March 25, 1958 M. P. HAVERSTICK 2,827,996

COIN SEPARATORS

Filed July 27, 1953 3 Sheets-Sheet 1

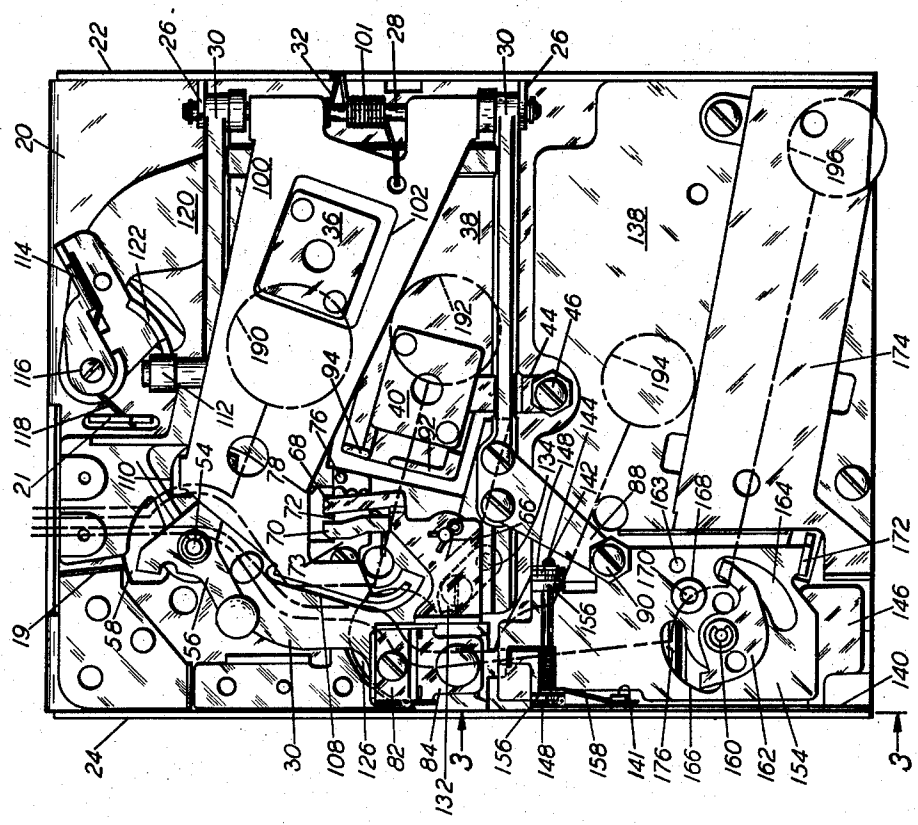


FIG. 1

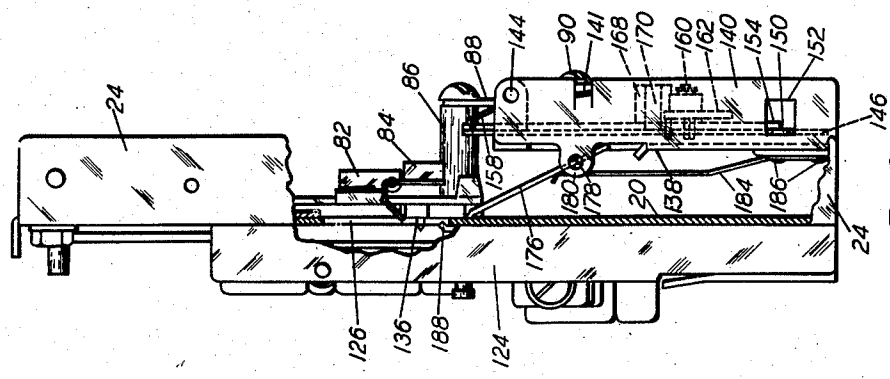


FIG. 2

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COIN SEPARATORS

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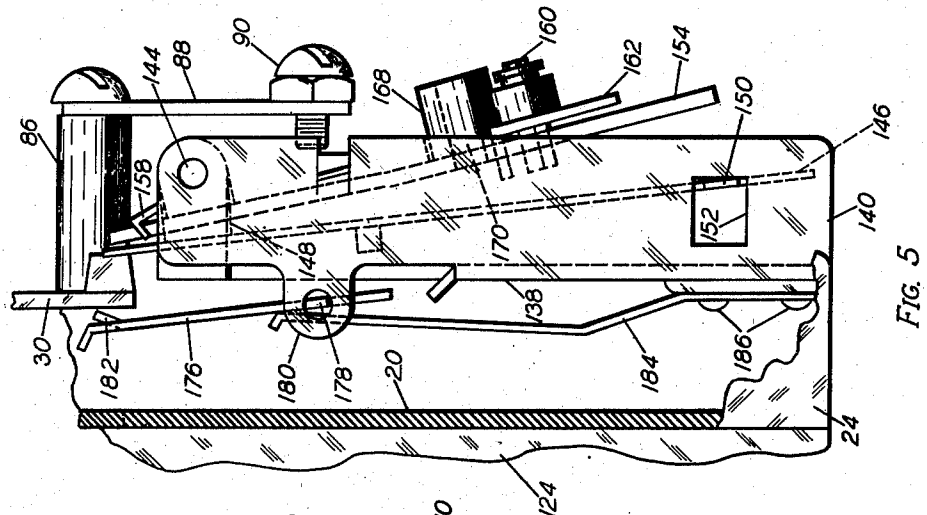


