US005887053A

United States Patent [19]

McGough

[11] Patent Number: 5,887,053

[45] Date of Patent: Mar. 23, 1999

[54] **COIN RETURN ANTI-STUFFING APPARATUS AND METHOD**

[75] Inventor: **Gerald B. McGough**, Huntsville, Ala.

[73] Assignee: **Quadrum Telecommunications, Inc.**, Huntsville, Ala.

[21] Appl. No.: **937,341**

[22] Filed: **Sep. 20, 1997**

Related U.S. Application Data

[60] Provisional application Nos. 60/042,005 Apr. 16, 1997 and 60/026,500 Sep. 23, 1996.

[51] **Int. Cl.**[6] **H04M 17/06**

[52] **U.S. Cl.** **379/145**; 379/150; 232/60; 232/57.5; 194/202

[58] **Field of Search** 379/145, 146, 379/147, 148, 150; 194/202–204; 232/57.5, 58, 59, 60

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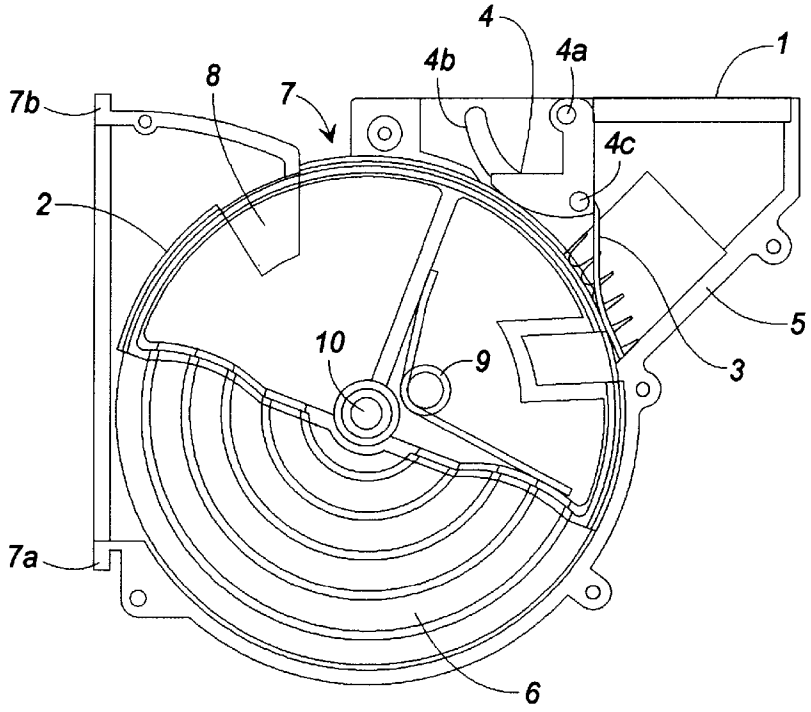
Primary Examiner—Paul Loomis

Attorney, Agent, or Firm—Arthur A. Gardner & Associates, P.C.

[57] **ABSTRACT**

A coin return apparatus, for use with a pay telephone, which provides a discontinuous coin return path between the coin return structure and the coin discharge opening of the pay telephone and which resists "stuffing", "stringing", and "pinning". The coin return apparatus includes a housing which is mountable within the pay telephone and a movable door mounted to the housing. The housing includes a chamber therein and a first opening which is communicable with a passageway of a coin return structure of the pay telephone and which is selectively communicable with the chamber. The housing further includes a second opening which is communicable with the environment about the pay telephone and which is selectively communicable with the chamber. The movable door is movable between first and second positions relative to the housing. The presence of the movable door in the first position enables removal of coins present in the chamber through the second opening of the housing and disables passage through the first opening from the chamber. The presence of the movable door in the second position enables the delivery of coins into the chamber through the first opening and disables passage through the second opening to the chamber.

30 Claims, 13 Drawing Sheets



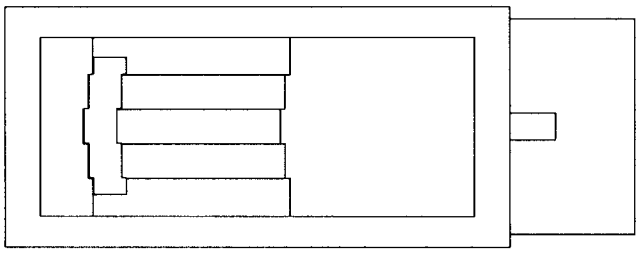


FIG. 1A

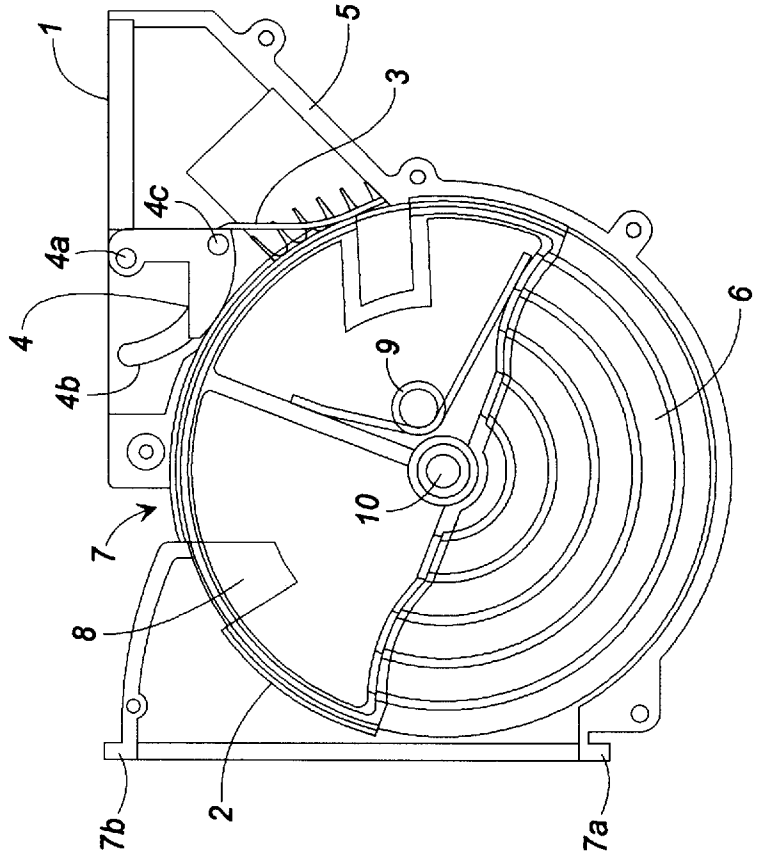


FIG. 1

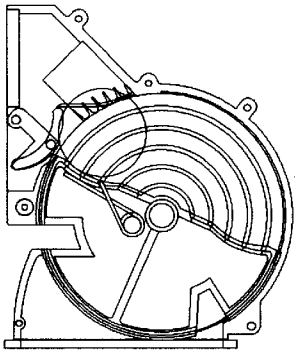


FIG. 4

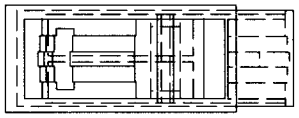


FIG. 3A

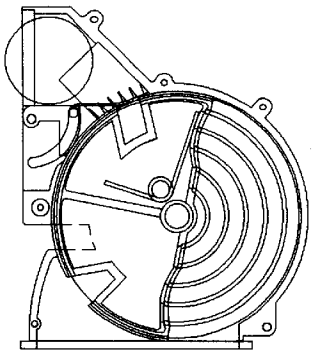


FIG. 3

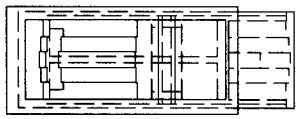


FIG. 2A

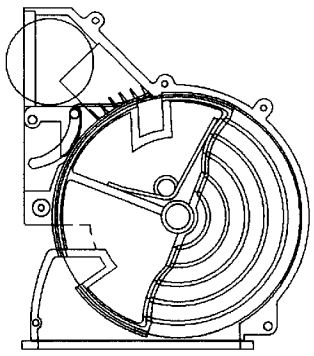


FIG. 2

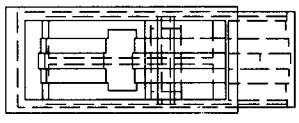
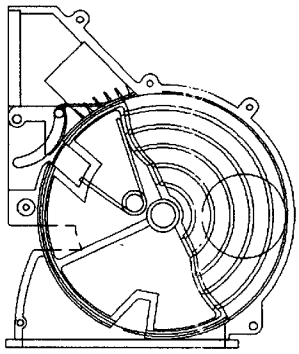


FIG. 6A



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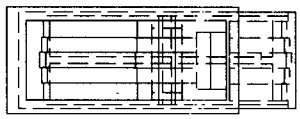
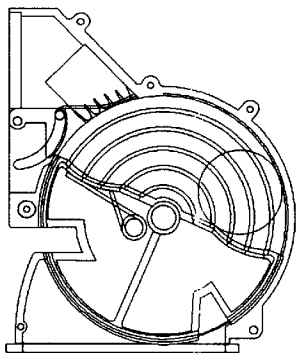


FIG. 5A



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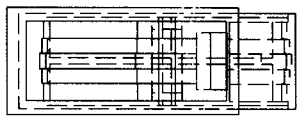


FIG. 4A

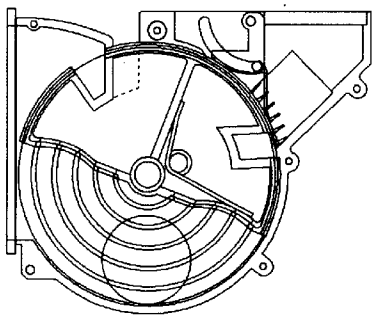


FIG. 7

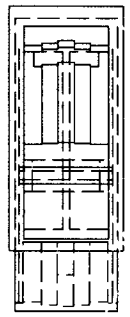
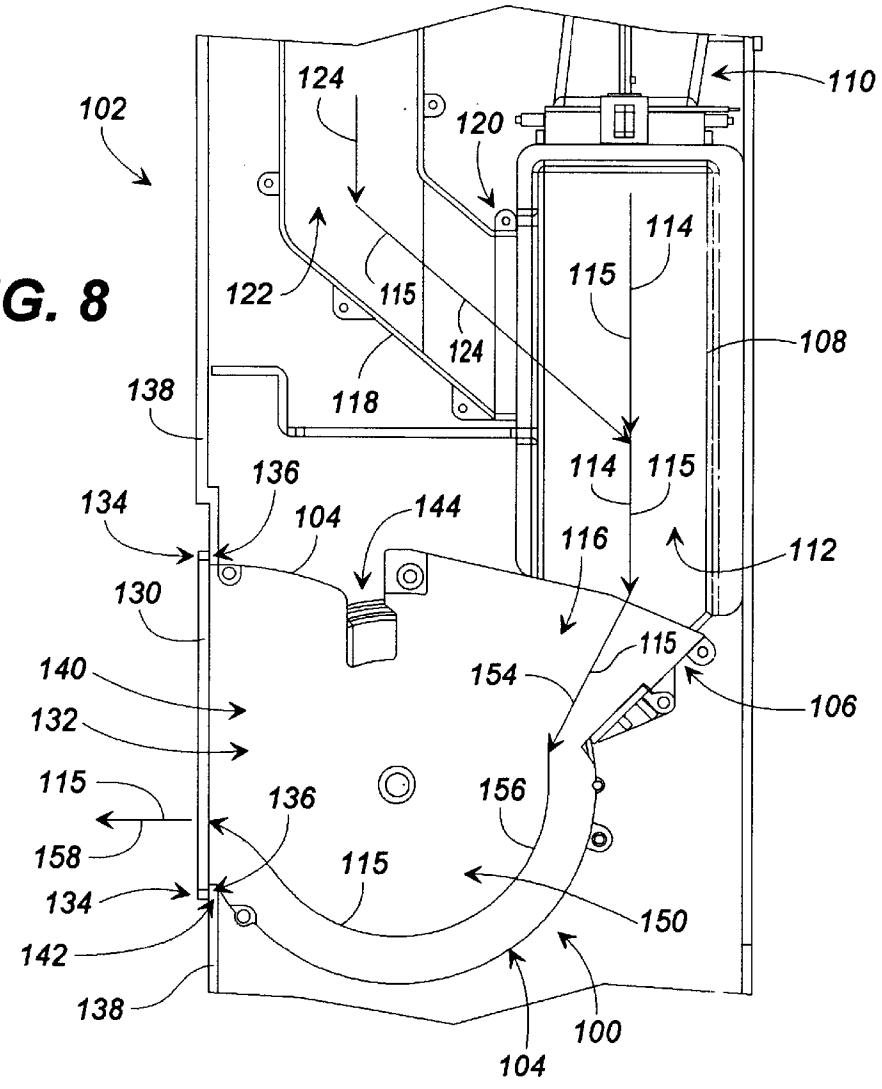


