April 8, 1958 H. SCHMIDT 2,829,475

SHEET DISPENSING APPARATUS

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Fig. 1

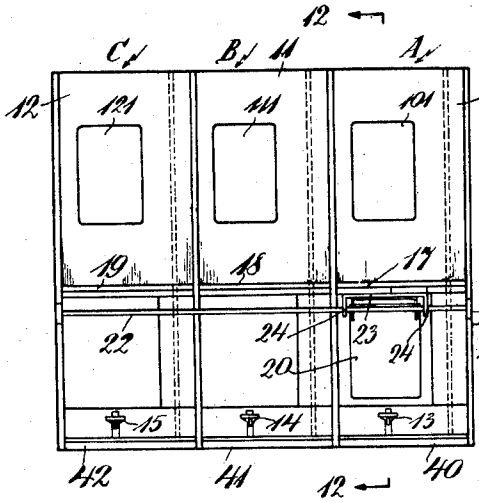


Fig. 2

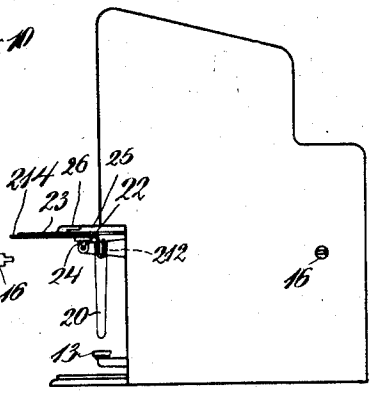
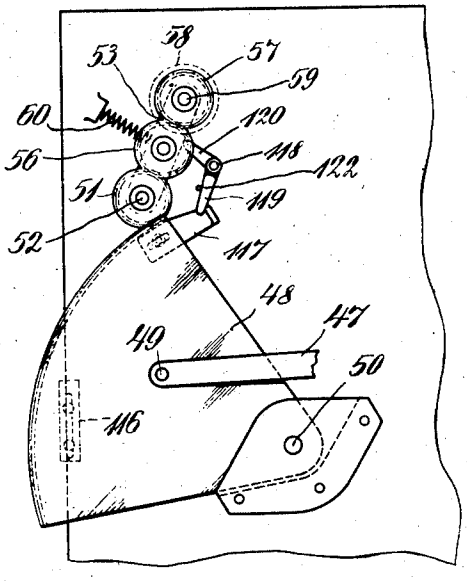


Fig. 11



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Fig. 5

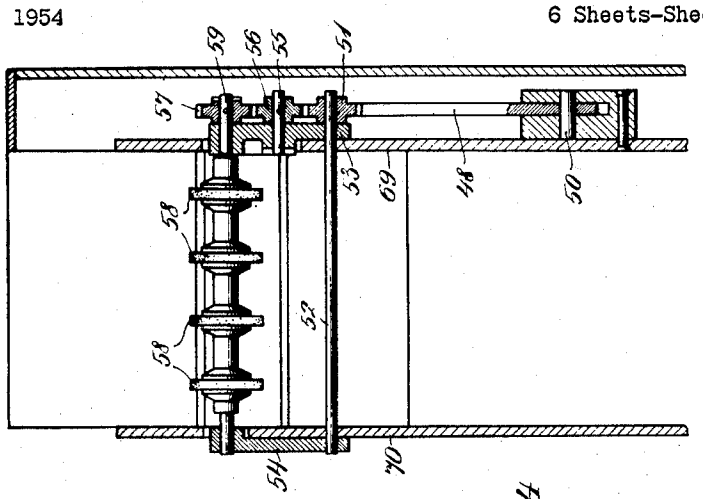
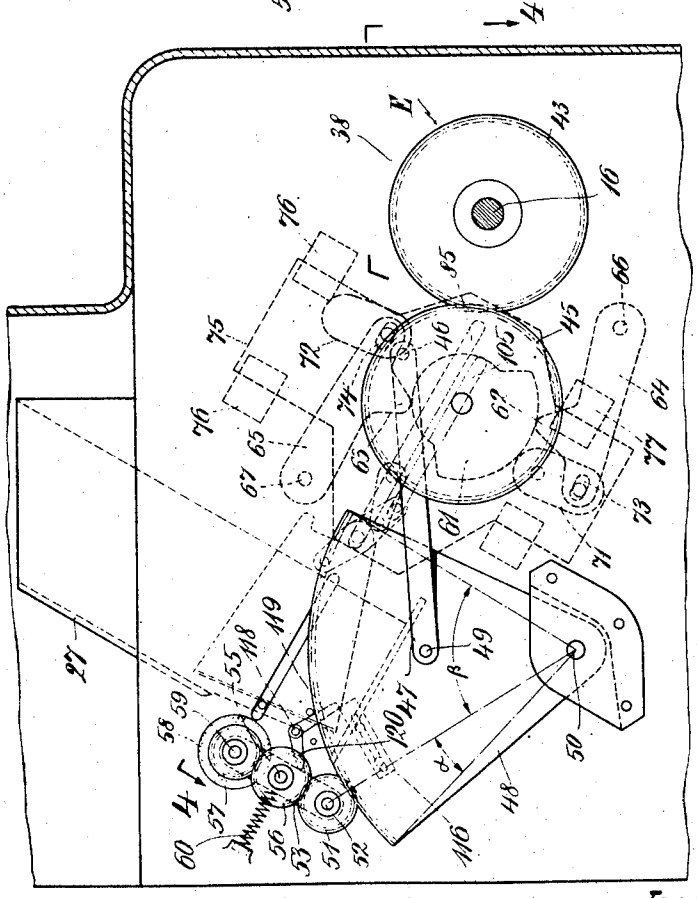