FIG. 5

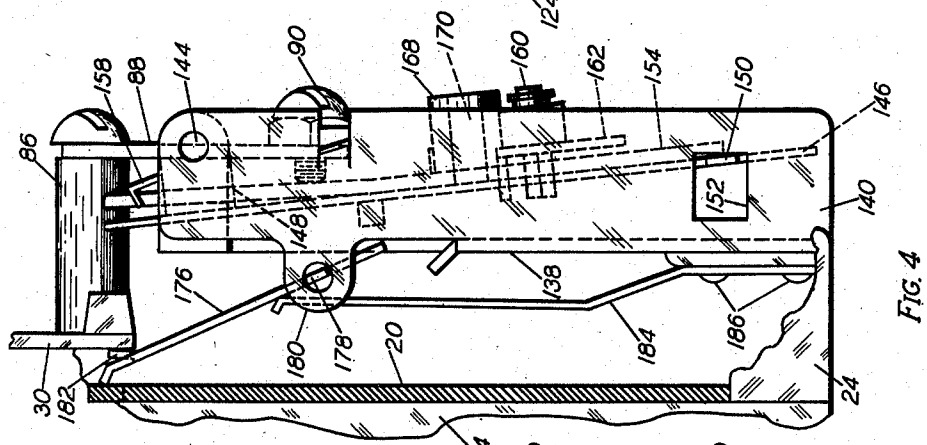


FIG. 4

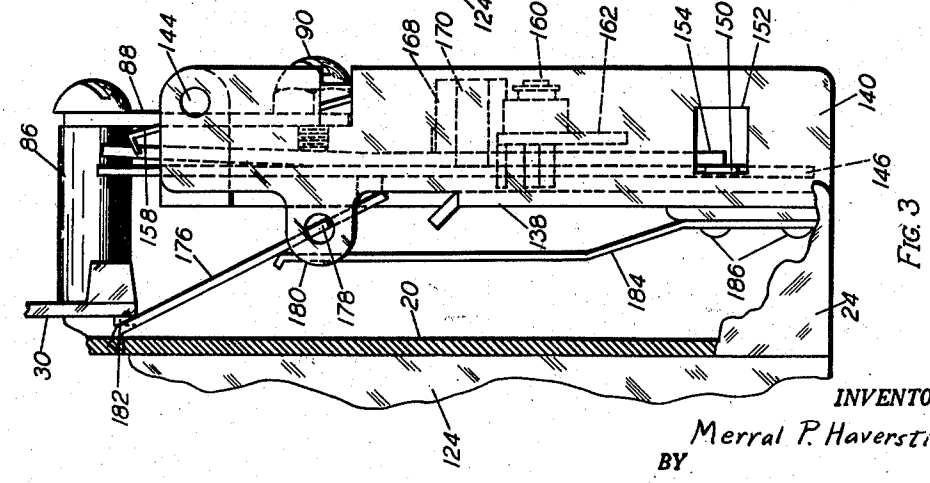


FIG. 3

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COIN SEPARATORS

Filed July 27, 1953 3 Sheets-Sheet 3

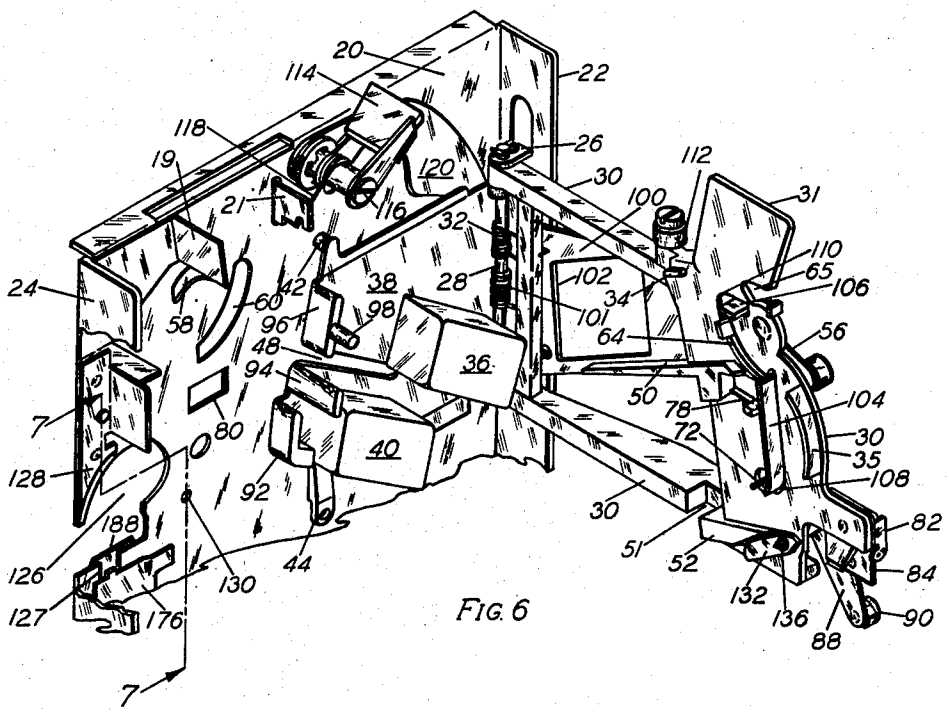


FIG. 6