FIG. 7A

FIG. 8



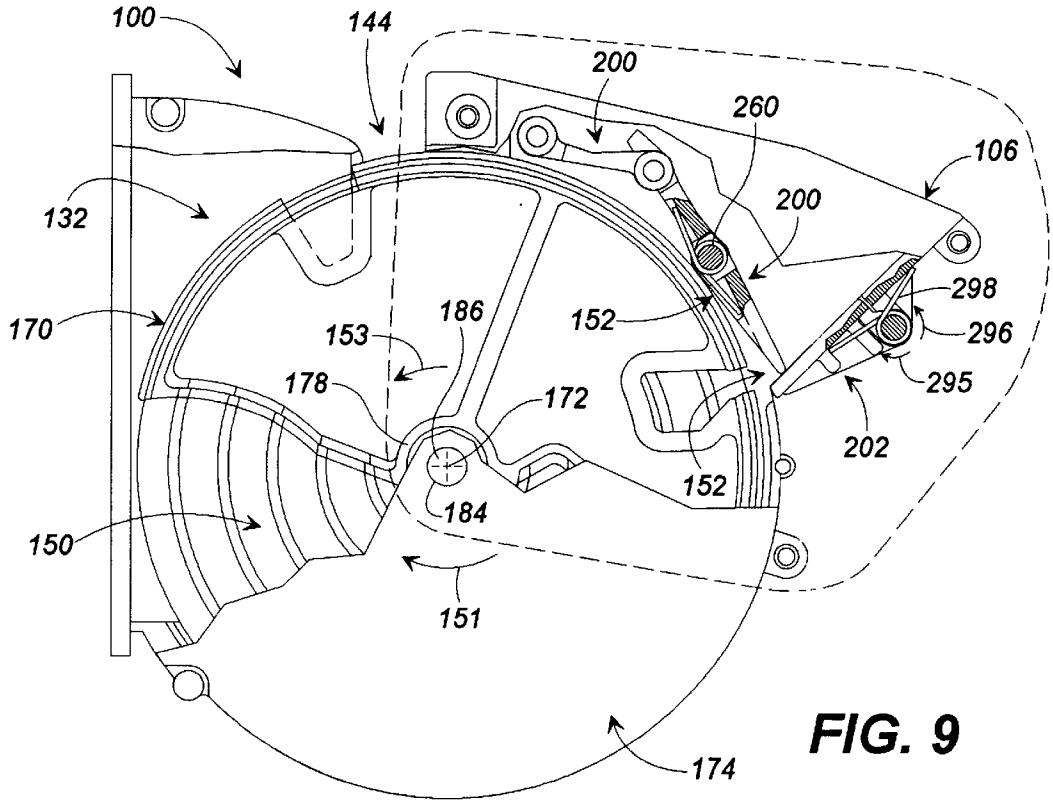

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FIG. 9

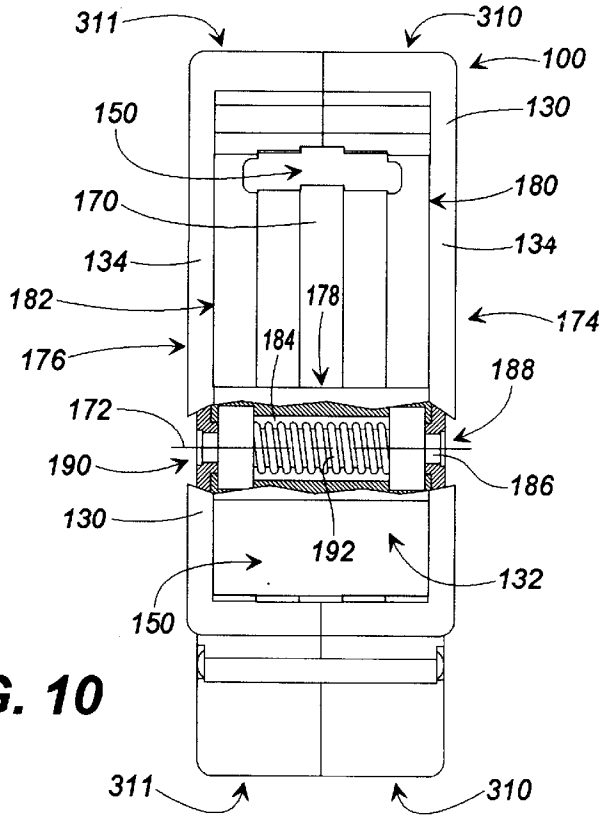
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FIG. 10

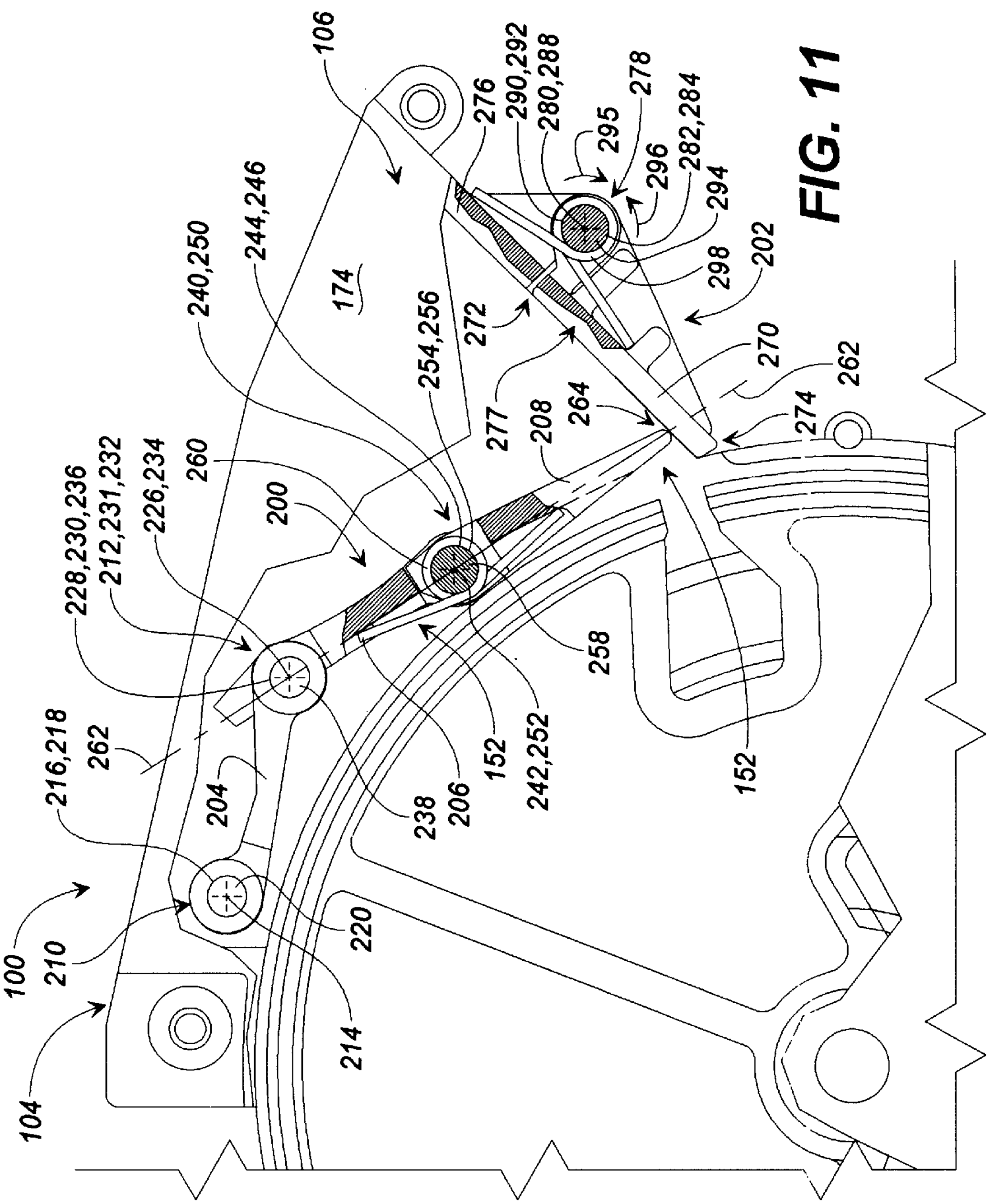

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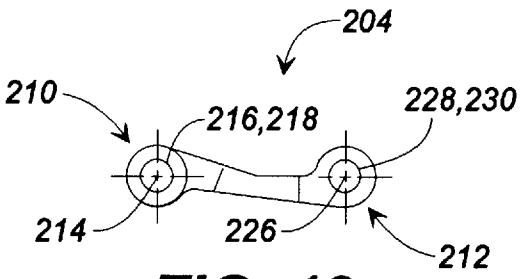
FIG. 11



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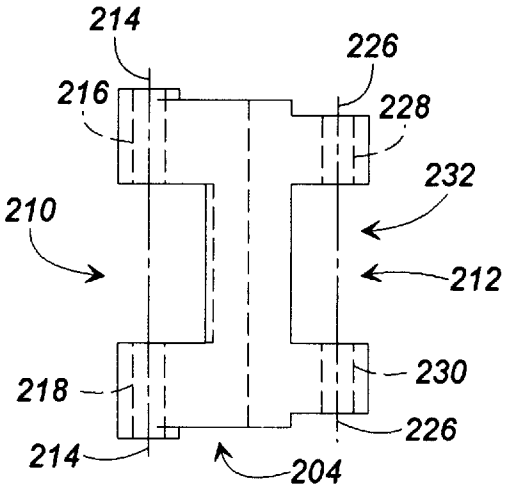


FIG. 13

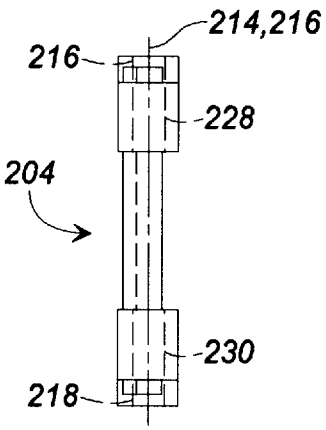
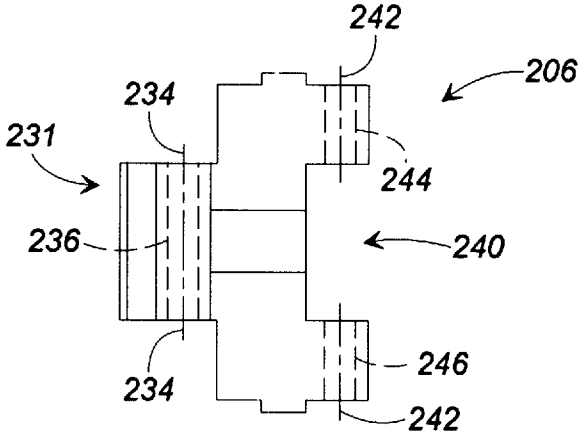


FIG. 14



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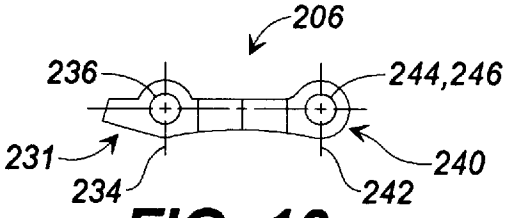