Fig. 3



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Fig. 4

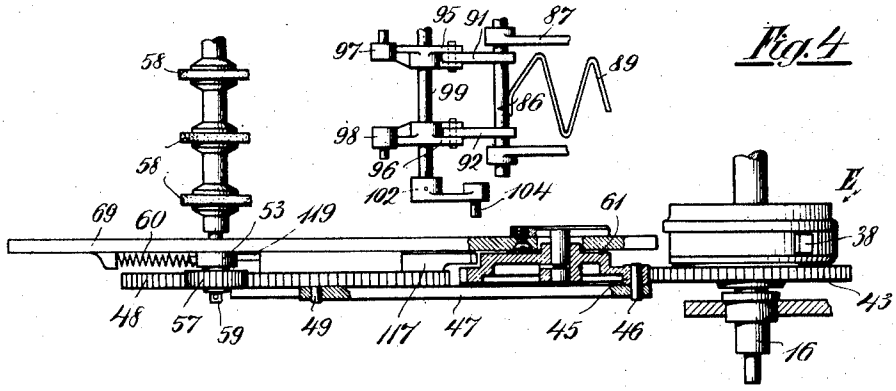
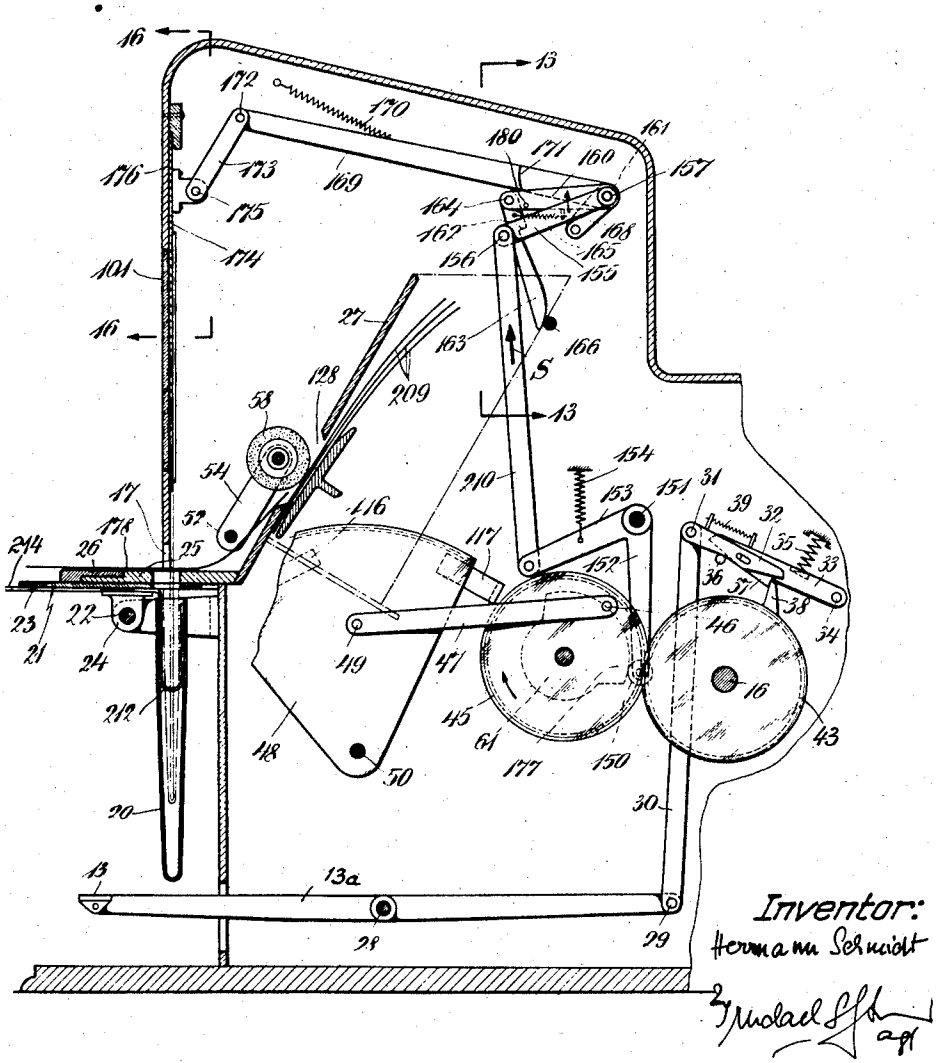


Fig. 12



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Fig. 7

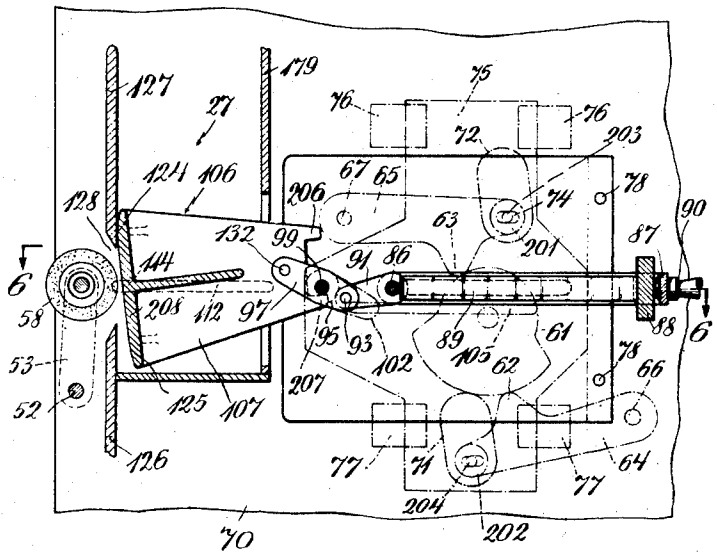
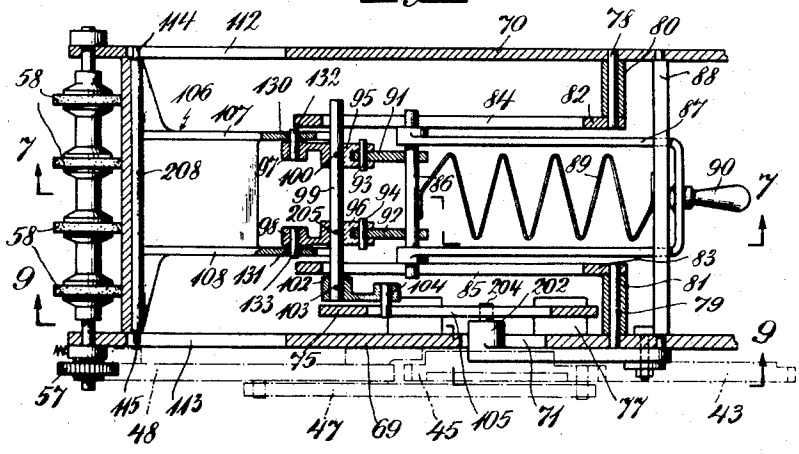


Fig. 6



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Fig. 9

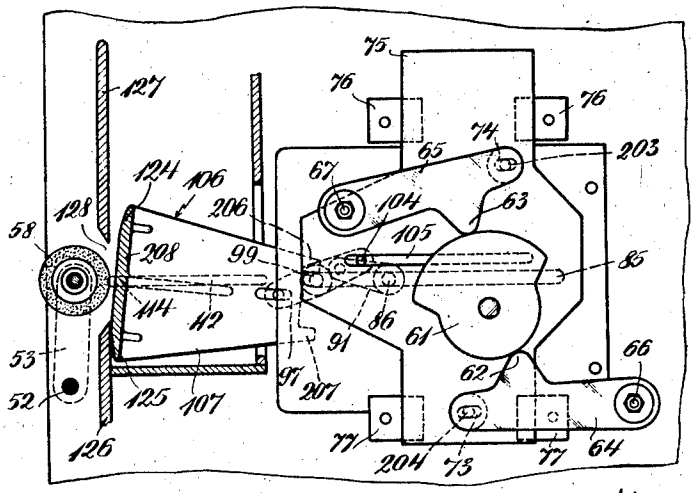


Fig. 8

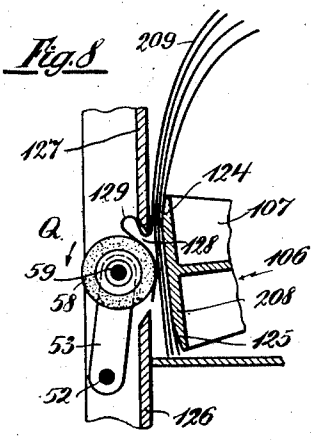


Fig. 10

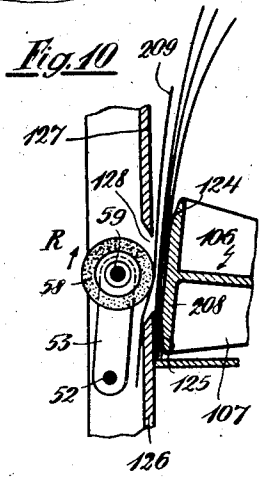


Fig. 14

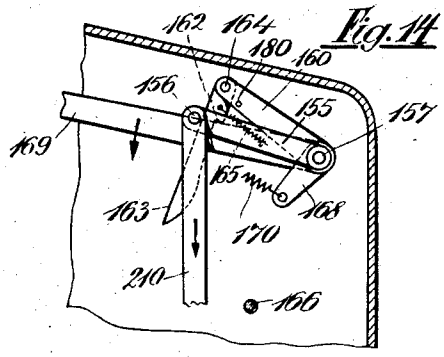
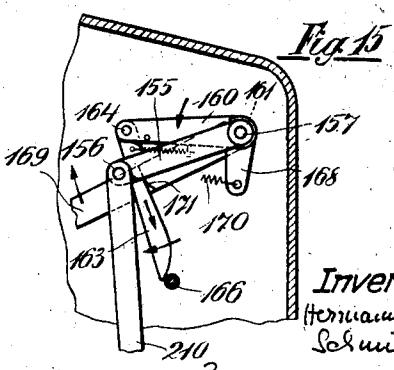


