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(54) **Cash dispensing apparatus**

(57) An automatic cash dispensing apparatus which affords a high degree of security to banknotes includes means to feed banknotes along a flowline from a storage station to a delivery station with customer access.

The banknote storage station (SS) is contained in a security casing 7 of safe-like construction with an access door 8 to permit withdrawal of supply modules 1, 2, 3, 4 which include detachable magazines 5 with banknotes of different denominations.

The flowline FL for banknotes extends through an aperture 9 in the wall of the storage station SS. The banknote conveying means is all driven by a common motor M outside the storage station. Gears 35A, 35B which are part of a gear train 35, are disengageable so that gear 35B is withdrawn with the supply station which is on runners 37.

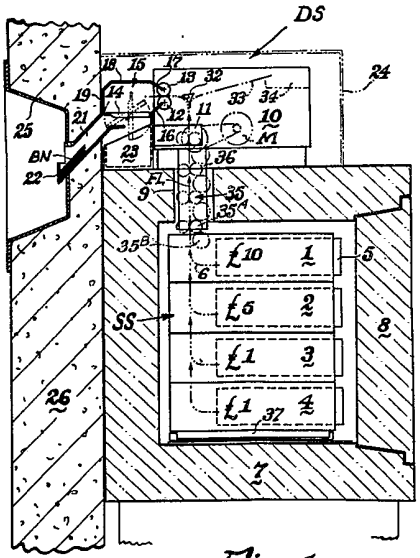

Fig 1.

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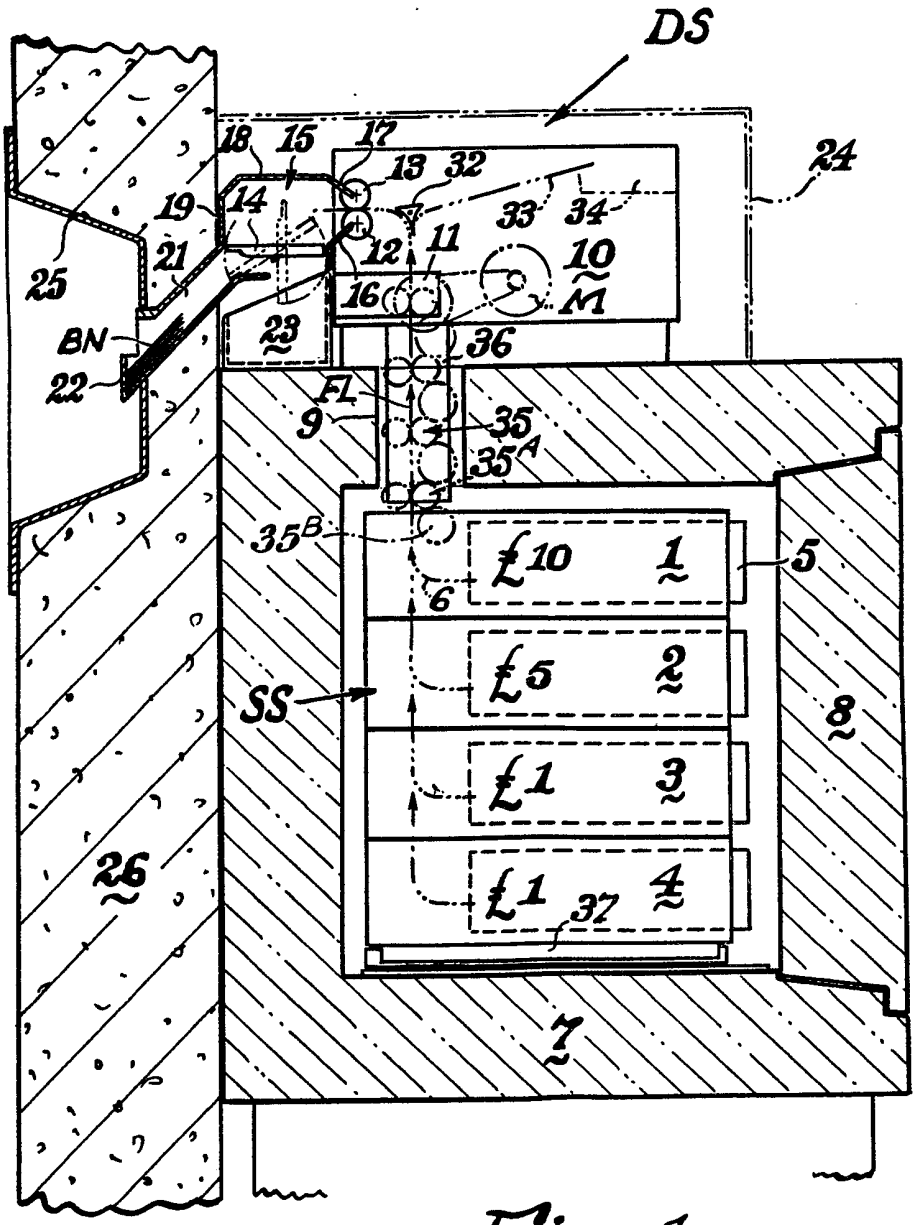
DS
18
15
17
13
32
24
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14
33
34
12
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M
25
21
16
23
BN
36
22
FL
9
35
35A
35B
£10
1
5
6
£5
2
SS
8
£1
3
£1
4
37
26
7