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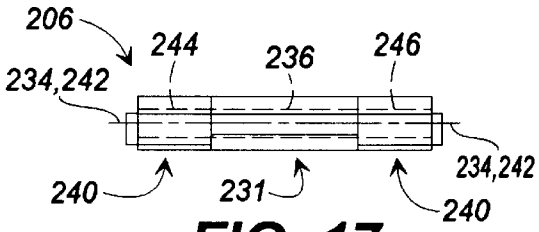

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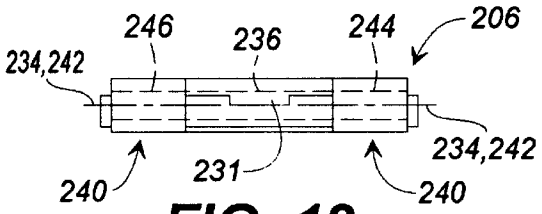

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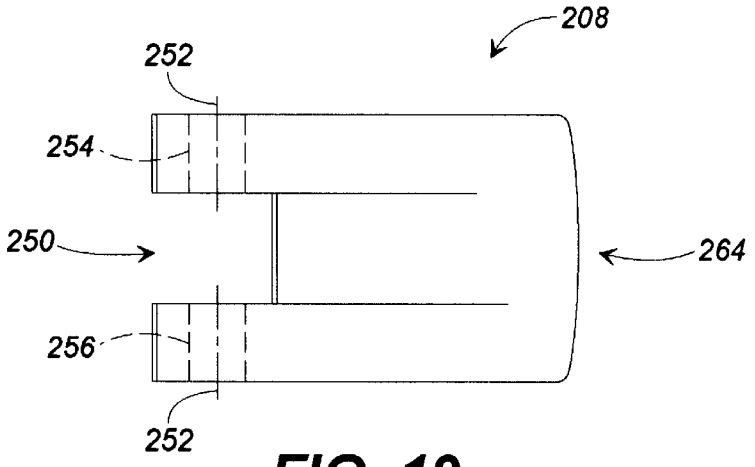


FIG. 19

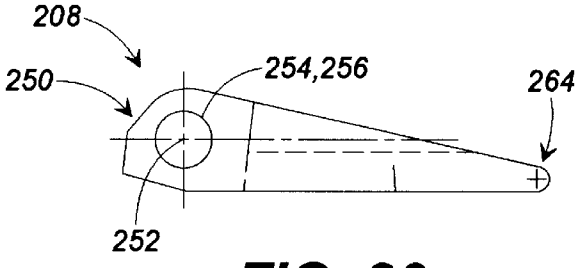


FIG. 20

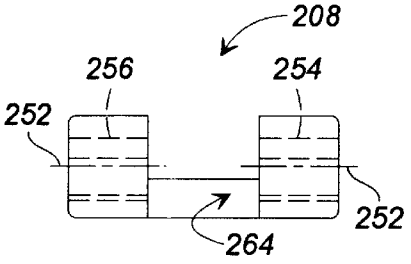


FIG. 21

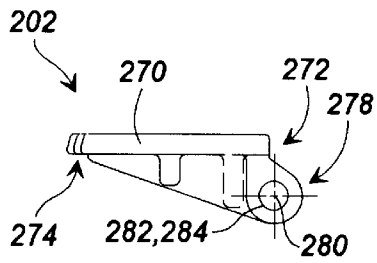
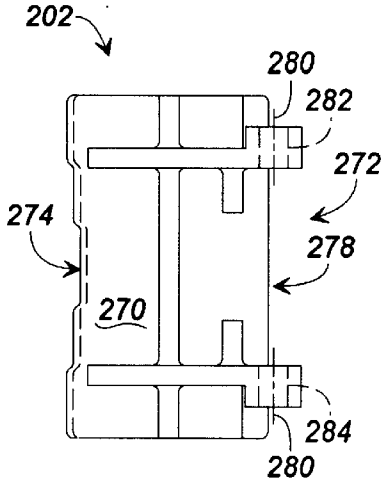


FIG. 22



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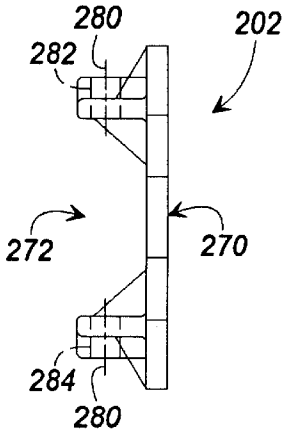

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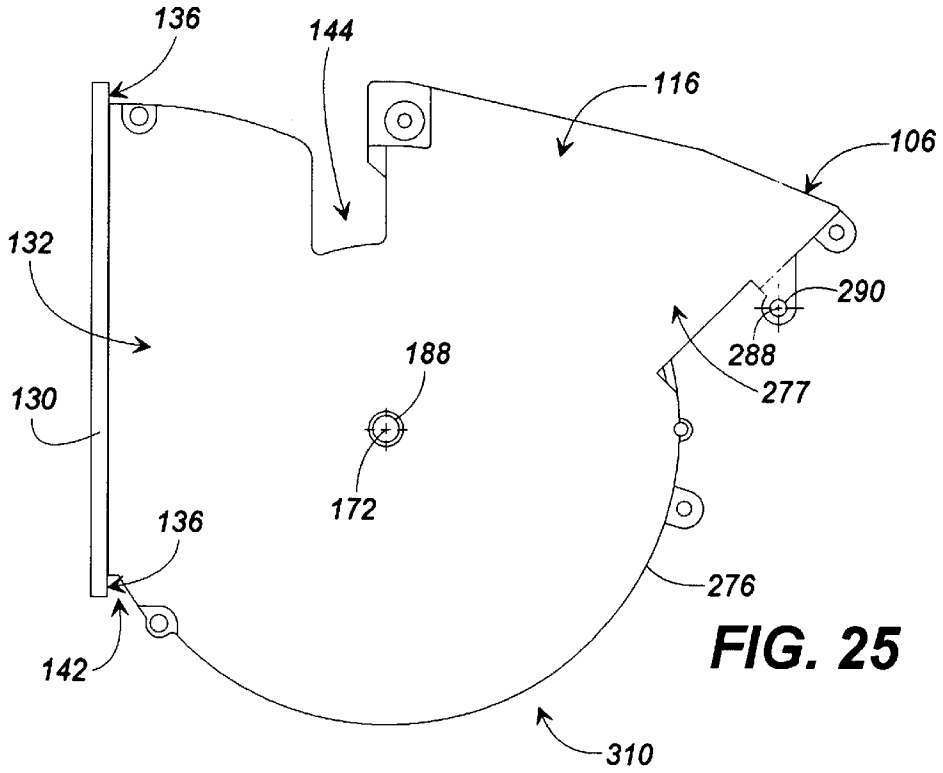

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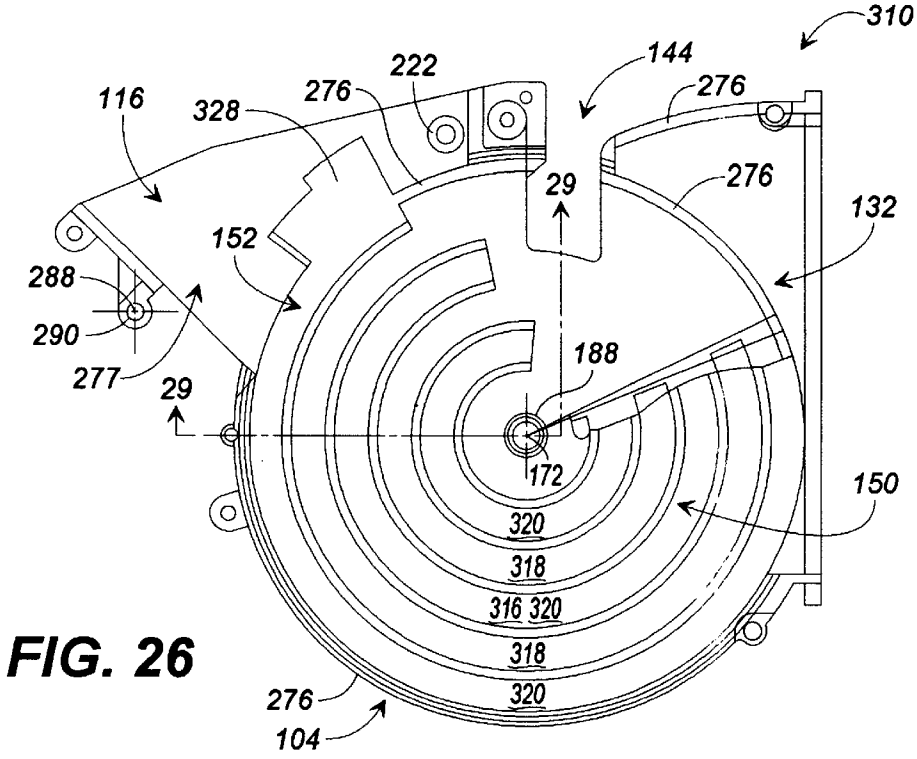

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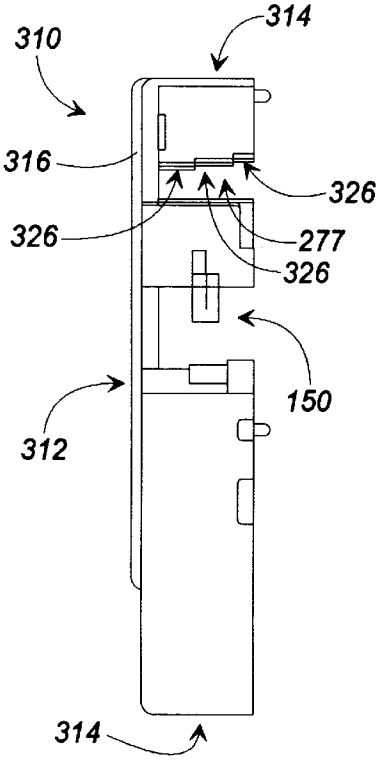

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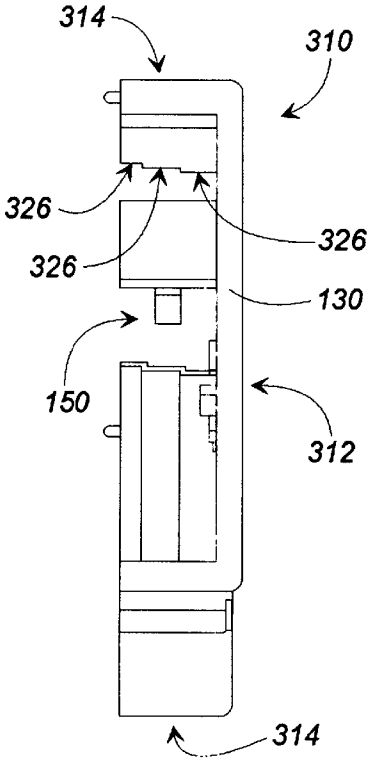

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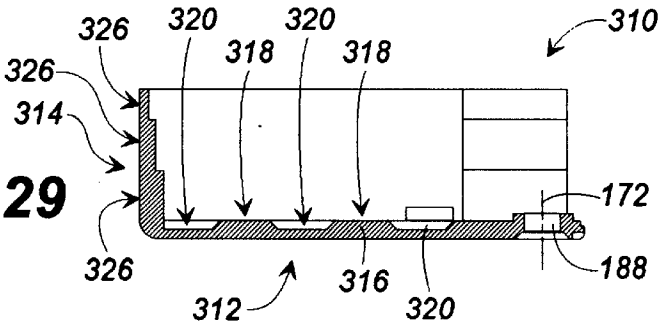