Fig. 15



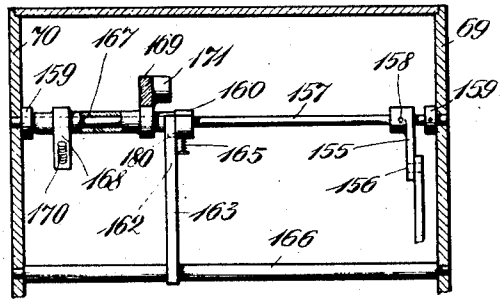
Inventor:
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SHEET DISPENSING APPARATUS

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Fig. 13



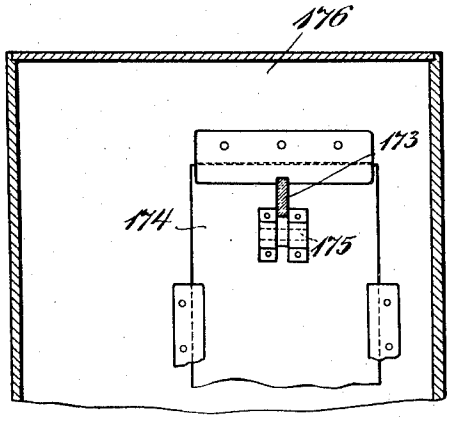
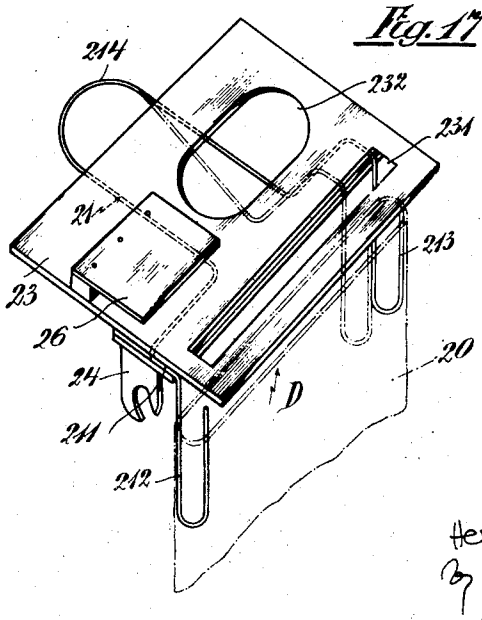


Fig. 16

Fig. 17



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United States Patent Office

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SHEET DISPENSING APPARATUS

Hermann Schmidt, Ludwigsburg, Germany

Application July 28, 1954, Serial No. 446,361

Claims priority, application Germany August 5, 1953

18 Claims. (Cl. 53—120)

The present invention relates to sheet dispensing apparatus and more particularly to an apparatus for dispensing flexible sheets, such as paper money.

It is one object of the present invention to provide an apparatus for dispensing flexible sheets which reliably dispenses a single sheet of a stack of sheets.

It is another object of the present invention to provide a dispensing means which first moves in one direction to form a loop in a sheet, and then moves in an opposite direction to dispense the sheet.

It is a further object of the present invention to provide sheet holding means for clamping a stack of sheets in such manner that the sheet dispensing means may dispense a single sheet while the remaining sheets are firmly held by the holding means.

It is a still further object of the present invention to provide a clamping member shiftable between one position in which the middle portion of a stack of sheets is clamped while the dispensing means form a loop in one end portion of the uppermost sheet, and a second position in which a stack of bills is clamped at an end portion, while the uppermost sheet is dispensed.

It is also an object of the present invention to provide means for pushing dispensed bills into a receiving container.

It is an important object of the present invention to provide a bill dispensing apparatus which may be combined with a coin dispensing apparatus to constitute a currency dispensing apparatus.

With these objects in view the present invention mainly consists in a sheet dispensing apparatus which comprises, in combination, movable sheet dispensing means; supporting means supporting the sheet dispensing means for movement in opposite direction; movable sheet holding means located opposite the sheet dispensing means so that the sheet dispensing means are adapted to engage a sheet held by the sheet holding means, the sheet holding means being movable between a first position for holding a sheet, and a second position for releasing the sheet; first operating means for moving the sheet holding means between the first and second positions; second operating means for moving the dispensing means first in one direction and then in an opposite direction; and actuating means for actuating the first and second operating means in a predetermined sequence so that the sheet holding means is in the first position when the sheet dispensing means moves in the one direction for forming a loop in one end portion of the sheet, and is in the second position when the movable sheet dispensing means moves in the opposite direction for dispensing the sheet released by the sheet holding means in the second position.

Preferably, the sheet dispensing means are rotary friction disks which are supported on movable supporting means by which they are moved toward and away from a stack of sheets. The sheet holding means preferably include two fixed members defining a dispensing slot, and a clamping member which is shifted by the first operating means between a first position in which it clamps the stack

of sheets to one of the fixed members and a second position in which it clamps the stack of sheets to the other fixed member.

The first operating means which move the clamping member preferably include a rotary cam disk and control means operated by the cam disk to shift the clamping member.

The second operating means preferably include a reciprocated toothed segment which meshes with gear means connected for rotation to the rotary dispensing means so that reciprocation of the toothed segment effects first rotation of the rotary dispensing means in one direction, and then in the opposite direction for consecutively forming a loop in a bill and then dispensing the bill.

Preferably third operating means are provided for shifting the movable supporting means of the rotary dispensing means toward and away from the stack of bills, the third operating means preferably including a pair of abutments on the toothed segment and a lever operated by the abutments and shifting the movable supporting means.

The cam disk which is an element of the first operating means is preferably used for actuating means for pushing a dispensed bill or sheet into a receiving container.

The actuating means preferably include a motor driven drive shaft, and a coupling device on the shaft which is actuated by manually operated means to connect the operating means to the drive shaft for performing a dispensing operation.

Preferably separate units are provided for bills of different currency denominations, each unit comprising a dispensing apparatus of the above described type.

A carrier for a single receiving container or bag is preferably provided for all units, and is shifted between the units to receive bills dispensed by a dispensing unit.