Fig 1.

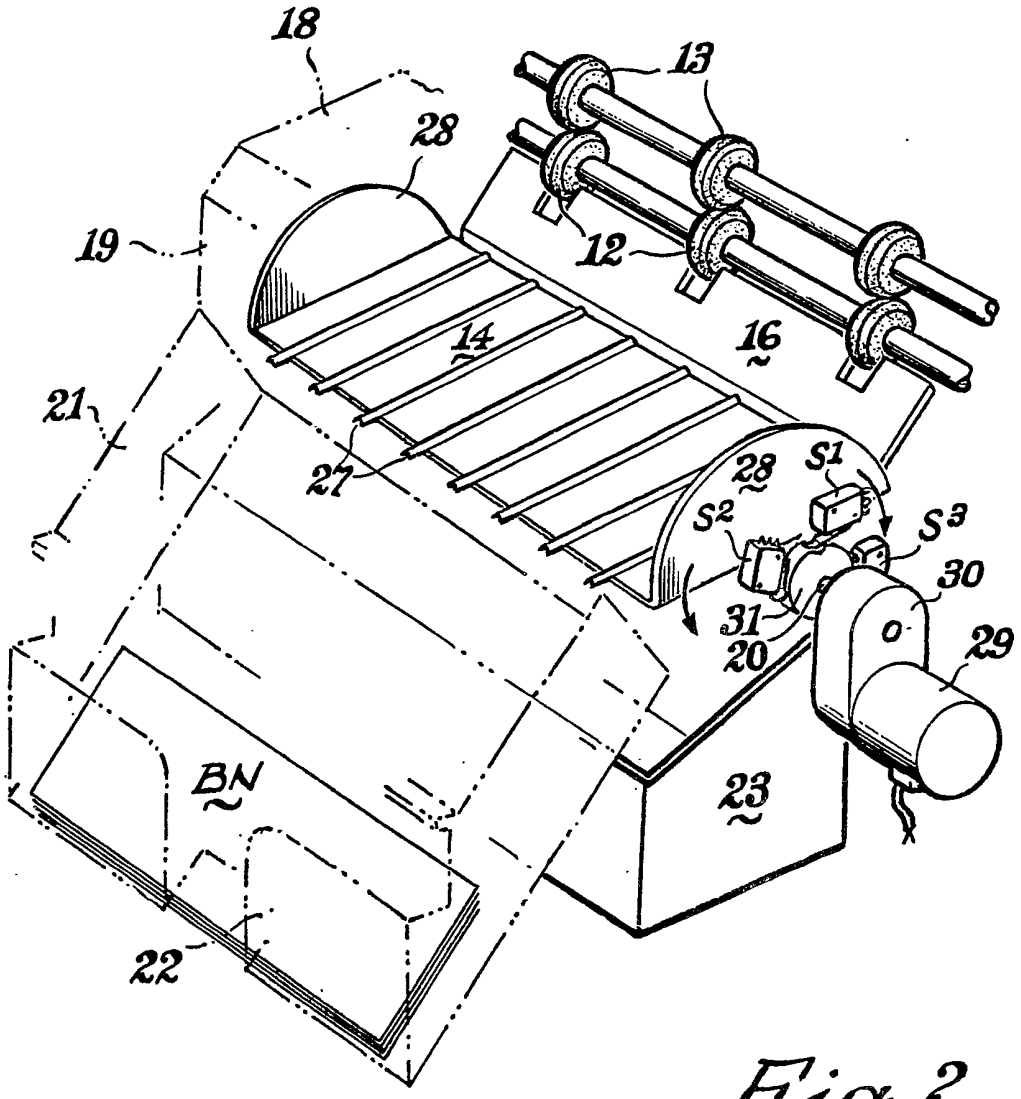

Fig 2.

SPECIFICATION

Improvements in cash dispensing apparatus

This invention relates to automatic cash dispensing apparatus and more especially to such apparatus including feeding means for feeding banknotes of one or more denominations from a storage station along a flowline to a delivery station from whence the banknotes are available to a user of the apparatus. The banknotes may be fed along the flowline one by one, or in packages of predetermined quantities with which the storage station is loaded.

Such apparatus, is well known per se, may be operated by a cashier within the confines of a bank, or by a customer for example, in response to an encoded authorisation document or device optionally in conjection with a keyboard capable of responding to a memorised security number or code unique to the customer. For such latter use, the apparatus is preferably installed adjacent to an outer wall of a bank and is arranged so that the banknotes are delivered through an aperture formed therein to an external facia panel associated with the bank wall and which also includes the keyboard and the delivery station.

Apparatus of the type referred to may serve to provide a 24 hour per day encashment facility for 7 days per week and to cater for such a service it follows that a large quantity of banknotes, having a high total monetary value, must be stored in the storage station so that the machine will be capable of operating for long period, e.g. throughout a weekend or holiday period, without the need for banknote replenishment.

It is therefore the prime object of the invention to provide an automatic cash dispenser which affords a high degree of security to the banknotes.

According to the present invention, cash dispensing apparatus comprises a storage station including a supply of banknotes, a delivery station at which dispensed banknotes are available to a user of the apparatus, and means for feeding banknotes from the supply stack and conveying them along a flowline to the delivery station, characterised in that the storage station is contained within a security casing and the delivery station is disposed externally thereof, an aperture incorporating said flowline being provided in a wall of the security casing.