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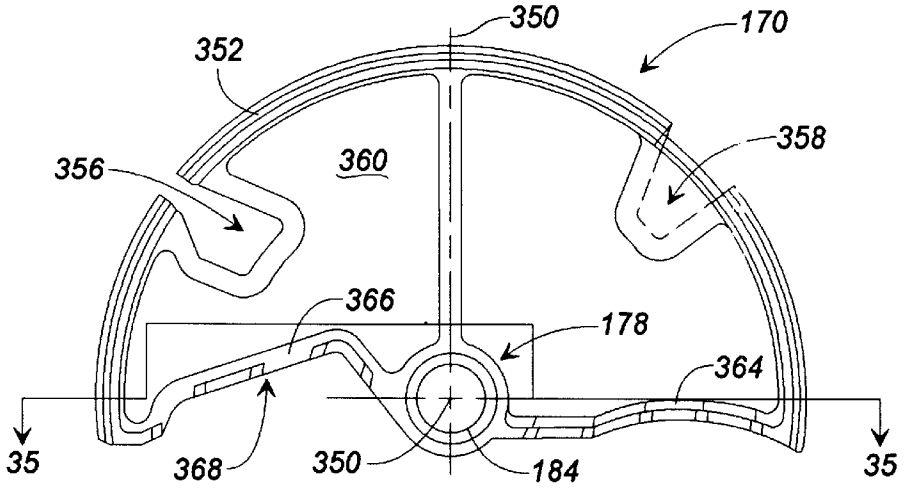


FIG. 30

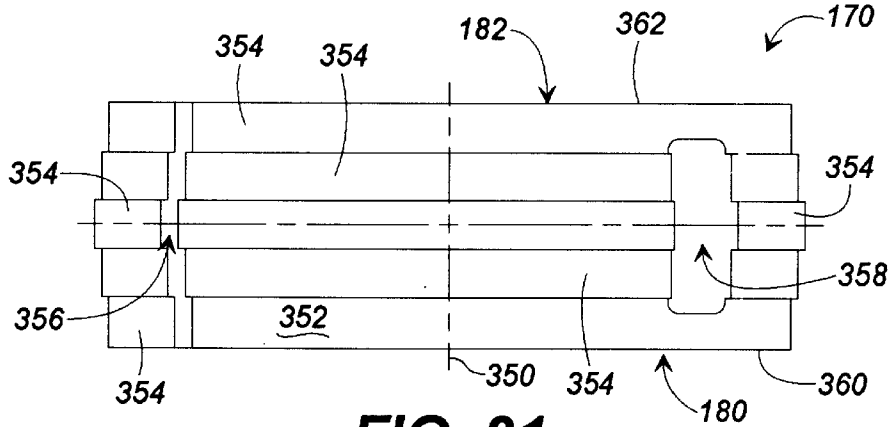
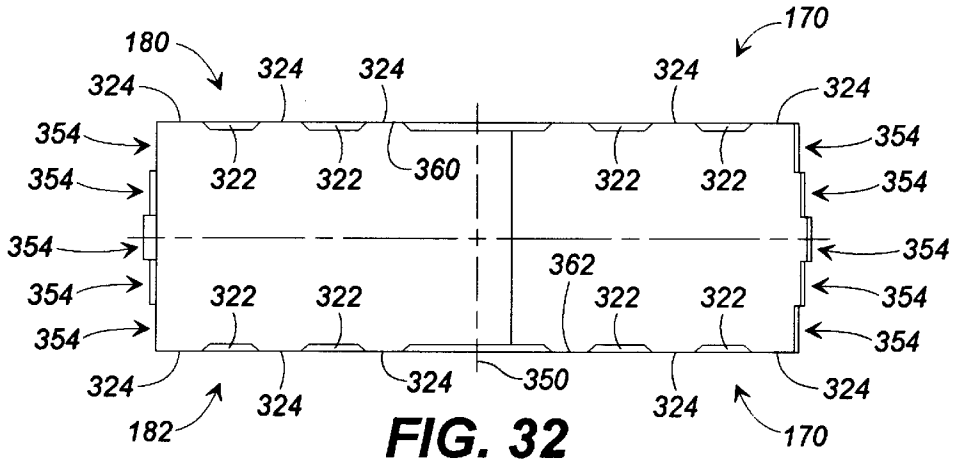


FIG. 31



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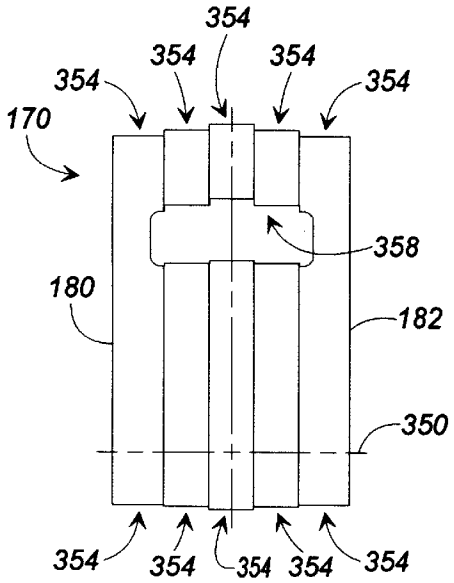

FIG. 33

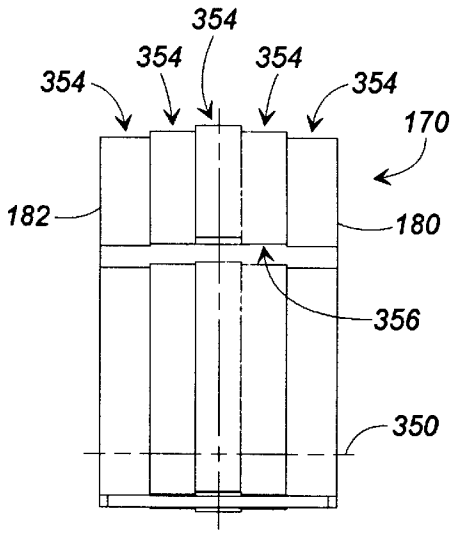

FIG. 34

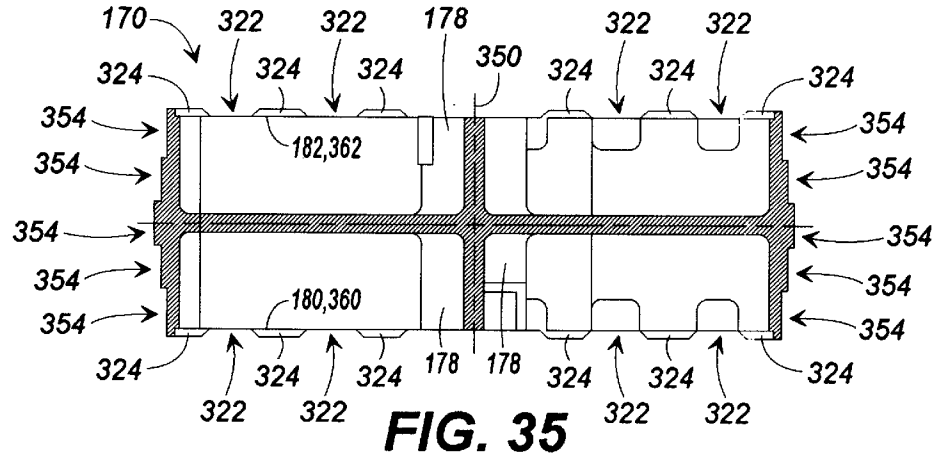

FIG. 35

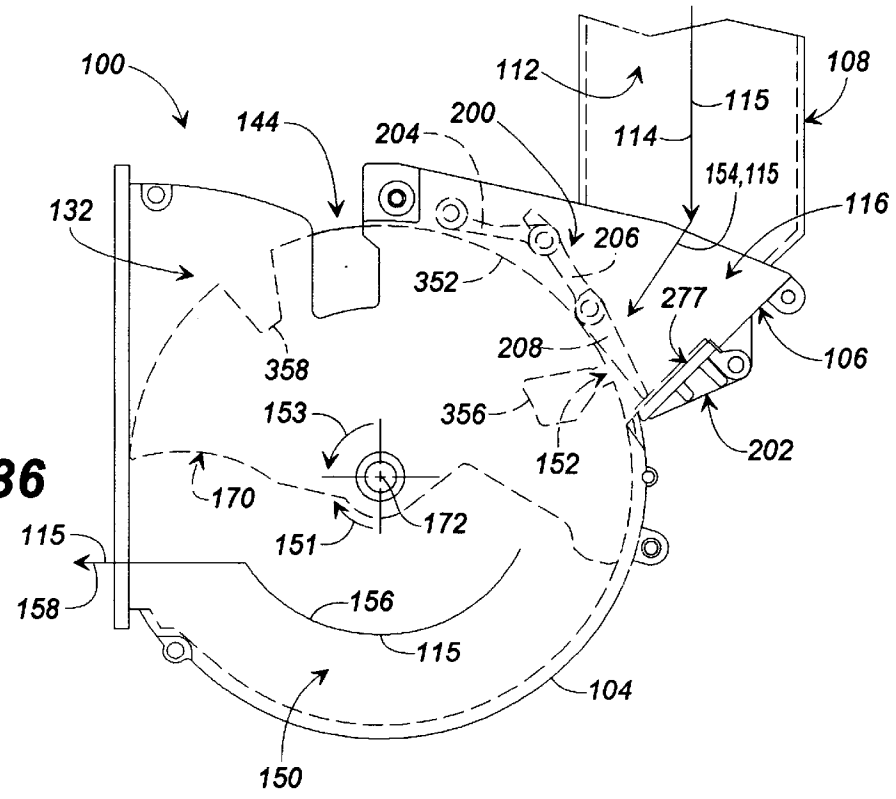
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FIG. 36

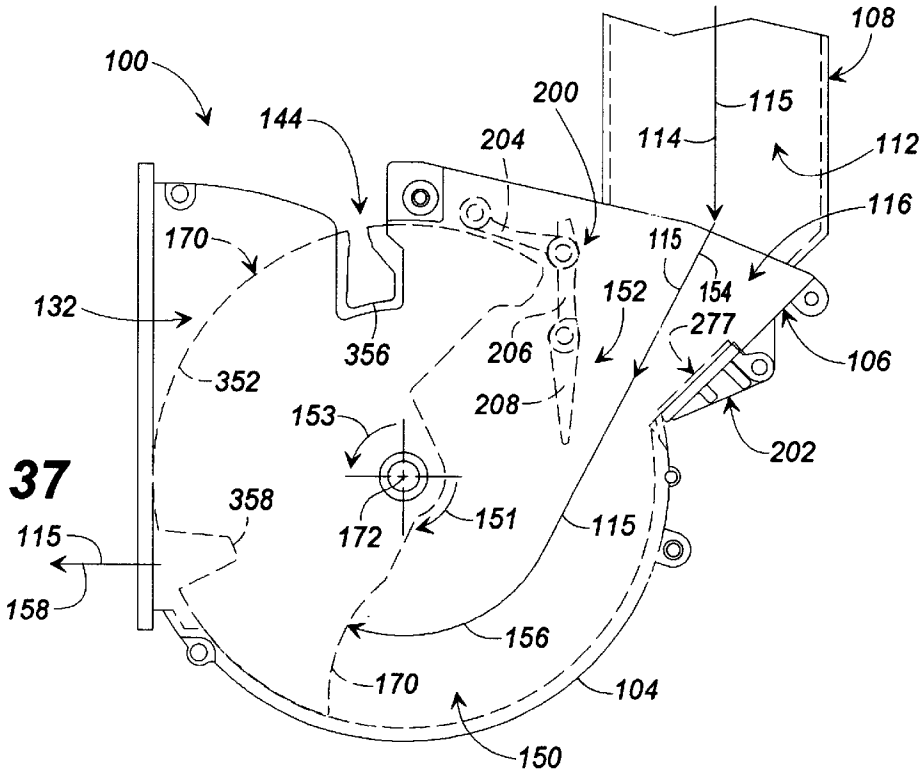
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FIG. 37