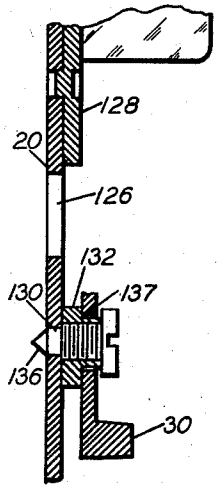


FIG. 7

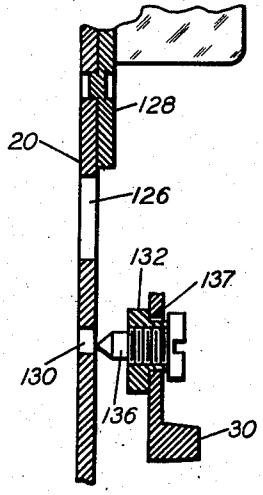


FIG. 8

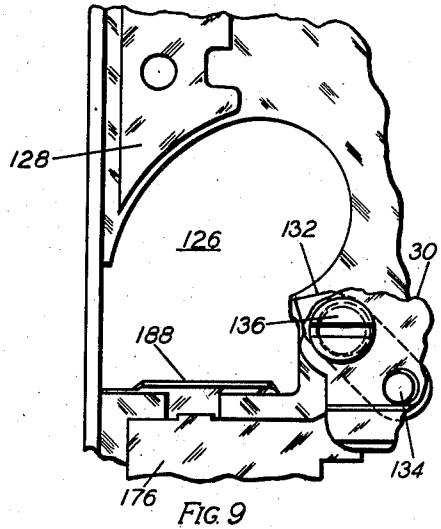


FIG. 9

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United States Patent Office 2,827,996 Patented Mar. 25, 1958