Preferably the delivery station is disposed above said security casing and said aperture is formed in an upper wall of said security casing.

Preferably the feeding and conveying means of the storage station and the conveying means of the delivery station are driven by a common driving means disposed externally of said casing.

Preferably the driving means comprises a driving motor within the delivery station and adapted to drive said feeding means within said casing by a power transmission means via a disengagable mechanical coupling thereby to permit withdrawal of the storage station. The power transmission may be effected by any suitable means but conveniently it comprises a train of serially arranged gear wheels, the disengageable mechanical coupling being effected by unmeshing a pair of adjacent gear wheels. Alternatively said coupling may comprise an axially disengageable clutch type device or a belt drive.

Preferably the delivery station includes means for counting banknotes arranged along the flow line and double detection means to detect the simultaneous passage of plural banknotes conveyed from the storage station.

Preferably the delivery station includes means for temporarily storing banknotes fed along the flowline, the said means being arranged, interalia, to permit incorrectly fed banknotes, for example simultaneously fed banknotes, to be diverted away from the delivery point. In a convenient construction a pivotally mounted horizontal receiving platform is provided to build up a stack of banknotes and thereafter, upon the attainment of the correct quantity, to move to a second position and to deliver said stack to the delivery chute. However, if the quantity is incorrect the platform is rotated in an opposite direction to a third position to deliver the stack to a reject bin for subsequent removal.