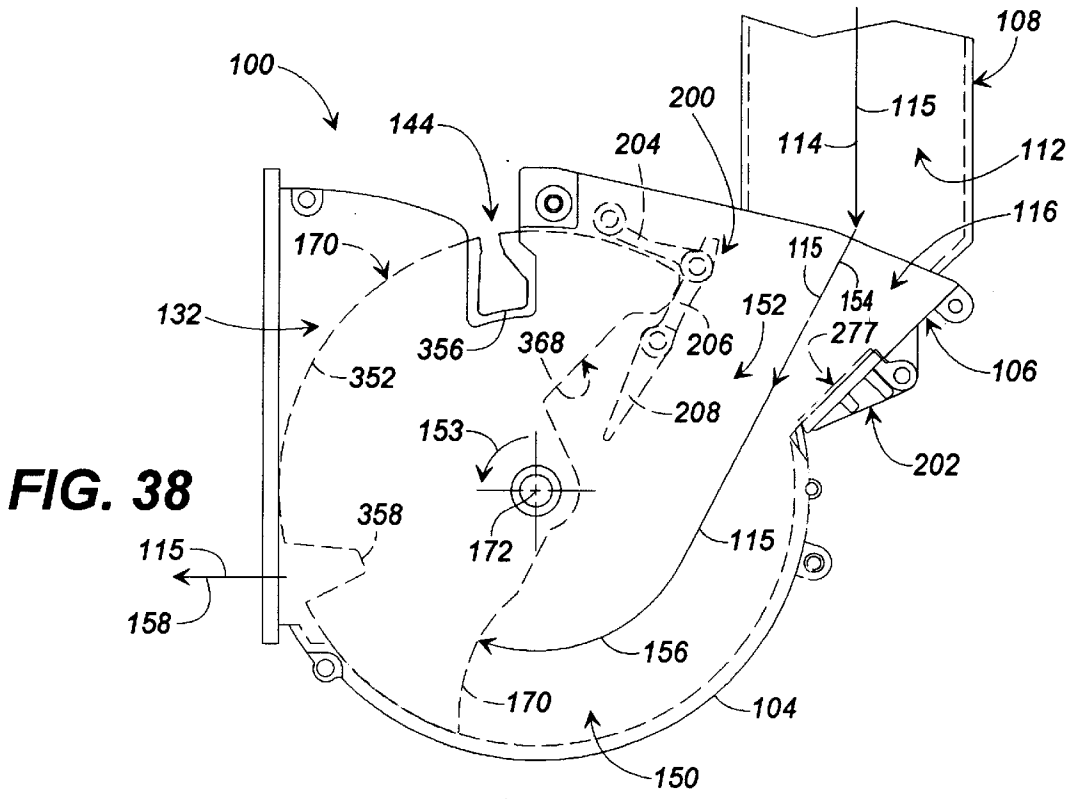
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FIG. 38

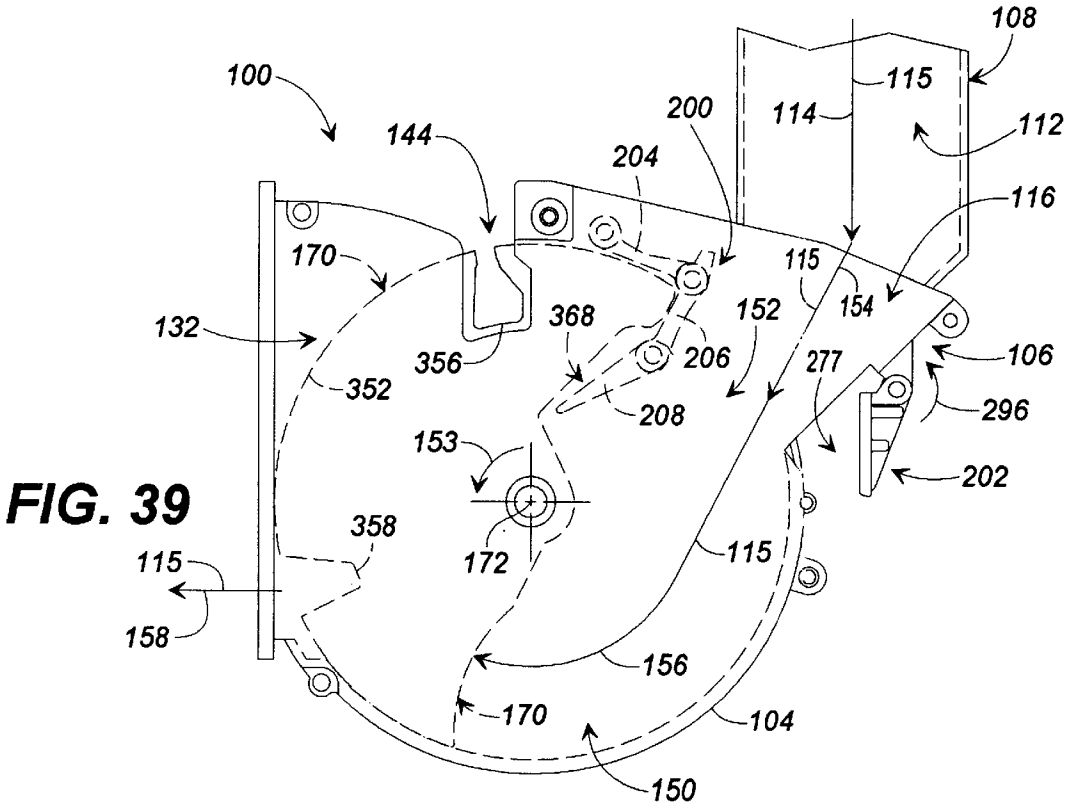
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FIG. 39

COIN RETURN ANTI-STUFFING APPARATUS AND METHOD

This application claims the benefit of U.S. Provisional Application(s) No(s).:

APPLICATION NO(S).:	FILING DATE
60/042,005	16 April 1997
60/026,500	23 September 1996.

FIELD OF THE INVENTION

The present invention relates to pay telephones and more particularly, to a coin return apparatus and method for protecting pay telephones from theft and/or vandalism.

BACKGROUND OF THE INVENTION

In general, the operation of a typical pay telephone involves the receipt of coins deposited in the pay telephone by a user of the telephone and the establishing of a communication session between the pay telephone's user and a called party associated with a telephone number input by the user. If, for some reason, the communication session cannot be established (i.e., due to a wrong number being input by the user, the called party does not answer, etc.), the user either hangs-up the telephone's handset or operates the telephone's hookswitch and the deposited coins are released by the telephone's coin escrow device (i.e., which holds deposited and accepted coins until a communication session is established successfully) for removal from the pay telephone by the user through a coin return opening generally located near the bottom of the pay telephone. Coins are also sometimes released from the telephone's coin acceptor/rejector by user operation of the telephone's coin release lever. In order to reach the coin return opening, the returned coins generally travel through some sort of coin return chute, or channel, descending within the pay telephone between the coin escrow device, the coin acceptor/rejector, and the coin return opening.

Unfortunately, many resourceful thieves have discovered that it is possible to abscond with the returned coins by blocking, or "stuffing", the chute with a foreign object positioned at a location sufficiently far up into the chute so as to avoid ready detection and removal by a representative of the pay telephone's owner. Then, whenever coins are released by the coin escrow device or coin acceptor/rejector, they are stopped from falling through the entire length of the chute to the coin return opening by the foreign object and are, instead, trapped within the chute above the foreign object to await collection by the thief. In order to collect the trapped coins, the thief merely removes the foreign object at a later time, thereby enabling the released, but trapped coins to continue their fall through the chute to the coin return opening where the thief removes and pockets the coins.

Over the years, pay telephone owners have discovered that the thieves employ a number of techniques to "stuff" a pay telephone. All of the techniques commonly involve the insertion of a foreign object which is, typically, a piece of cloth, paper, or other flexible material into the chute, but vary somewhat in the way in which the foreign object is introduced into the chute. For instance, one technique, known as traditional "stuffing", involves inserting a foreign object into the coin return opening and then pushing the foreign object upward into position within the coin return

chute with a reasonably stiff, yet bendable piece of wire. A second technique, known as "stringing", involves the preparation of a specially-modified coin, or slug, and its subsequent introduction into the coin receiving slot near the top of the pay telephone. Prior to insertion of the modified coin, the thief drills a hole through the coin and secures a thin first string to the modified coin by passing a first end of the first string through the hole and then by knotting the first end of the string to retain the modified coin. Once inserted into the coin acceptance slot, the thief holds on to a second end of the first string while the modified coin and a portion of the first string descend through the pay telephone with the modified coin either being rejected by a coin acceptor/rejector mechanism and directed into the coin return chute, or being accepted by the coin acceptor/rejector mechanism and held by the telephone's coin escrow device until released into the coin return chute by operation of the telephone's coin release lever by the thief. In either case, the modified coin falls through the chute to the coin return opening where the thief replaces the modified coin at the first end of the first string with a foreign object and a second string having a first end attached to the foreign object. The thief, pulling on the second end of the first string, pulls the foreign object upward into the coin return chute until the second end of the second string is barely visible in the coin return opening. Thereafter, subsequently returned coins are trapped within the coin return chute above the foreign object. The thief then returns to the pay telephone after a period of time, accesses the second end of the second string through the coin return opening, and pulls on the second end of the second string to remove the foreign object via the coin return opening. Once the foreign object is removed, the previously trapped coins descend through the coin return chute to the coin return opening for removal by the thief.

In addition to enabling the theft of released coins from a pay telephone, stuffing and/or attempted stuffing of a pay telephone by a thief can cause damage to various internal components of the pay telephone and can render the telephone inoperable. Damage is also often caused by vandals whose primary desire is to see if they can render a pay telephone inoperable, rather than to steal money from the pay telephone. Like the thieves, vandals employ a number of different techniques to vandalize a pay telephone. One of the more popular techniques seems to be the introduction and subsequent detonation of fireworks within the pay telephone's coin return chute.

Shock waves, created by the detonation, travel upward through the coin return chute generally damaging the chute and various other components of the pay telephone.

Prior efforts, although extensive, to prevent the stuffing and vandalism of pay telephones have not been completely effective. Accordingly, a need yet remains in the art for a tamperresistant coin return apparatus and method which prevent stuffing and damage due to vandalism. It is to the provision of such a coin return apparatus and method that the present invention is primarily directed.

SUMMARY OF THE INVENTION

Briefly described, in a preferred form the present invention comprises a coin return apparatus for use with a pay telephone. The coin return apparatus includes a housing which is mountable within the pay telephone and a movable door mounted to the housing. The housing includes a chamber therein and a first opening which is communicable with a passageway of a coin return structure of the pay telephone and which is selectively communicable with the

chamber. The housing further includes a second opening which is communicable with the environment about the pay telephone and which is selectively communicable with the chamber. The movable door is movable between first and second positions relative to the housing. The presence of the movable door in the first position enables removal of coins present in the chamber through the second opening of the housing and disables passage through the first opening from the chamber. The presence of the movable door in the second position enables the delivery of coins into the chamber through the first opening and disables passage through the second opening to the chamber.

Preferably, the coin return apparatus further comprises a means for hindering movement of a foreign object through the first opening of the housing. Also preferably, the coin return apparatus further comprises a means for impeding the wedging of a foreign object between the housing and the movable door. Also preferably, the movable door is pivotally connected to the housing and comprises a revolving door.

In another preferred form, the invention comprises a coin return apparatus having a first member fixedly mountable within the pay telephone and a second member which is cooperative with and movable relative to the first member. The first and second members define a chamber therebetween and the chamber is selectively communicable with a passageway with a coin return structure of the pay telephone and is also selectively communicable with the environment about the pay telephone. The second member places the chamber in exclusive communication with the passageway of the coin return structure at a first time and places the chamber in exclusive communication with the environment at a second time different from the first time. The second member also opposes communication between the passageway of the coin return structure and the environment at a same time.

Preferably, the first member and the second member are coupled for relative rotary motion therebetween. Also preferably, the coin return apparatus further includes a biasing means connected to the first member and the second member. The biasing means causes relative rotary motion between the first and the second member and returns the chamber into communication with the environment about the pay telephone after the chamber has been out of communication with the environment about the pay telephone. Also preferably, the coin return apparatus is insertable into the pay telephone through a coin return opening in a housing of the pay telephone. The coin return apparatus, preferably accommodates coins having a maximum size dimension as large as thirty-five millimeters.

A coin return according to the present invention has numerous advantages. Firstly, it is resistant to "stuffing", "pinning", and "stringing". Thus, it is extremely vandal-resistant. A key aspect of this vandal resistance is that direct access from outside of the pay telephone to the coin hopper is prevented. Rather, when the movable door is in the coin retrieval position, access to the coin hopper is blocked and conversely when the movable door is in the coin delivery position, access to the coin return chamber is blocked. Furthermore, the solution is elegant in its simplicity, having a minimum number of moving parts and having a low degree of complexity. Thus, the design is durable and easily manufactured and installed in the field.