Preferably the bill dispensing apparatus according to the present invention is combined with a coin dispensing apparatus to form a currency dispensing apparatus. It is preferred to provide in such currency dispensing apparatus a common totalizer for totalizing and indicating the amount of currency dispensed in the form of bills and coins.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

Fig. 1 is a front view of the bill dispensing apparatus according to the present invention;

Fig. 2 is a side view of the embodiment shown in Fig. 1;

Fig. 3 is a side view of the disepensing mechanism on an enlarged scale;

Fig. 4 is a fragmentary sectional view on line 4—4 in Fig. 3;

Fig. 5 is a fragmentary side view, partly in section, of the mechanism shown in Fig. 3;

Fig. 6 is a sectional view taken on line 6—6 of Fig. 7;

Fig. 7 is a sectional view taken on line 7—7 in Fig. 6;

Fig. 8 is a fragmentary sectional view taken on line 7—7 in Fig. 6 and showing a first operational position;

Fig. 9 is a sectional view taken on line 9—9 in Fig. 6;

Fig. 10 is a fragmentary sectional view corresponding to Fig. 8 and showing another operational position of the mechanism;

Fig. 11 is a side view of a constructive detail;

Fig. 12 is a sectional view taken on line 12—12 in Fig. 1 and showing the device on an enlarged scale;

Fig. 13 is a sectional view taken on line 13—13 in Fig. 12;

Fig. 14 is a fragmentary view showing a detail of Fig. 12 on an enlarged scale and in a different operational position;

Fig. 15 is a fragmentary view corresponding to Fig. 14 and showing a further operational position;

Fig. 16 is a sectional view taken on line **16—16** in Fig. 12; and

Fig. 17 is an isometric view of a constructive detail of the embodiment shown in Fig. 12.

Referring now to the drawings, and more particularly to Figs. 1 and 2 which show a preferred embodiment of the bill dispensing apparatus according to the present invention, three similar units are arranged beside each other, the unit A being provided for dispensing five dollar bills, the unit B being provided for dispensing ten dollar bills, and the unit C being provided for dispensing twenty dollar bills. Each unit includes a housing **10**, **11**, **12**, respectively, the housings provided with windows **101**, **111**, and **121**, respectively, through which the bills stored in the storing containers of the units may be viewed from the outside. The units A, B, and C have bottom plates **40**, **41**, **42** which project forwardly toward the operator. Dispensing keys **13**, **14**, and **15** are arranged above the projecting bottom plates, and are pressed down for dispensing a single bill of the bills stored in the respective unit.

It is possible to actuate the dispensing mechanisms in the interior of the units by the manual pressure exerted on the keys, but according to a preferred embodiment of the present invention the manual actuation of the dispensing keys **13**, **14** and **15** releases a motor driven dispensing mechanism. The drive means for the apparatus, which may for instance be an electro-motor and a suitable transmission, are not illustrated in the drawings, in which only a drive shaft **16** is shown which consists of as many shaft portions as units are provided, all shaft portions being connected for rotation to constitute the drive shaft **16** which passes through all three units. It will be understood that the drive shaft **16** may be driven by any suitable motor.

When one of the keys **13**, **14**, or **15** is actuated, a bill passes through one of the slots **17**, **18**, **19**, and according to a preferred embodiment of the invention a receiving container is provided for receiving dispensed bills. Preferably the receiving container is a bag **20**, see Fig. 1, 12 and 17, and means are provided for pushing a dispensed bill into the bag **20** as will be described hereinafter. The receiving bag **20** is mounted on a carrier which is slidable on the supporting rail **22** so that the receiving bag **20** can be used with any one of the units, and is shifted to a position in front of the dispensing slots **17**, **18**, **19**, respectively, before a bill is dispensed from one of the units. It is contemplated to provide means for automatically shifting the receiving bag **20** between its position when a push button is operated.

The receiving bag is mounted on a carrier D, which will now be described with reference to Fig. 17. The carrier D includes a plate member **23** which has two lateral guide members **24** which are provided with holes or slots for receiving the supporting rail **22** so as to be slidable on the same. The plate member **23** is formed with a slot **231** through which a bill is pushed into the bag **20** which is shown in dash and dot lines in Fig. 17. The plate member **23** is further provided with an elongated opening **232** through which a spring **21** passes which is secured to the plate member **23** at **211** and has two end portions bent to itself so as to form open loops **212** and **213** onto which the bag **20** is slipped. It will be understood that the spring **21** is first compressed into the position shown in dash and dot lines to permit attachment of the receiving bag **20**, whereupon the spring is released to hold the bag. The elongated opening **232** permits bending of the spring **21** at its yoke portion **214**. The loop portions **212** hold the bag open, as best seen in Fig. 12.

A holding member **26** is provided on the plate member **23**. As best seen in Fig. 2, a projecting table member **25**, secured to the housing, projects into the slot defined by the plate members **23** and **26** so that pivoting of the carrier D about the rail **22** is prevented.

The dispensing of a bill will now be described with reference to Figs. 2 to 12. The dispensing mechanism of the unit A is illustrated, but it will be understood that the units B and C are provided with identical dispensing devices which may be adapted to larger size bills, if this is required by the type of currency dispensed by the apparatus.

A coupling device E is arranged on the motor driven drive shaft **16** and includes one part secured to the drive shaft **16** for rotation, and another part which is freely turnable on shaft **16** and is only connected for rotation to shaft **16** if the coupling device E is shifted from its released position to a coupling position.

The coupling device E of the unit A is actuated by the previously mentioned dispensing key **13**, fixed on a lever **13***a* which is pivotally mounted on a pin **28**. A link **30** is pivotally connected by a pin **29** to the inner end of lever **13***a*, and pivotally connected at **31** to a bracing lever **32**. A pin fixed on a holding lever **33** engages an elongated slot in the bracing lever **32**. The holding lever **33** is turnably mounted at **34** in the housing and is urged downwardly by a spring **35**. Another spring **39** tends to pull the bracing lever **32** and the holding lever **33** together in a scissor-like motion. A stop **36** limits downward movement of the movable elements. The holding lever **33** has a projection **37** which is engaged by a projecting member **38** which is part of the coupling device E.

When the key **13** is depressed, the link **30** and the bracing lever **32** raise the holding lever **33** so that the member **38** is released which under the action of a spring, not shown, engages by a pawl portion a ratchet wheel, not shown, of the coupling device E so that the coupling device is moved into a coupling position in which the freely turnable part of the coupling device is connected to shaft **16** for rotation. The coupling device E and the above-described lever system effect a single rotation, or if desired a plurality of rotations, whenever the coupling device is shifted to coupling position by the key **13**, regardless of whether the key **13** is depressed for extended time, or immediately released. It will be understood that any coupling device which produces at least one complete revolution, whenever actuated, may be used in the construction of the present invention.

With the part of the coupling device which is freely rotatable on the shaft **16** when the coupling device is released, a drive gear **43** is fixedly connected so that the drive gear **43** performs a complete revolution whenever key **13** is actuated. A gear **45** meshes with drive gear **43** and has a pin **46** fixed thereto which turnably supports one end of a connecting rod **47**. The other end of connecting rod **47** is turnably connected to a toothed segment **48** which is turnable on a shaft **50**. Consequently, rotation of gears **43** and **45** will effect rocking movement of the segment **48**.

A pinion **51** which is mounted on a shaft **52** in the housing walls **69** and **70**, see Figure 5, meshes with the toothed peripheral portion of the segment **48**. The shaft **52** has end portions projecting through the housing walls **69** and **70** and secured to bearing plates **53** and **54**. The pinion **51** also meshes with an intermediate pinion **56** which is turnably mounted on a short shaft **55** in the bearing plate **53**. Intermediate pinion **56** meshes with a pinion **57** which is fixedly secured to a shaft **59**. Shaft **59** is turnably mounted in the bearing plates **53** and **54**. The shaft **59** carries a set of friction discs **58** which are preferably made of rubber and serve for frictionally engaging a bill during a dispensing operation, as will be described later on. A spring **60** urges the bearing plate

53 and 54 together with the parts supported thereon into the operational position shown in Fig. 3.