2,827,996

COIN SEPARATORS

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Application July 27, 1953, Serial No. 370,456

6 Claims. (Cl. 194—99)

This invention relates to improvements in coin separators. More particularly this invention relates to improvements in coin separators which can separate coins of closely similar diameters.

It is therefore an object of the present invention to provide a coin separator which can separate coins of closely similar diameters.

To be commercially acceptable and operative, a coin separator must be able to separate coins of closely similar diameters and yet must be able to release unacceptable coins which it must intercept. In the absence of such a release, or scavenging as it is known, the coin separator would have its coin passageways blocked. Accordingly, most commercially acceptable coin separators have a gate which can be moved away from the frame of the coin separator to release coins for movement to a rejected coin chute; and it is customary to mount one coin-intercepting surface on the gate and another cooperating coin-intercepting surface on the frame. Such a construction enables the two surfaces to intercept coins that should not be accepted by the coin separator, but permits the subsequent ready release of such coins as by separating the two coin-intercepting surfaces and thus removing the support for the intercepted coins. The gates of most commercially acceptable and operative coin separators are customarily mounted on hinges and their paths of movement are subject to certain variations because of manufacturing tolerances in the hinges. These variations in the paths of movement of the gates can vary the spacing between the coin-intercepting surfaces that are to intercept the undesired coin; and such variations can lead to the rejection of desired coins or to the acceptance of undesired coins. Such variations are, therefore, objectionable. The present invention obviates this objection by making one of the coin-intercepting surfaces movable relative to the frame and relative to the gate, and by providing a device that positively centers that coin-intercepting surface whenever the gate and frame are in normal position. With such a construction, variations in the path of movement of the gate are compensated for by the centering device and the distance between the two coin-intercepting surfaces is always the same; and thus precise coin separation is possible. It is therefore an object of the present invention to provide a coin separator with a coin intercepting surface which is movable relative to the frame and the gate and which has a centering device to precisely center it relative to the other coin-intercepting surface.

The movable coin-intercepting surface provided by the present invention is preferably pivoted to the gate or the frame and has a pointed projection on it. This projection will coact with a recess in the frame or the gate to move the movable coin-intercepting surface to a position that is precisely spaced from the fixed coin-intercepting surface. The movement of the movable coin-intercepting surface will be great enough to overcome all variations in the path of movement of the gate due to manufacturing tolerances and wear. As the gate is opened, the weight of the movable coin-intercepting surface will tend to move it downwardly, but as the gate is closed the pointed projection will engage the recess and raise the coin-intercepting surface upwardly into precisely spaced relation with the fixed coin-intercepting surface.

The coin-intercepting surfaces provided by the present invention can be disposed adjacent an opening through which under-sized coins can pass. Thus, those coin-intercepting surfaces can assist in directing under-sized coins to the opening while they also stand ready to gage the diameter of coins of the proper size.

The movable coin-intercepting surface provided by the present invention is of particular value where it is mounted adjacent an opening for under-sized coins. That movable coin-intercepting surface can have a specially hardened face which will be strongly resistant to wear, whereas it might be impractical to harden the periphery of the opening through which the under-sized coins must pass. With such a construction, the ability of the coin separator to pass under-sized coins of a predetermined diameter through the opening, will be preserved indefinitely because wear will be at a minimum.