Accordingly, it is an object of the present invention to provide a coin return which resists stuffing.

It is another object of the present invention to provide a coin return which prevents direct access to a coin hopper portion thereof.

It is another object of the present invention to provide a vandal resistant coin return which is simple in its construction, durable in use, and economical in manufacture.

These and other objects, features, and advantages of the present invention will become more apparent upon reading the following specification in conjunction with the accompanying drawing figures.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a right side, elevational, schematic view of a coin return device according to a first preferred embodiment of the invention.

FIG. **1A** is a front, elevational view of the coin return device of FIG. **1**.

FIG. **2** through FIG. **7** are right side, elevational, schematic views of the coin return device of FIG. **1**, showing the coin return device in various stages of operation.

FIG. **2A** through FIG. **7A** are front, elevational views of the coin return device of FIG. **1**, shown in stages of operation corresponding to FIG. **2** through FIG. **7**.

FIG. **8** is a right side, elevational view of a coin return device, according to a second preferred embodiment of the present invention, showing the coin return device installed within a pay telephone.

FIG. **9** is an isolated, partially cut-away, right side, elevational view of the coin return device of FIG. **8**.

FIG. **10** is an isolated, partially cut-away, front, elevational view of the coin return device of FIG. **8**.

FIG. **11** is an enlarged view of a portion of FIG. **9**, showing a folding door and a trap door of the coin return device of FIG. **9**.

FIG. **12** is an isolated, left side, elevational view of a first segment of the folding door of FIGS. **9** and **11**.

FIG. **13** is an isolated, top, plan view of the first segment of the folding door of FIG. **12**.

FIG. **14** is an isolated, back, elevational view of the first segment of the folding door of FIG. **12**.

FIG. **15** is an isolated, top, plan view of a second segment of the folding door of FIGS. **9** and **11**.

FIG. **16** is an isolated, right side, elevational view of the second segment of the folding door of FIG. **15**.

FIG. **17** is an isolated, front, elevational view of the second segment of the folding door of FIG. **15**.

FIG. **18** is an isolated, back, elevational view of the second segment of the folding door of FIG. **15**.

FIG. **19** is an isolated, top, plan view of a third segment of the folding door of FIGS. **9** and **11**.

FIG. **20** is an isolated, right side, elevational view of the third segment of the folding door of FIG. **19**.

FIG. **21** is an isolated, back, elevational view of the third segment of the folding door of FIG. **19**.

FIG. **22** is an isolated, right side, elevational view of the trap door of FIGS. **9** and **11**.

FIG. **23** is an isolated, bottom, plan view of the trap door of FIG. **22**.

FIG. **24** is an isolated, back, elevational view of the trap door of FIG. **22**.

FIG. **25** is an isolated, right side, elevational view of a right side portion of the housing of FIG. **1**.

FIG. **26** is an isolated, left side, elevational view of the right side portion of the housing of FIG. **25**.

FIG. **27** is an isolated, back, elevational view of the right side portion of the housing of FIG. **25**.

FIG. **28** is an isolated, front, elevational view of the right side portion of the housing of FIG. **25**.

FIG. **29** is a sectional view of the right side portion of the housing of FIG. **26** taken along section lines **29**—**29**.

FIG. **30** is an isolated, left side, elevational view of a revolving door of the coin return device of FIG. **1**.

FIG. **31** is an isolated, top, plan view of the revolving door of FIG. **30**.

FIG. **32** is an isolated, bottom, plan view of the revolving door of FIG. **30**.

FIG. **33** is an isolated, front, elevational view of the revolving door of FIG. **30**.

FIG. **34** is an isolated, back, elevational view of the revolving door of FIG. **30**.

FIG. **35** is a sectional view of the revolving door of FIG. **30** taken along section lines **35**—**35**.

FIG. **36** is a partial, right side, schematic view of the coin return device and coin return chute of FIG. **1**, showing the components of the coin return device in a first orientation.

FIG. **37** is a partial, right side, schematic view of the coin return device and coin return chute of FIG. **1**, showing the components of the coin return device in a second orientation.

FIG. **38** is a partial, right side, schematic view of the coin return device and coin return chute of FIG. **1**, showing the components of the coin return device in a variant of the second orientation.

FIG. **39** is a partial, right side, schematic view of the coin return device and coin return chute of FIG. **1**, showing the components of the coin return device in a variant of the second orientation.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawing figures, wherein like reference numerals represent like parts throughout the several views, FIG. **1** shows a coin return apparatus according to a first preferred embodiment of the invention. The coin return includes a housing which defines an upper hopper **1**. The housing is configured to be front mounted in a conventional pay telephone and mounted beneath a coin validation mechanism. The housing defines an interior opening for receiving a revolving door (i.e., movable door means) **2**. The revolving door **2** acts similarly to an airlock in that it prevents direct access from the outside of the pay telephone to the coin hopper **1**. This prevents a vandal or thief from passing a foreign object up into the coin hopper, such as to stuff the coin hopper for subsequent theft. As seen in FIG. **1**, the revolving door **2** is roughly in the shape of one-half of a circle. In this way, depending upon the rotational position of the door, the door **2** can occlude a space or passageway or provide access to a space or passageway.

A trap door **3** is positioned at the bottom of the coin hopper **1** for engaging the solid portion of the revolving door **2**. The trap door **3** prevents the reverse flow of foreign objects or coins and prevents explosive forces from being carried along through the coin hopper and back up into the coin validation unit above. The trap door **3** is secured to, and pivots with, a blocking door **4** which operates to retain foreign objects (i.e., stuffed material). The blocking door **4** is pivoted by a pivot pin **4***a* and its pivotal motion is limited by a slot **4***b* and a pin **4***c*. The blocking door has vent holes formed therein to allow explosive gases and explosive forces to pass therethrough and prevent damage.

A string cutter **5** is provided at a lower portion of the coin hopper **1** generally adjacent the trap door **3** (with the trap door in its closed position as shown in FIG. **1**). The string cutter **5** operates to cut strings which may be used by vandals or thieves in an attempt to drag stuffing material back up into the coin path.

The coin return chamber **6** includes concentric grooves (with lands formed therebetween) formed in the housing. These grooves and lands are also formed in the solid portion of the revolving door. The tight fit between the various grooves and lands prevents pins, of any diameter, from being inserted in order to jam the revolving door and also helps to keep coins from inadvertently jamming the revolving door. The grooves and lands prevent the insertion of shims of any substantial width, or strength. Note that the geometry of the coin return chamber **6**, the housing, and the revolving door does not define ledges, particularly hidden ledges, against which a pin or shim can be wedged. Note also that the revolving door can be forced, by the user, in either direction to clear a weak pin or shim.

The housing includes a slot or deep notch **7** for allowing the coin return to be slipped into position in a pay telephone, the coin return being installed from the front of the telephone housing. The coin return housing also includes a small hook **7***a* for engaging a face portion of the pay telephone housing and a flange **7***b* for engaging another portion of the face of the pay telephone housing.

The revolving door **2** also includes a finger grip slot **8** for manual user operation of the revolving door. Furthermore, the revolving door **2** includes a return spring **9**. The revolving door pivots about a pivot axle or pivot pin **10**. Still referring to FIG. **1**, one can see that the finger grip slot **8** allows the user to rotate the revolving door **2** in a counter-clockwise direction, and that the return spring **9** operates to return the revolving door **2** in the clockwise direction.

Operation of the coin return of the first preferred embodiment is quite straightforward. In use, a user would insert a finger into the finger slot **8** of the revolving door **2** and rotate the door downwardly, allowing coins to fall into the revolving door chamber **6**. Thereafter, the user would release the revolving door **2**, allowing the return spring **9** to return the revolving door to the position shown in FIG. **1**. The user would then reach a finger or fingers into the chamber **6** to retrieve coins deposited therein. These operational steps are depicted in greater detail in FIGS. **2**, **2**A through **7**, **7**A.

The coin return according to the present invention is resistant to "pinning" in which jam pins and other objects otherwise would be inserted alongside the revolving door so that the user cannot operate it. The novel coin return is also resistant to "stringing" in which a string is tied to a coin and the coin is inserted into the pay station to allow it to be rejected and then stuffing material is tied to the coin end of the string and dragged back up into the coin path. The invention is resistant to such vandalism. The invention also is resistant to simply stuffing of material up into the hopper and to stuffing by fireworks.

In accordance with a second, most preferred embodiment of the present invention, FIG. **8** schematically displays a coin return device **100** mounted within a pay telephone **102**. The coin return device **100**, viewed from its right side **174**, comprises a housing **104** having an entrance chute portion **106** (also referred to herein as the entrance chute **106**) which resides partially beneath one end of a coin return chute **108** and extends, from the remainder of the housing **104**, in a generally upward and rearward direction. The other end of the coin return chute **108** to a coin escrow device **110**. The

coin return chute **108** defines a channel **112** extending therein which descends within the coin return chute **108** to direct return coins along a portion **114**, indicated by arrow **114**, of a coin return path **115** into a first, uppermost opening **116** of the entrance chute portion **106** of the coin return device **100**. A coin reject chute **118** descends within the pay telephone **102** between a coin validator device, not shown, (also referred to herein as a coin acceptor/rejector) at an upper end (not visible) and connects to the coin return chute **108** at a lower end **120** which is elevationally above the entrance chute **106** of the coin return device **100**. The coin reject chute **118** defines a channel **122** therein which directs return coins along a portion **124**, indicated by arrow **124**, of the coin return path **115** into channel **112** of the coin return chute **108**.

The housing **104** of the coin return device **100** also has a flange **130** which defines a discharge opening **132** therethrough. The flange **130** has a first face **134** which is visible when the pay telephone **102** is viewed from its front and a second face **136** which resides adjacent to and partially overlaps a front face plate **138** of the pay telephone **102**. The flange **130** and the portion of the housing **104** near the flange **130** cooperate to hold the coin return device **100** within a hole **140** of the front face plate **138** of the pay telephone **102**. Note that the flange **130** and the portion of the housing **104** near the flange **130** define a hook-like cut-out **142** which receives a portion of the front face plate **138** of the pay telephone **102** and aids in securing the coin return device **100** to the pay telephone **102**. The housing **104** additionally has a notch **144** which temporarily receives a portion of the front face plate **138** near the top of hole **140** during installation of the coin return device **100**, through hole **140**, from the front of the pay telephone **102**.

Between flange **130** and the entrance chute **106**, the housing **104** defines a chamber **150** therein which has a substantially circular shape when viewed from a side of the coin return device **100**. The chamber **150** communicates, at appropriate times during operation of the coin return device **100** as described below, with the discharge opening **132** and a second, lowermost opening **152** of the entrance chute **106** defined by the housing **104**. The entrance chute **106** and the portion of the housing **104** about the chamber **150**, during operation, generally direct return a coins along portions **154**, **156**, indicated respectively by arrows **154**, **156**, of the coin return path **115** through the coin return device **100** for subsequent removal by the user via the discharge opening **132** and portion **158** of the coin return path **115**.

Referring now to FIGS. **9** and **10**, the coin return device **100** further comprises a movable, revolving door **170** (described in more detail below with reference to FIGS. **30–35**) which resides within the chamber **150** and which is rotatable, within the chamber **150** (i.e., in the clockwise and counterclockwise directions indicated by arrows **151**, **153**, respectively), relative to an axis **172** extending between sides **174**, **176** of the housing **104** and through chamber **150**. The revolving door **170** has a core portion **178** which extends between sides **180**, **182** of the revolving door **170** and which defines a bore **184** which also extends between sides **180**, **182**. A rod **186** extends in the direction of axis **172** within the bore **184** and through holes **188**, **190** defined, respectively, by sides **174**, **176** of the housing **104**. A spring **192** wraps about the rod **186** and biases the revolving door **170** relative to the housing **104** in a first position, shown in FIGS. **9**, **10**, **11**, and **36**, where the chamber **150** and the discharge opening **132** are in communication and where the chamber **150** and the second opening **152** of the entrance chute **106** are not in communication.