Two abutment members 116 and 117 are secured to the toothed segment 48 as best seen in Fig. 11. The abutment members 116 and 117 cooperate with the arm 119 of an angular lever 119, 120 which is turnably mounted in the housing at 118. The other arm 120 of the angular lever engages in a predetermined operational position the bearing plate 53 and raises the same until the stop 122, see Fig. 11 limits such movement.

The previously mentioned gear 45 is fixed to a cam disc 61, as best seen in Figs. 3 and 4. The cam disc 61 cooperates with two control levers 64 and 65 which have projecting cam follower portions 62 and 63 and are turnably mounted on pins 66 and 67. The control levers 64 and 65 are provided at their free ends with projecting portions 201 and 202 in which guide pins 203 and 204 are mounted, see Figs. 7 and 9. The projecting portions 201 and 202 pass through oval openings 71 and 72 in the housing wall 69, see Fig. 6. The guide pins 203 and 204 project into elongated slots 73 and 74 of a control slide member 75 which is guided in guiding means 76 and 77 secured to the inner surface of the housing wall 69.

As best seen in Figs. 6 and 9, two holding plates 82 and 93 are fixedly secured to the housing walls 69 and 70 by means of bolts 78 and 79 and bushings 80 and 81. The holding plates 82 and 83 are provided with slots 84 and 85 into which the end portions of a rod 86 projects. Rod 86 is mounted on a U-shaped support 87 which passes through a transverse supporting member 88. A spring means 89 is secured at one end thereof to the supporting bar 88 and at the other end to the rod 86 and tends to move the U-shaped support 87 to the left in Fig. 6. A handle 90 is secured to the U-shaped support 87 so that it can be pulled back against the action of the spring 89 with the ends of rod 86 sliding in the slots 84 and 85 of the holding plates 82 and 83.

Two links 91 and 92 are turnably mounted on the rod 86 and are pivotally connected by pins 93 and 94 to the arms 95 and 96 of two-armed levers 95, 97 and 96, 98. These two-armed levers are fixed to a shaft 99 by pins 100 and 205. A lever 102 is fixed to one end of shaft 99 by a pin 103 and has on its free end a fixed projecting pin 104 which engages the slot 105 of the control slide member 75, see also Figure 9.

A clamping member 106 includes two side walls 107 and 108 which are provided at their inner ends with projecting abutments 206, 207 defining a recess for receiving the shaft 99 so that the projecting abutments 206, 207 limit movement of the clamping member 106. A clamping plate 208 which preferably has a slightly arcuate front face, is secured to the side walls 107 and 108. The upper and lower clamping edges 124 and 125 of the clamping plate 208 serve for clamping bills during a dispensing operation. Pins 114 and 115 are secured to the lateral ends of the clamping plate 208 and are guided in slots 112 and 113 of the housing walls 70 and 69. The side walls 107, 108 of the clamping member 106 are formed with bores 130 and 131 into which the pivot pins 132 and 133 project which are secured to the lever arms 97 and 98.

A storing container 27 is provided for storing bills which are to be dispensed from unit A, and as best seen in Figs. 6 and 7 includes two plates 126 and 127 which define a dispensing opening 128. Wall means 179 of the bill storing container 27 are provided with an opening through which the clamping member 106 passes. Preferably at least one plate 127 is adjustable.

The operation of the bill dispensing unit will now be described:

When the dispensing key 13 is depressed, the coupling device E is moved to its coupling position so that the drive gear 43 performs a single complete revolution regardless of whether the key is held depressed, or immediately released. Consequently, the cam disc 61 turns a single complete revolution, when key 13 is depressed.

In the position of rest, that is when the machine is not operated and no dispensing key is depressed, the clamping member 106 is in the first clamping position shown in Figs. 7 and 8 in which a stack of bills 209 is pressed by the clamping edge 124 of the clamping member 208 against the inner face of the plate 127. When the clamping member 106 is in this position, the angular lever 119, 120 is in the position shown in Fig. 3 so that the bearing plates 53 and 54 are pivoted by the spring 60 into the lower position thereof in which the friction discs 58 press against the bills 209, see Figs. 8 and 10.

At the begin of the turning of the gear 45, the connecting rod 47 moves to the right in Figs. 3 and 4 into a retracted dead center position. During this movement of the connecting rod 47, the segment 48 is turned through an angle α in clockwise direction as shown in Fig. 3. During turning of the segment 48 through this angle, the pinion 57, the shaft 59, and friction disks 58 are turned through pinions 51, 56 in counterclockwise direction as indicated by the arrow Q in Fig. 8. During such turning movement, the friction discs 58 rotate counterclockwise while in engagement with the uppermost bill so that the lower portion of the uppermost bill 209 is pulled back and a loop 129 is formed in the bill between the friction disc 58 and the plate 127. As shown in Fig. 8, the lower edge of the bill is pulled up and away from the edge of plate 126, while the loop passes through the opening 128 between the plates 126 and 127. During this operation the angular lever 119, 120 slides on the upper face of the abutment 116, as best seen in Fig. 3, to hold the bearing plates 53, 54 in a position in which the friction disks 58 engage the bills.

Continued rotation of the gear 45 beyond the dead center position of the connecting rod 47 turns segment 48 in counterclockwise direction as shown in Fig. 4 so that pinion 57 turns in clockwise direction, and the friction discs 58 also turn in clockwise direction as indicated by the arrow R in Fig. 10. In the dead center position of the connecting rod 47 the clamping member 106 is shifted shortly before the reversed rotation of friction discs 58 starts so that the clamping edge 125 presses the pile of bills 209 against the plate 126, while the clamping edge 124 releases the bills. Consequently rotation of the friction discs 58 in clockwise direction downwardly moves the uppermost bill 209, which is the only bill not clamped between the clamping member 106 and the clamping plate 126. Since the lower end portion of the uppermost bill 129 has been pulled into the opening 128 during the previous counterclockwise rotation of the friction discs 58, the clockwise rotation of the friction discs 58 now pushes the uppermost bill 209 out of the opening 128 along the outer face of the plate member 126. The friction discs 58 are in engaging position as long as the segment 48 moves through an angle $\alpha+\beta$ in counterclockwise direction. Approximately at the end of the turning movement, the abutment 117 engages the arm 119 of the angular lever 119, 120 with its projection and pivots the angular lever 119, 120 into the position shown in Fig. 11, in which the angular lever 119, 120 pivots the bearing plate 53 about the shaft 52 in counterclockwise direction so that the friction discs 58 move away from the opening 128, and from the bills in the bill storing container 27.

The segment 48 is then turned by the connecting rod 47 through the angle β in clockwise direction until the single revolution of the gears 43 and 45 has been completed. During such movement of the segment 48 the bills are not influenced since the friction discs 58 remain spaced from the bills. At the approach to the initial position, the abutment 116 engages the angular lever 119, 120 and turns the same into the position shown in Fig. 3 so that the spring 60 turns the bearing plates 53, 54 clockwise, and the friction discs 58 engage the uppermost bill and are ready for the next operation.

The operation and actuation of the clamping member **106** will now be described:

The cam disc **61** operates the control levers **64** and **65** when the gear **45** turns the cam disc **61** a single complete revolution. After turning of the cam disc **61** through a predetermined angle which corresponds substantially to the angle α, the control levers pivot inwardly and outwardly, respectively and shift the control slide member **75** to an upper portion in Figs. 3 and 7. Shifting of the control slide member **75** effects movement of the pin **104** so that the arm **102** turns the shaft **99** through a corresponding angle. Turning of the shaft **99** effects turning of the two-armed levers **96, 98** and **95, 97** through corresponding angles so that the pins **132**, which engage the bores **133** and **131** in the side walls **107** and **108**, turn the clamping member **106** until the lower abutments **207** engage the shaft **99**.