Preferably detector devices of well known type are provided at strategic positions within the delivery station to monitor the flow of banknotes and to feed back respective output signals to an overall sequence controller of the dispenser.

Preferably the aperture formed in the security casing is of minimal cross-section to permit accommodation therein of the banknote conveying and power transmission means.

The security casing may comprise any suitable material used in conventional safe constructions, for example it may be wholly metallic, reinforced concrete or a combination thereof.

A non-limiting example of the invention relating to a customer operated three-denomination through-the-wall type banknote dispenser will now be described with reference to the accompanying drawings in which:

Figure 1 is a diagrammatic vertical cross-section and

Figure 2 is a perspective view of certain of the components illustrated in Figure 1.

The apparatus essentially comprises two distinct spacially disposed assemblies, viz a storage station, generally indicated SS, and a delivery station indicated DS, which are connected together by a flowline FL.

The storage station comprises a plurality of substantially identical tiered supply modules 1,2,3 and 4 of known construction which are adapted to contain stacks of banknotes of denominations £10, £5, £1 and £1 respectively.

The specific construction of the storage station and associated feed means are not critical to the invention and are not shown in detail, but essentially each supply module includes a detachable magazine 5 adapted to contain 3000 banknotes on-edge together with a spring-biassed pressure plate member to feed the banknotes in a leftward direction towards an oscillatory-suction-arm type feeder. In operation the said arm serves to remove the lower edge of the frontmost banknote from the stack and

feed it into a nip formed between a pair of driven seizing rollers which serve to pull the banknote from the stack and feed it in a horizontal direction along a primary flowline 6. Thereafter the banknote is conveyed in an upward direction into the flowline FL by means of a plurality of serially arranged driven conveying rollers not shown. Banknotes are selectively removed from the lower supply modules in a similar manner and are propelled in an upward direction to the flowline FL by the conveying rollers of downstream modules.

The storage station SS is contained in a security casing 7 of safe-like construction, which includes an access door 8 to permit withdrawal of the supply modules on anti-friction runner means 37, and a vertical aperture 9 of rectangular cross-section to provide clearance for the conveying mechanism associated with the flowline FL. In the described embodiment the walls of the casing have a thickness of 160 mm. and comprise reinforced concrete externally cladded with steel plates.

The delivery station DS comprises a delivery and conveying module 10 which incorporates a sensing module 11 and a driving motor M for the apparatus.

Banknotes of all denominations are conveyed along the flowline FL and through the sensing module 11 which creates a 'count' output pulse upon the passage of each single banknote and also creates a "double-detection" output pulse upon the simultaneous passage of plural banknotes. These signals are routed to a sequence controller and counter unit (not shown) to record the quantity of banknotes fed along the flowline FL and to actuate the mechanism described below. The said controller also receives information indicative of the quantity and denomination of the banknotes required by a user of the apparatus, and acting on this information controls the supply of vacuum to the respective feeders by means of solenoid-operated airflow valves.

The banknotes are propelled along the flowline FL and through the module 10 by a succession of serially arranged conveying rollers (not shown) which are in turn driven from the driving motor by a gear train. The said gear train comprises gear wheels fixedly mounted to the respective rollers along the flowline together with intermediately disposed idler gears to rotate the rollers in unison with the flowline.

The rollers disposed within the aperture 9 together with their associated gear train generally indicated by symbol 35 are mounted upon a depending sub frame assembly 36 which extends into the interior of the casing. The lower gear wheel 35A of the said gear train is arranged to engage with the upper gear wheel 35B of the gear train of the £10 denomination supply modules and which in turn extends the drive to the other three modules, thereby to drive the suction feeding arms and conveyor rollers of all of the supply modules. It will thus be appreciated that upon withdrawal of the storage station from the security casing the power transmission thereto will be automatically disconnected by the disengagement of the above mentioned lower and upper gear wheels. Conversely, power transmission will be re-established upon the complete insertion of the supply modules.