The coin return device **100**, according to the preferred embodiment, further comprises a folding door **200** and a trap door **202**. The folding door **200**, as displayed in FIGS. **9** and **11**, resides within the entrance chute **106** to cover and uncover the second opening **152** of the entrance chute **106**. The folding door **200** includes first, second, and third segments **204**, **206**, **208** which reside between sides **174**, **176** of the housing **104**. The first segment **204** (see FIGS. **12–14** for detailed views) has a first end **210** and a second end **212** distant from the first end **210**. The first end **210** defines an axis **214** extending therethough and defines bores **216**, **218** about the axis **214**. A rod **220** extends through bores **216**, **218** and between recesses **222**, **224** defined, respectively, by sides **174**, **176** of the housing **104** to position the first segment **204** of the folding door **200** and to enable rotation of the first segment **204** relative to axis **214**. Similar to the first end **210** of the first segment **204** of the folding door **200**, the second end **212** of the first segment **204** defines an axis **226** extending therethrough and defines bores **228**, **230** about axis **226**.

The second segment **206** (see FIGS. **15–18** for detailed views) of the folding door **200** defines a tongue **231** portion which is received within a fork portion **232** of the first segment **204**. The tongue portion **231** defines an axis **234** extending therethrough and a bore **236** extending therethrough about axis **234**. As seen in FIG. **11**, axis **226** of the second end **212** of the first segment **204** coaxially aligns with axis **234** of the second segment **206** of the folding door **200**. A rod **238** extends within bores **228**, **230** of the first segment **204** and within bore **236** of the second segment **206** to couple the first and second segments **204**, **206** and to enable rotation of the second segment **206** between housing sides **174**, **176** about axes **226**, **234**. The second segment **206** of the folding door **200** also has a fork portion **240** which defines an axis **242** extending therethrough and which defines bores **244**, **246** about axis **242**.

The third segment **208** (see FIGS. **19–21** for detailed views) of the folding door **200** has a fork portion **250** which defines an axis **252** extending therethrough and bores **254**, **256** about the axis **252**. The fork portion **250** of the third segment **208** resides between the forks of the fork portion **240** of the second segment **206** with axes **242**, **252** in coaxial alignment. A rod **258** extends within bores **244**, **246** of the second segment **206** and within bores **254**, **256** of the third segment **208** to couple the second and third segments **206**, **208** and to allow rotation of the second and third segments **206**, **208** between housing sides **174**, **176** about axes **242**, **252**. A spring **260** resides about axes **242**, **252** and biases the second and third segments **206**, **208** of the folding door **200** in a first orientation, as seen in FIGS. **9** and **11**, where the second and third segments **206**, **208** lie within a common plane **262**. The third segment **208** of the folding door **200** has an end **264** distant from bores **254**, **256** which is proximate the trap door **202** when the revolving door **170** is in its first orientation relative to the housing **104**.

The trap door **202**, as seen in FIGS. **9** and **11** (see FIGS. **22–24** for detailed views), rotatably couples to the entrance chute **106** of the coin return device **100** near the second opening **152** of the entrance chute **106**. The trap door **202** comprises a panel **270**, extending between trap door ends **272**, **274**, which aligns with a rear portion of wall **276** of the entrance chute **106** and resides within opening **277** of the housing **104** when the trap door **202** is in its closed position as illustrated in FIGS. **9** and **11**. At end **272**, the trap door **202** has a forked portion **278** which defines an axis **280** therethrough. The forked portion **278** defines bores **282**, **284** which extend about axis **280**. The entrance chute portion **106**

of the housing **104** defines an axis **288** and bores **290, 292** about axis **288**. A rod **294** extends within trap door bores **282, 284** and within entrance chute bores **290, 292** to couple the trap door **202** to the housing **104** and to enable rotation of the trap door **202** relative to colinearly-aligned axes **280, 288** in the clockwise and counterclockwise directions indicated, respectively, by arrows **295, 296**. In its closed position, illustrated in FIGS. **9** and **11**, end **274** of the trap door **202** resides slightly within the second opening **152** of the entrance chute **106**. A spring **298** biases the trap door **202** relative to the entrance chute **106** to maintain the trap door **202** normally in its closed position.

In accordance with the second preferred embodiment, the housing **104** comprises a right side portion **310** and a left side portion **311** (see FIG. **10**) which are substantially mirror images of one another. FIGS. **25–29** display various views of the right side portion **310** of the housing **104**. The right side portion **310** has a wall **276** which defines side and laterally-extending portions **312, 314** of the right side **174** of the housing **104** of the coin return device **100**. In the chamber area of the side portion **312**, an inside surface **316** of wall **276** defines a first plurality of lands **318** and a plurality of grooves **320** which are substantially concentric at various radii about axis **172** of the housing **104** with one groove **320** being located between an adjacent pair of lands **318**. The first plurality of lands **318** and the plurality of grooves **320** cooperate with opposing respective grooves **322** and lands **324** of the revolving door **170**, described below, to aid in guiding rotation of the door **170** about axis **172** and to aid in preventing shims (i.e., introduced into the coin return device **100** by thieves and/or vandals) and return coins from jamming rotation of the door **170**. In the chamber area of the laterally-extending portions **314**, the inside surface **316** of the wall **276** defines a second plurality of lands **326** laterally offset at terraced radii relative to axis **172** of the housing **104**. The lands **326** of the second plurality of lands **326** cooperate with opposing laterally offset, terraced lands **354** of the revolving door **170** to aid in guiding smooth rotation of the revolving door **170** and to aid in preventing shims and return coins from jamming rotation of the door **170**. The right side portion **310** of the housing **104** also defines a recessed area **328** which cooperates with segments of the folding door **200**.

Referring now to FIGS. **30–35**, the revolving door **170** defines a laterally-extending axis **350** between sides **180, 182** which is coaxial with axis **172** of the housing **104**. The revolving door **170** comprises an outer wall **352** forming a first plurality of lands **354** which are laterally offset, in the direction of axis **350**, at terraced radii relative to axis **350**. The outer wall **352** defines a first notch **356** which extends, in the direction of axis **350**, between sides **180, 182** of the revolving door **170** and in a substantially inward radial direction toward axis **350**. The first notch **356** cooperates with notch **144** of the housing **104** during installation of the coin return device **100** by aligning with notch **144** to temporarily receive a portion of the front face plate **138** of the pay telephone **102**. The outer wall **352** also defines a second notch **358** which extends, in the direction of axis **350**, partially between sides **180, 182** of the revolving door **170** and in a substantially inward radial direction toward axis **350**. The second notch **358** is accessible to a user of the pay telephone **102** through the discharge opening **132** and receives the tip of a user's finger during operation of the coin return device **100** as described below.

The revolving door **170** further comprises side walls **360, 362** at sides **180, 182** and inside walls **364, 366**. The side walls **360, 362** and inside walls **364, 366** define a second plurality of lands **324** and a plurality of grooves **322** at appropriate distances from axis **350** to enable their respective cooperation with the plurality of grooves **320** and the first plurality of lands **318** of the right side portion **310** of the housing **104** and with substantially similar lands and grooves of the left side portion **312** of the housing **104**. Inside wall **366** also defines a recess **368** which sometimes receives the folding door **200** during operation of the coin return device **100**.

According to a method of the second preferred embodiment, the coin return device **100** defines, as seen in the schematic view of FIG. **36**, a first orientation of its components prior to interaction between the pay telephone **102** and a user of the pay telephone **102** (i.e., at a first time). In the first orientation, the revolving door **170** of the coin return device **100** resides in housing **104**, with its second notch **358** oriented near the top of the discharge opening **132**, with a portion of its outer wall **352** entirely blocking the second opening **152** of the entrance chute **106** (i.e., thereby making the entrance chute **106** and the coin return chute **108** non-communicable with the chamber **150** and with the discharge opening **132**), and with chamber **150** being accessible to the user through the discharge opening **132**. Also, the folding door **200** rests substantially against a portion of the outer wall **352** and the trap door **202** entirely blocks opening **277** of the housing's entrance chute **106**. Note that, in the first orientation, the outer wall **352** of the revolving door **170** and the folding door **200** break the coin return path **115** into discontinuous segments (i.e., a first segment including portions **114, 154** of the coin return path **115** and a second segment including portions **156, 158**) with only the second segment of the coin return path **115** (i.e., and, hence, return coins within chamber **150**) being accessible to a user.

Then, upon insertion of coin(s) into a coin receiving slot of the pay telephone **102** by the user, the coin validator determines whether each inserted coin is acceptable (i.e., not a slug, not an unacceptable coin of a foreign country, etc.) or not acceptable. If a coin is not acceptable (i.e., and, hence, termed herein as a "rejected coin"), the coin validator directs the rejected coin into the coin reject chute **108** where it falls, under the influence of gravity, through channel **122** along portion **124** of the coin return path **115** and into channel **112** of coin return chute **108**. If a coin is acceptable (i.e., and, hence, termed herein as an "accepted coin"), the coin validator directs the accepted coin into the coin escrow device **110** for temporary storage until either (1) the user's telephone call is successfully completed and the accepted coins are directed toward a coin receptacle (not shown) for storage until collected by a representative of the pay telephone's owner, or (2) the user's telephone call is not successfully completed and the user either hangs-up the telephone's handset or operates the telephone's hookswitch to cause the coin escrow device **110** to release and direct the accepted coins into channel **112** of the coin return chute **108**. Note that together, any rejected coins and any accepted, but released coins (i.e., released by the coin escrow device **110**) which travel through channel **112** of the coin return chute **108** are referred to herein as "return coins".

Upon introduction into channel **112** of the coin return chute **108**, return coins are guided along a portion **114** of the coin return path **115**, in the direction of the arrows, into the entrance chute **106** of the coin return device **100** through the entrance chute's first opening **116**. Once within the entrance chute **106**, the return coins collect atop the folding door **200**. The user, desiring to recover the return coins, places the tip of a finger through the discharge opening **132** of the coin return device's housing **104** and into the second notch **358**

of the revolving door **170**. In response to the application of a, generally, downward tangential force, by the user, to the outer wall **352** in the proximity of the second notch **358**, the revolving door **170** rotates in a counterclockwise direction, indicated by arrow **153**, about axis **172** of the housing **104**. Upon continuing receipt of the, generally, downward tangential force, the revolving door **170** continues its rotation in the counterclockwise direction with the second notch **358** getting increasingly nearer the bottom of the discharge opening **132**, with the outer wall **352** of the revolving door **170** blocking increasingly more of the discharge opening **132** (i.e., thereby increasingly blocking user access to the chamber **150** within the coin return device **100** through the discharge opening **132** of the housing **104**), and with the outer wall **352** blocking decreasingly less of the entrance chute's second opening **152**.

When the user can no longer cause continued counterclockwise rotation of the revolving door **170** (i.e., when the second notch **358** is positioned substantially near the bottom of the discharge opening **132**), the components of the coin return device **100** are positioned in a second orientation, at a second time, as shown schematically in FIG. **37**. In the second orientation, the first notch **356** of the revolving door **170** aligns with notch **144** of the housing **104** and a portion of the outer wall **352** entirely blocks the discharge opening **132**, thereby rendering the chamber **150**, the entrance chute **106**, and channel **122** of the coin return chute **108** inaccessible to the user via the discharge opening **132**. Also, the outer wall **352** no longer blocks the second opening **152** of the entrance chute **106**, and the second and third segments **206**, **208** of the folding door **200** extend in a substantially downward vertical direction into chamber **150** after having pivoted relative to the first segment **204** due to the removal of support from the outer wall **252** and the combined weight of return coins previously residing atop the door **200** in the entrance chute **106** and the weight of the door **200** itself applying a downward force on the folding door **200**. Note that, in the second orientation, the revolving door **170** breaks the coin return path **115** into discontinuous segments (albeit segments comprising different portions than in the first orientation) with portions **114**, **154**, **156** (i.e., a first segment) of the path **115** not being accessible to the user through the discharge opening **132** and portion **158** (i.e., a second segment) of the path **115** being accessible to a user. In the second orientation, the chamber **150** is in communication with the entrance chute **106** and channel **122** of the coin return chute **108**, thereby enabling, with the folding door **200** extending downward, return coins to fall into the chamber **150** from the entrance chute **106** and the coin return chute **108**. Note also that should a substantial number of return coins be present within the entrance chute **106** and/or coin return chute **108**, the second and third segments **206**, **208** of the folding door **200** are pivotable, as depicted in FIG. **38**, into recess **368** of the revolving door **170** (i.e., defining a variant of the second orientation of the coin return device **100**).