The clamping member **106** is now in the position shown in Figs. 9 and 10 in which the lower clamping edge **125** presses the bills against the plate **126**. The clamping member **106** remains in this position during the rocking of the segment **48** in clockwise direction through the angles $\alpha+\beta$, that is during the phase of the operation in which the outermost bill is dispensed by the friction disc **58**.

After the movement of the segment **48** through the angles $\alpha+\beta$ is terminated, as above described, the segment **48** moves in the opposite direction, and during such movement the control slide member **75** is returned by the control levers **63** and **64** to its former position so that the clamping member **106** returns to the position shown in Fig. 7 in which the clamping edge **24** of the clamping plate **208** presses the bills against the plate member **127**. The dispensing unit is now ready for dispensing a further bill.

The handle **90** serves for retracting members **87, 86, 91, 92, 95, 96, 97, 98** whereby clamping member **106** can be retracted from the plate **127** for insertion and removal of bills. The slots **84, 85, 105** permit movement of rod **86** and shaft **99**.

The dispensed bills may be deposited on a horizontal surface, but according to a preferred embodiment of the present invention dispensed bills are placed in a receiving bag. The mechanism for placing dispensed bills in the receiving bag **20** will now be described. A bell crank lever **152, 153** is pivotally mounted at **151** and provided with a cam follower roller engaging the cam face of the cam disc **61** due to the action of the spring **154**. A link **210** is pivotally connected to the arm **153**, and is connected at the other end thereof with a lever **155** by a pin **156**. The lever **155** is fixedly connected for rotation to a shaft **157** by a pin **158**. Shaft **157** is turnably mounted in the housing walls **69** and **70** and is secured by rings **159** against movement in axial direction.

A further lever arm **160** is secured by the pin **161** to shaft **157** and has a free end pivotally connected at **164** to a pawl lever **163** which is provided with a projection **162**. Pawl lever **163** is pressed by a spring **165** against a stop pin **166**. A pin **180** secured to the lever arm **160** serves as a stop for the pawl lever **163** when the same moves away from the stop pin **166** in an upward direction.

A sleeve **167** is turnable on the shaft **157** and has two projecting arms **168** and **169**. The arm **168** cooperates with a spring **170** which tends to turn arm **168**, sleeve **167**, and thereby arm **169** in clockwise direction as illustrated in Figs. 12 to 15. At the inner end of arm **169**, an abutment **171** cooperating with the projection **162** of the pawl lever **163** is provided. A link **173** is pivotally connected to the free end of arm **169** at **172**, and is also pivoted by pin **175** to a slide **174** which is guided on the front wall **176** of the housing.

The operation of the device for placing bills in a receiving container is as follows:

In the position of rest all levers are in the positions shown in Fig. 12. The arm **169** and consequently the slide **174** are in the upper position thereof into which they are urged by the spring **170**. Pawl lever **163** engages the stop **166** under the action of the spring **165**. When the cam disc **61** turns in clockwise direction no change takes place in the positions of the levers as long as the cam follower roller **150** runs on the cam face **177** of the cam disc **61**. As soon as a cam follower **150** leaves the cam face **177**, the bell crank lever **152, 153** turns in clockwise direction about the shaft **151** so that the arm **153** presses the link **210** upwardly in the direction of the arrow S until the lever **163** snaps with its projection **162** over the abutment **171**. When the cam follower **150** again runs onto the cam face **177**, the bell crank lever **152, 153** is turned in clockwise direction, and pulls the link **210** and therewith the arm **169** in downward direction. During such pivoting movement, the arm **169** moves the slide **174** through the link **173** so that the slide **174** moves along the front wall **176** and pushes the bill **178** into the receiving bag **120**. The downward movement of the slide **174** is continued until the lever **163** engages the stop **166** and releases after a short motion the abutment **171** of the arm **169** which rapidly turns in upward direction due to the action of the spring **170** when released so that the slide **174** returns to its initial position.

The sequence of the above-described operation and of the bill dispensing operation is such that the bill is pushed into the receiving bag **20** directly after it is dispensed through the dispensing opening **128**.

The dispensing device has been described with reference to a preferred embodiment in which rotary friction discs are provided for first forming a loop and then dispensing the uppermost bill. It will be understood that instead of rotary dispensing means, a friction dispensing means performing a rectilinear reciprocating movement can be provided so that the uppermost bill is first retracted to form a loop and then dispensed by opposite movement of the reciprocable dispensing means.

The windows **101, 111**, and **121** in the bill storing containers **27** of the units A, B and C permit viewing of the contents of the bill containers. Preferably, the structure located behind the transparent window including the slide **174** is made at least partly of transparent material.

A sheet dispensing apparatus according to the present invention preferably comprises movable sheet dispensing means **58**; supporting means **54, 55** supporting the sheet dispensing means **58**; sheet holding means including the clamping member **106** and two fixed members **126** and **127**; first operating means for shifting the clamping member **106** and including the cam disk **61** and the members **63, 64, 75, 102, 99, 97** and **98**; second operating means for turning the rotary dispensing means **58** in opposite directions and including the gear **45**, the connecting rod **47**, the toothed segment **48**, and the gear means **51, 56** and **57**; and an actuating drive means including the drive shaft **16** and a coupling device for coupling the drive shaft **16** with the gear **43** which meshes with gear **45**.

Third operating means including the abutments **116, 117**, and the angular lever **119, 120** are provided for shifting the movable supporting means **53, 54** of the rotary dispensing means **58**.

The coupling device E has been described to achieve a single complete revolution of the gear **43**. According to a preferred embodiment the dispensing key **13** and the lever **13***a* may be raised instead of being depressed to move the coupling device into a position in which the gear **43** is connected for rotation to the drive shaft **16** as long as the key **13** is raised. A construction of this type is described in detail in my copending previously mentioned application. It will be understood that the continuous rotation of the coupling device E will obtain

consecutive dispensing of bills as long as the key 13 is raised so that it becomes possible to remove all bills stored in the machine in rapid succession if a checking of the contents of the machine is desired.

The bill dispensing apparatus of the present invention is preferably used in connection with a currency dispensing apparatus which also includes dispensing means for dispensing coins and is described in my above mentioned copending application. Preferably the dispensed amounts are registered by a totalizer and indicated so that the amount of currency dispensed by the apparatus may be checked by the cashier and the customer.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of sheet dispensing apparatus differing from the types described above.

While the invention has been illustrated and described as embodied in a bill dispensing apparatus including rotary dispensing means and shiftable bill clamping means, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be secured by Letters Patent is:

1. In a sheet dispensing apparatus, in combination, movable sheet dispensing means movable in one direction for forming a loop in a sheet and movable in an opposite direction for dispensing said sheet; supporting means supporting said sheet dispensing means for movement in said directions; movable sheet holding means located opposite said sheet dispensing means so that said sheet dispensing means are adapted to engage a sheet held by said sheet holding means, said sheet holding means being movable between a first position for holding a sheet, and a second position for releasing the sheet; first operating means for moving said sheet holding means between said first and second positions; second operating means for moving said dispensing means first in said one direction and then in said opposite direction; and actuating means for actuating said first and second operating means in a predetermined sequence so that said sheet holding means is in said first position when said sheet dispensing means moves in said one direction for forming a loop in one end portion of the sheet, and is in said second position when said movable sheet dispensing means moves in said opposite direction for dispensing the sheet released by said sheet holding means in said second position.