After passing through the sensing module 11 the bank-notes are turned through a right-angle by driven conveying rollers until they finally emerge from the module 10 between an ultimate pair of rollers 12 and 13, and are deposited onto a pivotally mounted receiving platform 14 forming the lower component of a receiving chamber 15.

The receiving chamber 15 further comprises a pair of divergent castellated entry plates 16 and 17; the latter of which is integrally attached to a roof plate 18, and a side plate 19 in the manner shown in Figure 1. End plates, not shown, are attached to the extremities of the above mentioned plates to form a unitary box-like structure and also to provide bearings for a horizontal shaft 20 upon which is mounted the platform 14. Angularly disposed with respect to the receiving chamber 15 there is provided a downwardly inclined gravity cute 21 of rectangular cross-section which terminates at its lower extremity at a vertical flange 22.

Disposed below the receiving chamber 15 there is provided a removable collecting bin 23 for rejected banknotes.

The delivery station, comprising the module 10, the receiving chamber 15, and the collecting bin 23, are contained in a ventilated casing 24 which includes various lockable access doors (not shown), to permit removal and replacement of the collecting bin and to enable servicing of the module etc. to be effected. It will be appreciated that large sums of money are not contained in the casing 24 and accordingly special security, apart from the controlled use of keys, is not required.

The lower end of the gravity chute 21 and the flange 22 are incorporated within a facia panel assembly 25 which is recessed into a cavity formed in the outer wall 26 of a bank. The facia panel also includes various user-input devices which are well known per se and form no part of the invention.

While the above described configuration of the delivery point is particularly suitable on account of its simplicity, other known types may be employed, for example, a drawer or rotary drum of known construction.

If it is desired, access to the delivery point by the customer or machine-user may be controlled by a slidable plate or some other movable device which, in a first position, denies access to the delivery point but which in a second position permits such access, movement to the second position preferably being under the control of a device sensitive to the delivery of a desired and correct number of banknotes.

Additional constructional details of, and the means for rotating, the receiving platform 14 will now be described with particular reference to Figure 2.

The working surface of the platform is provided with ridges 27 as shown, to assist in the transference of banknotes into the gravity chute, and also upstanding semi-circular side flanges 28 to prevent skewed banknotes from contacting the end panels of the receiving chamber.

The shaft 20, upon which is mounted the platform 14, is rotated from a normal horizontal position as shown by means of a reversible electric motor 29 via

the medium of a reduction gear box 30. Actuation of the motor is controlled by three switches S1, S2 and S3 which are opened and closed by means of a cam 31 fixedly mounted to the shaft 20. S1 serves to 'home' the platform to its normal horizontal positon; S2 serves as an anti-clockwise limit switch to arrest operation of the motor when the ridges 27 contact the working surface of the chute and S3 serves as a clockwise limit switch to arrest operation of the motor when the platform assumes a vertical position. The two extreme positions of movement are indicated by chain-dotted lines in Figure 1.

Operation of the apparatus

The general operation of the apparatus will be obvious from the above description, but the essential feature resides in the fact that a predetermined quantity of banknotes are fed from the respective modules and are deposited upon the receiving platform and are formed into a pile. Thereafter, the platform is rotated in an anti-clockwise direction so that the working surface thereof aligns with the chute and the bundle of banknotes descend by gravity down the chute to the vertical flange 22 for removal by a user. In the eventuality of the simultaneous passage of plural banknotes, the sensing means arrests feeding, and after the banknotes arrive at the platform 14 it is rotated to a vertical position so that the bundle so far accumulated is deposited into the collecting bin 23; finally the platform is returned to its horizontal position and a repeat feeding cycle is instigated.