Once the user is satisfied that return coins are present within the chamber **150** of the coin return device **100**, the user removes the tip of his/her finger from the second notch **358** of the revolving door **170**. In response to removal of the user's finger, spring **192** causes the revolving door **170** to rotate in a clockwise direction, indicated by arrow **151**, about axis **172** of the housing **104** until the revolving door **170** and the other components of the coin return device **100** return to the arrangement of their first orientation shown in FIG. **36**. During the clockwise rotation of the revolving door **170**, the second notch **358** of the revolving door **170** becomes increasingly nearer the top of the discharge opening **132** and the outer wall **352** of the revolving door **170**, while blocking increasingly more of the second opening **152** of the entrance chute **106**, presses generally upward on the segments **204**, **206**, **208** of the folding door **200** to return the folding door **200** to its position in the first orientation of the coin return device **100**.

Note that, due, in part, to the sizing, spacing, and spatial arrangement of the components of the coin return device **100** and due, in part, to the movement of the revolving door **170** relative to the housing **104**, a direct, continuous, uninterrupted, unsegmented coin return path **115** is never present between the discharge opening **132** and the first opening **116** of the entrance chute **106** (i.e., nor between the discharge opening **132** and channel **122** of the coin return chute **108**). Because no such continuous, unsegmented coin return path **115** is ever present, the coin return device **100** renders it extremely difficult, if not impossible, for a thief to introduce a foreign object into the coin return chute **108** via the discharge opening **132**. Should a thief attempt to "stuff" the pay telephone **102**, the thief will discover that the foreign object cannot be introduced any farther than the chamber **150** because the lack of a direct, continuous, unsegmented coin return path **115** created by the coin return device's "airlock" design does not allow the foreign object to be pushed into the coin return chute **108** even upon rotation of the revolving door **170**. A customer desiring to use the pay telephone **102** might notice the foreign object (i.e., as the foreign object may likely be visible through discharge opening **132**) and either not use the telephone **102** or remove the foreign object before using the telephone **102**. Should a thief attempt to introduce a foreign object into the coin return chute **108** by employing a "stringing" technique, the folding door **200**, when in its second orientation shown in FIG. **37** (i.e., which would necessarily be the door's orientation when the thief attempts to pull the foreign object into the coin return chute **108**) and as proven by experimentation, substantially resists the pulling of a foreign object upward through the second opening **152** of the entrance chute **106** (i.e., because spring **260** locks the second and third segments **106**, **208** of door **200** in plane **262** enabling the tip to segment **208** of the folding door **200** to engage the foreign object and resist its upward travel), thereby causing the foreign object to remain and be detectable in chamber **150** when the revolving door **170** and folding door **200** return to their positions of the first orientation. Note that, in an alternate embodiment, a string cutter is employed in the entrance chute **106** to prevent repeated "stringing" attempts.

Also, note that should the coin return device **100**, for some reason, become jammed with return coins (i.e., which may be possible, although not very likely, when a substantial number of coins attempt to fall through the second opening **152** of the entrance chute **106**), the second and third segments **206**, **208** of the folding door **200** pivot relative to one another (i.e., defining a variant of the coin return device's second configuration), upon successive clockwise and counterclockwise rotations of the revolving door **170**, in order to aid in clearing the jam (see FIG. **39**). In addition, the trap door **202** is rotatable in a substantially a counterclockwise direction, as indicated by arrow **296**, into an open position (see FIG. **39**), thereby allowing return coins to fall through opening **277** of the housing **104** and into other portions of the pay telephone **102** in order to assist in breaking the jam. Upon clearing of the jam and releasing of the revolving door **170** by the user, the folding door **200** and the trap door **202** return to their positions of the first orientation of the coin return device **100**.

Additionally, should a vandal insert and detonate fireworks within chamber **150**, the coin return device **100** resists damage to itself and to sensitive components of the pay telephone **102**. In the event that the fireworks detonate with the revolving door **170** in the first orientation, a substantial portion of the energy released by the detonation is directed through the discharge opening **132** and, hence, away from the pay telephone **102**. In the event that the revolving door **170** is somehow held (i.e., to overcome the force exerted by spring **192** tending to always return the revolving door **170** to the first orientation) in the second orientation when the fireworks detonate, the revolving door **170** rotates somewhat in either a clockwise or counterclockwise direction, the folding door **200** rotates somewhat in a substantially counterclockwise direction away from the second opening **152** of the entrance chute **106**, and the trap door **202** rotates somewhat in a substantially counterclockwise direction away from opening **277** of the housing **104** to aid in dissipating energy which might, otherwise, be transmitted, via shock waves traveling in a substantially upward direction through the coin return chute **108**, to sensitive components of the pay telephone **102**.

Note that the various components of the coin return device **100** (including, particularly, the entrance chute first and second openings **116**, **152**, the folding door **200**, the trap door **202**, the chamber **150**, and the discharge opening **132**) are appropriately sized and positioned to enable the coin return device **100** to return large coins having diameters (or, other maximum dimensions) of at least 35 millimeters, as well as smaller coins having lesser diameters (or, other maximum dimensions), to a pay telephone's user.

While the invention has been disclosed in the form of a coin return device **100** having a revolving door **170** as the movable door, it is understood that the scope of the present invention encompasses use of a door which moves in a linear, reciprocating manner. Such a reciprocating door could still provide indirect access to the coin hopper **1**, or entrance chute **106**, whereby user access to the coin hopper **1** would be blocked whenever user access is provided to the coin return chamber **150**.

While the invention has been disclosed in preferred embodiments, it will be apparent to those reasonably skilled in the art that many modifications, additions and deletions can be made therein without departing from the spirit and scope of the present invention as set forth in the following claims.

I claim:

1. A coin return apparatus for use with a pay telephone, said coin return apparatus comprising:

a housing mountable within the pay telephone, said housing having a chamber therein, a first opening communicable with a passageway of a coin return structure of the pay telephone and selectively communicable with said chamber, and a second opening communicable with the environment about the pay telephone and selectively communicable with said chamber; and,

movable door mounted to said housing, said movable door being movable between first and second positions relative to said housing, wherein the presence of said movable door in said first position enables removal of coins present in said chamber through said second opening and disables passage through said first opening from said chamber, and wherein the presence of said movable door in said second position enables delivery of coins into said chamber through said first opening and disables passage through said second opening to said chamber.

2. The coin return apparatus of claim **1** wherein said coin return apparatus further comprises means for hindering movement of a foreign object through said first opening of said housing.

3. The coin return apparatus of claim **2** wherein said movable door is a first movable door and said means for hindering movement comprises a second movable door positionable between first and second orientations relative to said first opening of said housing, wherein said second movable door in said first orientation substantially occludes said first opening of said housing and said second movable door in said second orientation extends into said chamber of said housing.

4. The coin return apparatus of claim **1** wherein said coin return apparatus further comprises means for impeding the wedging of a foreign object between said housing and said movable door.

5. The coin return apparatus of claim **4** wherein said means for impeding comprises a plurality of lands of said housing and a plurality of grooves of said movable door, said plurality of lands being cooperative with said plurality of grooves.

6. The coin return apparatus of claim **4** wherein said means for impeding comprises a plurality of grooves of said housing and a plurality of lands of said movable door, said plurality of lands being cooperative with said plurality of grooves.

7. The coin return apparatus of claim **1** wherein said coin return apparatus further comprises means for enabling movement of said movable door between said first position and said second position.

8. The coin return apparatus of claim **7** wherein said means for enabling movement comprises a recess of said movable door accessible to a user from outside said coin return apparatus.

9. The coin return apparatus of claim **1** wherein said coin return apparatus further comprises means for clearing jammed coins from said housing.

10. The coin return apparatus of claim **9** wherein said housing has a third opening therein and said means for clearing jammed coins comprises a trap door selectively covering said third opening.

11. The coin return apparatus of claim **1** wherein said movable door is pivotally connected to said housing.

12. The coin return apparatus of claim **11** wherein said movable door comprises a revolving door mounted within said housing.

13. A coin return apparatus for use with a pay telephone, said coin return apparatus comprising:

a first member fixedly mountable within the pay telephone; and,

a second member cooperative with and movable relative to said first member, said first and second members defining a chamber therebetween, said chamber being selectively communicable with a passageway of a coin return structure of the pay telephone and selectively communicable with the environment about the pay telephone, said second member placing said chamber in exclusive communication with the passageway of the coin return structure at a first time and in exclusive communication with the environment at a second time different from the first time, said second member opposing communication between the passageway of the coin return structure and the environment at a same time.

14. The coin return apparatus of claim **13** wherein said first member and said second member are coupled for relative rotary motion therebetween.

15. The coin return apparatus of claim 14 wherein said coin return apparatus further comprises a biasing means for causing relative rotary motion between said first member and said second member, said biasing means being connected to said first member and to said second member.

16. The coin return apparatus of claim 15 wherein said biasing means comprises means for returning said chamber into communication with the environment about the pay telephone after said chamber has been out of communication with the environment about the pay telephone.

17. The coin return apparatus of claim 14 wherein said second member resides within said first member.

18. The coin return apparatus of claim 13 wherein said coin return apparatus further comprises a first opening and a second opening therein, said first opening being selectively communicable with the passageway of the coin return structure of the pay telephone and said second opening being selectively communicable with the environment about the pay telephone, and wherein said second member selectively blocks access to said first opening and to said second opening.

19. The coin return apparatus of claim 13 wherein said coin return apparatus further comprises means for blocking passage of a foreign object through said coin return apparatus.

20. The coin return apparatus of claim 13 wherein said coin return apparatus further comprises means for thwarting wedging of a foreign object within said coin return apparatus.

21. The coin return apparatus of claim 13 wherein said coin return apparatus is insertable into the pay telephone through a coin return opening in a housing of the pay telephone.

22. The coin return apparatus of claim 13 wherein said coin return apparatus accommodates coin s therein having a maximum size dimension as large as thirty-five (35) millimeters.

23. A coin return apparatus for use with a pay telephone, said coin return apparatus comprising:

a housing mountable within the pay telephone, said housing defining a coin return path therethrough having a first segment and a second segment discontinuous from said first segment; and,

means connected to and cooperative with said housing for selectively making said first segment accessible from outside said housing at a first time and for selectively making said second segment accessible from outside said housing at a second time different from said first time, said first and second segments not being accessible from outside said housing at a same time.

24. The coin return apparatus of claim 23 wherein said means for selectively making is positionable by a user to make said first segment of said coin return path continuous with a coin return path of the pay telephone extending outside of said housing, whereby coins are delivered into the housing from a coin handling component of the pay telephone.

25. The coin return apparatus of claim 24 wherein said means for selectively making comprises a rotatable member pivotally coupled to said housing.

26. The coin return apparatus of claim 23 wherein said coin return apparatus is capable of passing coins therethrough having a maximum size dimension as large as thirty-five (35) millimeters.

27. A coin return apparatus for use with a pay telephone, said coin return apparatus comprising:

a housing defining a coin hopper and a coin return chamber positioned generally below said coin hopper; and,

movable door means mounted to said housing for movement between a coin retrieval position and a coin delivery position, wherein with said movable door means in said coin retrieval position coins within said coin return chamber can be retrieved manually and access to said coin hopper is blocked, and with said movable door means in said coin delivery position access to said coin return chamber is blocked and coins can be delivered by gravity from said coin hopper to said coin return chamber.

28. The coin return apparatus of claim 27 wherein said movable door means is pivotally mounted to said housing.

29. The coin return apparatus of claim 28 wherein said movable door means comprises a revolving door.

30. The coin return apparatus of claim 27 wherein said coin return apparatus further comprises means for opposing introduction of a foreign object into said coin hopper.

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