2. In a sheet dispensing apparatus, in combination, movable sheet dispensing means; supporting means supporting said sheet dispensing means for movement in opposite directions; movable sheet holding means located opposite said sheet dispensing means so that said sheet dispensing means are adapted to engage the uppermost sheet of a stack of sheets held by said sheet holding means, said sheet holding means being movable between a first position for holding the middle portion of a stack of sheets, and a second position releasing said middle portion and holding a set of one end portions of the sheets of said stack of sheets; first operating means for moving said sheet holding means between said first and second positions; second operating means for moving said dispensing means first in one direction and then in an opposite direction; and actuating means for actuating said first and second operating means in a predetermined sequence so that said sheet holding means is in said first position when said sheet dispensing means moves in said one direction for forming a loop in said one end portion of the uppermost sheet so that said one end portion of the uppermost sheet is moved away from said one end portions of the sheets of said stack of sheets, and so that said sheet holding means is in said second position when said movable sheet dispensing means moves in said opposite direction for dispensing the uppermost sheet whose said one end portion is released by said sheet holding means while said one end portions of the stack of other sheets is held by said sheet holding means in said second position.

3. In a sheet dispensing apparatus, in combination, movable sheet dispensing means; supporting means supporting said sheet dispensing means for movement in opposite directions; movable sheet holding means located opposite said sheet dispensing means so that said sheet dispensing means are adapted to engage the uppermost sheet of a stack of sheets held by said sheet holding means, said sheet holding means including two spaced fixed members defining a dispensing opening located opposite said sheet dispensing means, and a movable clamping member movable between a first position for clamping the middle portion of a stack of sheets against one of said fixed members, and a second position for clamping a set of one end portions of the sheets of said stack of sheets against the other of said fixed members; first operating means for moving said movable clamping member between said first and second positions; second operating means for moving said dispensing means first in one direction and then in an opposite direction; and actuating means for actuating said first and second operating means in a predetermined sequence so that said movable clamping member is in said first position when said sheet dispensing means moves in said one direction for forming a loop in said one end portion of the uppermost sheet so that said one end portion of the uppermost sheet is moved away from said one end portions of the sheets of said stack of sheets, and so that said movable clamping member is in said second position when said movable sheet dispensing means moves in said opposite direction for dispensing the uppermost sheet whose said one end portion is released by said movable clamping member while said one end portions of the stack of other sheets is held by said movable clamping member in said second position.

4. In a sheet dispensing apparatus, in combination, rotary sheet dispensing means turnable in one direction for forming a loop in a sheet and turnable in an opposite direction for dispensing said sheet; supporting means supporting said sheet dispensing means for turning movement in said directions; movable sheet holding means located opposite said sheet dispensing means so that said sheet dispensing means are adapted to engage a sheet held by said sheet holding means, said sheet holding means being movable between a first position for holding a sheet, and a second position for releasing the sheet; first operating means for moving said sheet holding means between said first and second positions; second operating means for turning said dispensing means first in said one direction and then in said opposite direction; and actuating means for actuating said first and second operating means in a predetermined sequence so that said sheet holding means is in said first position when said sheet dispensing means turns in said one direction for forming a loop in one end portion of the sheet, and is in said second position when said rotary sheet dispensing means turns in said opposite direction for dispensing the sheet released by said sheet holding means in said second position.

5. In a sheet dispensing apparatus, in combination, rotary sheet dispensing means; supporting means supporting said sheet dispensing means for turning movement in opposite directions; movable sheet holding means

located opposite said sheet dispensing means so that said sheet dispensing means are adapted to engage the uppermost sheet of a stack of sheets held by said sheet holding means, said sheet holding means including two spaced fixed members defining a dispensing opening located opposite said sheet dispensing means, and a movable clamping member movable between a first position for clamping the middle portion of a stack of sheets against one of said fixed members, and a second position for clamping a set of one end portions of the sheets of said stack of sheets against the other of said fixed members; first operating means for moving said movable clamping member between said first and second positions; second operating means for turning said dispensing means first in one direction and then in an opposite direction; and actuating means for actuating said first and second operating means in a predetermined sequence so that said movable clamping member is in said first position when said sheet dispensing means moves in said one direction for forming a loop in said one end portion of the uppermost sheet so that said one end portion of the uppermost sheet is moved away from said one end portions of the sheets of said stack of sheets, and so that said movable clamping member is in said second position when said movable sheet dispensing means moves in said opposite direction for dispensing the uppermost sheet whose said one end portion is released by said movable clamping member while said one end portions of the stack of other sheets is held by said movable clamping member in said second position.

6. In a sheet dispensing apparatus, in combination, rotary sheet dispensing means; supporting means supporting said sheet dispensing means for turning movement in opposite directions, said supporting means being movable for moving said sheet dispensing means between an advanced position and a retracted position; movable sheet holding means located opposite said sheet dispensing means so that said sheet dispensing means in said advanced position are adapted to engage a sheet held by said sheet holding means, said sheet holding means being movable between a first position for holding a sheet, and a second position for releasing the sheet; first operating means for moving said sheet holding means between said first and second positions; second operating means for turning said dispensing means first in one direction and then in an opposite direction; and actuating means for actuating said first and second operating means and for moving said movable supporting means in a predetermined sequence so that said sheet holding means is in said first position when said sheet dispensing means in said advanced position moves in said one direction for forming a loop in one end portion of the sheet, and is in said second position when said movable sheet dispensing means in said advanced position moves in said opposite direction for dispensing the sheet released by said sheet holding means in said second position.

7. In a sheet dispensing apparatus, in combination, rotary sheet dispensing means; supporting means supporting said sheet dispensing means for turning movement in opposite directions, said supporting means being movable for moving said sheet dispensing means between an advanced position and a retracted position; movable sheet holding means located opposite said sheet dispensing means so that said sheet dispensing means in said advanced position are adapted to engage the uppermost sheet of a stack of sheets held by said sheet holding means, said sheet holding means including two spaced fixed members defining a dispensing opening located opposite said sheet dispensing means, and a movable clamping member movable between a first position for clamping the middle portion of a stack of sheets against one of said fixed members, and a second position for clamping a set of one end portions of the sheets of said stack of sheets against the other of said fixed members; first operating means for moving said movable clamping member between said first and second positions; second operating means for turning said dispensing means first in one direction and then in an opposite direction; and actuating means for actuating said first and second operating means and for moving said movable supporting means in a predetermined sequence so that said movable clamping member is in said first position when said sheet dispensing means in said advanced position moves in said one direction for forming a loop in said one end portion of the uppermost sheet so that said one end portion of the uppermost sheet is moved away from said one end portions of the sheets of said stack of sheets, and so that said movable clamping member is in said second position when said movable sheet dispensing means in said advanced position moves in said opposite direction for dispensing the uppermost sheet whose said one end portion is released by said movable clamping member while said one end portions of the stack of other sheets is held by said movable clamping member in said second position.

8. A sheet dispensing apparatus as claimed in claim 7 wherein said rotary sheet dispensing means includes at least one friction roller, and a shaft supporting said friction roller; and wherein said movable supporting means is a pair of pivoted bearing plates supporting said shaft; and including third operating means for pivoting said bearing plates between an advanced position in which said friction roller is adapted to engage a sheet, and a retracted position in which said friction roller is retracted, said third operating means being connected to said first operating means and actuated by the same in a predetermined sequence with said first and second operating means.