It is frequently desirable to equip coin separators with magnets which will halt the movement of magnetic coins or slugs. In many instances the magnets are disposed adjacent portions of the coin passageway where the coins are falling freely or are rolling along a runway, and while such an arrangement is workable and operative, it requires a powerful magnet. In some instances, the cost and size of such magnets are prohibitive, and the provision of a structure that will intercept and hold magnetic coins or slugs with only a small magnet is essential. The present invention provides such a structure by mounting a coin-intercepting device and a magnet in close proximity. The coin-intercepting device will intercept and hold the coin and thus greatly reduce the speed of the coin; in some cases completely halting that coin. That coin-intercepting device will thereafter release the coin if the coin is of the type which is to be accepted by the coin separator. If the coin is spurious, as by being of magnetic material, the magnet which is adjacent the coin-intercepting device will hold the coin and keep the coin-intercepting device from releasing it. This magnet can be small because the coin is partially supported by the coin-intercepting device, and the coin-intercepting device has largely absorbed the kinetic forces which the coin possessed before it engaged the coin-intercepting device. It is therefore an object of the present invention to provide a coin separator with a coin-intercepting device and a magnet which is adjacent that coin-intercepting device and will coact with that coin-intercepting device to hold magnetic coins or slugs.

The coin-intercepting device provided by the present invention can be a pivoted cradle which will receive a coin and will thereafter rotate to transfer the coin to a runway. Such a cradle will largely halt the movement of the coin and will thereafter rotate under the weight of the coin to let the coin roll onto the runway. During its rotation, the cradle will move the coin at a moderate speed and the magnet will act upon that coin while it is being moved at that speed by the cradle. This speed is sufficiently slow that the magnet will be able to stop the rotation of the coin-carrying cradle, as by applying sufficient magnetic force to the coin to overcome the gravitational forces on that coin. The magnet will be assisted in holding the coin by the supporting action of the cradle.

Other and further objects and advantages of the present invention should become apparent from an examination of the drawing and accompanying description.

In the drawing, Fig. 1 is a front elevational view of a coin separator that is made in accordance with the principles and teachings of the present invention;

Fig. 2 is a partially broken away end view of the coin separator of Fig. 1;

Fig. 3 is a partially broken away end view of a portion of the coin separator of Fig. 1, and it is taken along the plane indicated by the line 3—3 in Fig. 1;

Fig. 4 is a partially broken away end view of the structure of Fig. 3, and it shows that structure in an intermediate scavenging position;

Fig. 5 is a partially broken away end view of the structure of Fig. 3, and it shows that structure in fully scavenged position;

Fig. 6 is a perspective view of a portion of the coin separator of Fig. 1, and it shows the gate of that separator in open position;

Fig. 7 is a sectional end view of a portion of the structure of Fig. 6, and it is taken along the broken plane indicated by the line 7—7 in Fig. 6;

Fig. 8 is a sectional view of the structure of Fig. 7, but it shows the gate moved slightly away from the frame, and

Fig. 9 is a front elevational view, on an enlarged scale, of a portion of the coin separator of Fig. 1.

Referring to the drawing in detail, the numeral **20** denotes the frame of the coin separator provided by the present invention. That frame is essentially a flat plate provided with a projecting flange **22** at the right-hand side thereof and with a flange **24** at the left-hand side thereof. Two ears **26** are provided on the right-hand flange **22**; those ears preferably being punched out of that flange. The ears **26** support a pivot pin **28** and that pin rotatably supports a movable gate **30**. The gate can rotate about the pin **28** from a position in parallel with the center wall of the frame **20** to a position angularly disposed relative to that wall. A spring **32** encircles the pivot pin **28** and bears against the right-hand flange **22** and against the gate **30**. This spring biases the gate into parallel relation with the center wall of the frame **20**. A spacer **34** is formed on the gate **30**, and that spacer engages the center wall of the frame **20** to limit the movement of the gate **30** toward the center wall of the frame **20**. This space will be dimensioned to enable the gate **30** to cooperate with the center wall of the frame **20** to provide the entering portion of a coin passageway.