Various sensors of known type may optionally be provided to monitor the correct flow of banknotes and bundles thereof through delivery station. Furthermore, presence detector may be provided to actuate an indicator lamp or other warning device when a bundle of banknotes BN arrives at the delivery point thereby to remind the user to remove the bundle.

Further modifications and alternatives may be incorporated within the apparatus without departing from the intended scope of the invention. For example, a pivotal divertor device 32, under the control of the sensing module 11, may be provided to divert plural banknotes and feed them along a secondary flowline 33 into a reject bin 34 disposed within the module 10. Such an arrangement effectively serves to cull out adhered-together bank notes and thereby to reduce the quantity of banknotes deposited in the collecting bin 23.

As an alternative to the above described gear train 35 within the casing aperture 9, a belt of the internally notched type may be used as a power transmision means. For example, such a belt may be adapted to run between a suitable notched pulley rotationally mounted on the subframe 36 and a second such pulley upon the £10 denomination supply module 1 (viz upon the shaft adapted to bear the gear wheel 35B of the above described embodiment). To disengage the storage station it is only necessary to slide the belt from either of the pulleys.

It will thus be seen that by means of this invention the possibility of obtaining material quantities of banknotes by forcible means is substantially eliminated because the storage station is contained in a high security casing.

CLAIMS

1. Cash dispensing apparatus comprising a storage station including a supply stack of banknotes, a delivery station at which dispensed banknotes are available to a user of the apparatus, and means for feeding banknotes from the supply stack and conveying them along a flowline to the delivery station, characterised in that the storage station is contained within a security casing and the delivery station is disposed externally thereof, an aperture incorporating said flowline being provided in a wall of the security casing.

2. Cash dispensing apparatus as claimed in claim 1 wherein said delivery station is disposed above said security casing and said aperture is formed in an upper wall of said security casing.

3. Cash dispensing apparatus as claimed in claim 1 or claim 2 in which the feeding and conveying means of the storage station and the conveying means of the delivery station are driven by a common driving means disposed externally of said casing.

4. Cash dispensing apparatus as claimed in claim 3 in which said driving means comprises a driving motor mounted within the delivery station and adapted to drive the feeding and delivery means for said storage station via disengageable power transmission means.

5. Cash dispensing means as claimed in claim 4 in which said disengageable power transmission means comprises a train of serially arranged gear wheels.

6. Cash dispensing apparatus as claimed in claim 4 in which said disengageable power transmission means comprises belt drive means.

7. Cash dispensing apparatus as claimed in any of the preceding claims in which the storage station is slidably mounted within said security case.

8. Cash dispensing apparatus as claimed in any one of the preceding claims in which the storage station includes a plurality of supply stacks of banknotes, said feeding means being adapted to feed banknotes selectively from said stacks into said flowline.

9. Cash dispensing apparatus as claimed in any one of the preceding claims in which the delivery station includes means for counting banknotes conveyed completely along said flowline.

10. Cash dispensing apparatus as claimed in claim 9 in which said delivery station also includes means for detecting the simultaneous passage of a plurality of banknotes along said flowline.

11. Cash dispensing apparatus as claimed in any one of the preceding claims in which the delivery station terminates at an inclined delivery chute from one end of which banknotes are available to a user of the apparatus.

12. Cash dispensing apparatus as claimed in claim 11 in which upstream of said chute there is provided a temporary storage means.

13. Cash dispensing apparatus as claimed in

claim 12 in which said temporary storage means comprises a platform which is normally horizontal but tiltable from that position to a second position to deposit banknotes thereon onto said chute.

14. Cash dispensing apparatus as claimed in claim 13 in which said platform is tiltable alternative to a third position to deposit banknotes thereon into a storage means.

15. Cash dispensing apparatus as claimed in claim 1 in which the banknotes in the supply stack are stored in prepacked bundles each containing a predetermined quantity of banknotes, said feeding and conveying means being adapted to deliver to a user a single one of said prepacked bundles.

16. Cash dispensing apparatus substantially as hereinbefore particularly described and as illustrated in the accompanying drawings.

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