9. A sheet dispensing apparatus as claimed in claim 7 wherein said second operating means include a toothed segment; gear means meshing with said toothed segment and including a gear fixed on said shaft for turning said friction roller; and means for reciprocating said toothed segment.

10. A sheet dispensing apparatus as claimed in claim 7 and including a supporting member supporting said clamping member for movement in a direction transverse to the movement between said first and second positions thereof; and spring means urging said clamping member to move in said transverse direction into engagement with said fixed members.

11. A sheet dispensing apparatus as claimed in claim 10 and including manually operated means secured to said supporting member for retracting the same and said clamping member from said fixed members.

12. A sheet dispensing apparatus as claimed in claim 7 wherein said first operating means include a rotary cam disk; a pair of pivoted control levers engaging said cam disk; a movable control slide connected to said control levers and being moved by the same when said control levers are pivoted by said cam disk; and lever means operated by said control slide for moving said clamping member between said first and second positions.

13. A sheet dispensing apparatus as claimed in claim 12, wherein said second operating means include a toothed segment, gear means meshing with said toothed segment and including a gear connected for rotation to said rotary sheet dispensing means, a wheel connected for rotation to said cam disk, and a connecting rod connecting said wheel with said toothed segment for reciprocating the latter; and further comprising third operating means for moving said movable supporting means between an advanced position in which said rotary sheet dispensing means is adapted to engage a sheet and a retracted position in which said rotary dispensing means is retracted from said sheet, said third operating means including a pivoted lever engaging said movable supporting means; and a pair of spaced abutments fixed on said toothed segment and engaging said pivoted lever during reciprocation of said toothed segment for shifting said movable

supporting means in a predetermined sequence with the reversal of rotation of said rotary sheet dispensing means.

14. In a sheet dispensing apparatus, in combination, movable sheet dispensing means; supporting means supporting said sheet dispensing means for movement in opposite directions; movable sheet holding means located opposite said sheet dispensing means so that said sheet dispensing means are adapted to engage the uppermost sheet of a stack of sheets held by said sheet holding means, said sheet holding means being movable between a first position for holding the middle portion of a stack of sheets, and a second position releasing said middle portion and holding a set of one end portions of the sheets of said stack of sheets; first operating means for moving said sheet holding means between said first and second positions; second operating means for moving said dispensing means first in one direction and then in an opposite direction; and actuating drive means including a drive shaft, a rotary means freely rotatable on said drive shaft, a coupling device for coupling said rotary means with said drive shaft, and manually operated means for operating said coupling device, said rotary means being connected to said first and second operating means for actuating said first and second operating means in a predetermined sequence so that said sheet holding means is in said first position when said sheet dispensing means moves in said one direction for forming a loop in said one end portion of the uppermost sheet so that said one end portion of the uppermost sheet is moved away from said one end portions of the sheets of said stack of sheets, and so that said sheet holding means is in said second position when said movable sheet dispensing means moves in said opposite direction for dispensing the uppermost sheet whose said one end portion is released by said sheet holding means while said one end portions of the stack of other sheets is held by said sheet holding means in said second position.

15. In a sheet dispensing apparatus, in combination, rotary sheet dispensing means; supporting means supporting said sheet dispensing means for turning movement in opposite directions, said supporting means being movable for moving said sheet dispensing means between an advanced position and a retracted position; movable sheet holding means located opposite said sheet dispensing means so that said sheet dispensing means in said advanced position are adapted to engage the uppermost sheet of a stack of sheets held by said sheet holding means, said sheet holding means including two spaced fixed members defining a dispensing opening located opposite said sheet dispensing means, and a movable clamping member movable between a first position for clamping the middle portion of a stack of sheets against one of said fixed members, and a second position for clamping a set of one end portions of the sheets of said stack of sheets against the other of said fixed members; first operating means for moving said movable clamping member between said first and second positions; second operating means for turning said dispensing means first in one direction and then in an opposite direction; and actuating drive means including a drive shaft, a rotary means freely rotatable on said drive shaft, a coupling device for coupling said rotary means with said drive shaft, and manually operated means for operating said coupling device, said rotary means being connected to said first and second operating means for actuating said first and second operating means and for moving said movable supporting means in a predetermined sequence so that said movable clamping member is in said first position when said sheet dispensing means in said advanced position moves in said one direction for forming a loop in said one end portion of the uppermost sheet so that said one end portion of the uppermost sheet is moved away from said one end portions of the sheets of said stack of sheets, and so that said movable clamping member is in said second position when said movable sheet dispensing means in said advanced position moves in said opposite direction for dispensing the uppermost sheet whose said one end portion is released by said movable clamping member while said one end portions of the stack of other sheets is held by said movable clamping member in said second position.

16. In a container filling apparatus, in combination, movable sheet dispensing means; supporting means supporting said sheet dispensing means for movement in opposite directions; movable sheet holding means located opposite said sheet dispensing means so that said sheet dispensing means are adapted to engage a sheet held by said sheet holding means, said sheet holding means being movable between a first position for holding a sheet, and a second position for releasing the sheet; first operating means for moving said sheet holding means between said first and second positions; second operating means for moving said dispensing means first in one direction and then in an opposite direction; actuating means for actuating said first and second operating means in a predetermined sequence so that said sheet holding means is in said first position when said sheet dispensing means moves in said one direction for forming a loop in one end portion of the sheet, and is in said second position when said movable sheet dispensing means moves in said opposite direction for dispensing the sheet released by said sheet holding means in said second position; carrier means located adjacent said movable sheet dispensing means for carrying a receiving container; and pushing means for pushing a sheet dispensed by said dispensing means into a receiving container carried by said carrier means.

17. In a container filling apparatus as claimed in claim 16 wherein said first operating means include a driven rotary cam disk; and including motion-transmitting means operated by said cam disk and connected to said pushing means so that said pushing means are operated in a predetermined sequence with said first operating means.

18. In a container filling apparatus, in combination, movable sheet dispensing means; supporting means supporting said sheet dispensing means for movement in opposite directions; movable sheet holding means located opposite said sheet dispensing means so that said sheet dispensing means are adapted to engage a sheet held by said sheet holding means, said sheet holding means being movable between a first position for holding a sheet, and a second position for releasing the sheet; first operating means for moving said sheet holding means between said first and second positions; second operating means for moving said dispensing means first in one direction and then in an opposite direction; actuating means for actuating said first and second operating means in a predetermined sequence so that said sheet holding means is in said first position when said sheet dispensing means moves in said one direction for forming a loop in one end portion of the sheet, and is in said second position when said movable sheet dispensing means moves in said opposite direction for dispensing the sheet released by said sheet holding means in said second position; carrier means located adjacent said movable sheet dispensing means for supporting a receiving container, said carrier means including a plate formed with a slot located opposite said dispensing means; a pusher slide movable between a retracted position, and an advanced position passing through a slot so as to project into said receiving container carried by said carrier means; and motion transmitting means connecting said first operating means with said movable slide for operating same in a predetermined sequence with said first and second operating means, said motion transmitting means including a lever having an abutment, a pawl lever movable between a first position engaging said abutment and a second position releasing said abutment, spring means acting on said pawl lever and urging the same to move to said second position, and a cam follower,

said first operating means including a rotary cam disk cooperating with said cam follower.

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