted to move in accordance with the following movements of said holding means disposed therein, and switch means operatively associated with each of said containers so that as said holding-means completes a following movement to said completion position consequent upon the decrease of number of sheets contained in their respective one of said containers position that a sheet-dispensing position, said magnetic means is brought into operative association with said switch means and actuates the same to gener-

20

25

30

ate a signal representative of the fact that said predetermined limited quantity has been attained;

adjustable support means for supporting said switch means and operatively associated with said rotatable driving means, whereby said switch means is automatically adjusted in response to the different dimensions of said sheet-containers so that said signal may be correctly generated irrespective of which one of said containers is disposed adjacent said sheet-removing position;

sheet-dispensing means operatively associated with said sheet-containers for dispensing sheets from respective sequentially selected ones of said sheet-containers when the sheet-dispensing ends thereof are brought to said sheet-dispensing positions; and

sheet-receiving means for receiving the sheets dispensed from said sheet-dispensing means.

2. The device according to claim 1, in which said movable support means comprises an arm fixedly carrying said switch means on one end thereof and turnably supported on the other end by a stationary part of the sheet dispensing machine, a cam follower rotatably supported by said arm intermediate between both ends thereof, and a cam wheel rotatable with said sheet containers, said cam follower being in contact with the periphery of said cam wheel whereby the position of said switch means relative to the sheet container in said sheet-removal position is modified in accordance with the contour of said periphery of said cam wheel.

* * * * *

35

40

45

50

55

60

65