A permanent magnet **36** is mounted on a movable wall **38**, and that movable wall is rotatable about the pivot pin **28**. No spring is necessary to bias the movable wall **38** toward the center wall of the frame **20**, because the magnet **36** will provide a force that biases the wall **38** toward the center wall of the frame **20**. A second permanent magnet **40** is mounted on the movable wall **38** and that magnet will also provide a biasing force that will urge the movable wall **38** toward the center wall of the frame **20**. A spacer **42** is mounted on the center wall of the frame **20** in register with an upwardly extending ear on the movable wall **38**. This spacer will be dimensioned to hold the free edge of the movable wall **38** away from the center wall of the frame **20** a distance just slightly greater than the thickness of acceptable coins. An ear **44** is provided on the bottom of the movable wall **38** and that ear carries a screw **46** which can be adjusted to serve as an adjustable spacer for the bottom of the movable wall **38**. The screw **46** will be adjusted to hold the bottom of the free edge of the movable wall **38** away from the center wall of the frame **20** the same distance that the spacer **42** holds the upper end of that free edge away from the center wall of the frame **20**. Thus, the spacers **42** and **46** assure the maintenance of the proper spacing between the free edge of the movable wall **38** and the center wall of the frame **20**.

A slot **48** is formed in the movable wall **38**, and that slot accommodates a runway **50** on the gate **30**, and permits that runway to move into engagement with the center wall of the frame **20**. The gate **30** carries a second runway **52** which extends to and engages the center wall of the frame **20**. The runway **52** stops short of the ear **44** on the bottom of the movable wall **38**, and a recess **51** is provided in the bottom of the gate **30** to accommodate that ear. Coins rolling along the runway **52** will pass between the ear **44** and the center wall of the frame **20**.

A pivot **54** is provided on the gate **30**, and that pivot rotatably supports a cradle **56**. This cradle has fingers which extend into slots **58** and **60** which are formed in the frame **20**. Thus, the fingers of the cradle **56** completely span the coin passageway formed between the gate **30** and the center wall of the frame **20**; thereby keeping coins of predetermined size from slipping past the cradle **56** without being intercepted by that cradle. A slot **64** is provided in the gate **30** to receive one of the fingers of the cradle **56**, and the gate **30** is cut away, as at **65**, to receive the other finger of the cradle **56**. The slot **64** of the cradle will be similar to and will register with the slot **60** in the center wall of the frame **20**, and the cutaway portion **65** of the gate **30** will be generally similar to and will register with the slot **58** in the center wall of the frame **20**. Thus, whenever the gate **30** is in parallel relation with the center wall of the frame **20**, the fingers of the cradle **56** will be free to move in the slots and cutaway portions of the gate **30** and the center wall of the frame **20**.

A pivot **66** is mounted on the gate **30**, and two levers **68** and **70** are rotatably mounted on the pivot **66**. A wire **72** is provided adjacent the levers **68** and **70** and that wire pivots in a slot of a plate **73** secured to the gate **30**. The wire **72** is identical to the wire **161** disclosed in B. W. Fry Patent Number 2,292,628 which issued August 11, 1942; and it serves the same purpose that the said wire **161** serves. The lever **70** is substantially identical to the bell crank **153** in the said B. W. Fry patent and it serves the same purpose that the said bell crank serves. The lever **68** is a substitute for the wire spring **169** in the said B. W. Fry patent, and it performs the same function that the said wire spring performs. A stop **76** is mounted on the gate **30** and that stop limits rotation of the lever **68** in a clockwise direction. An opening **78** is provided in the gate **30** to receive the end of the lever **70**, and an opening **80** is provided in the center wall of the frame **20** to receive the end of the lever **70**. This enables the upper end of the lever **70** to extend through the coin passageway defined by the gate **30** and the center wall of the frame **20**, and as a result, coins of a certain size cannot slip past the upper end of the lever **70** without being intercepted by that upper end.

A generally U-shaped bracket **82** is secured to the free edge of the gate **30**, and that bracket carries a generally V-shaped deflector **84** which is provided with a weight on one of the legs thereof. The deflector **84** will be free to pivot relative to the bracket **82** and thus will be free to pivot relative to the gate **30** and the center wall of the frame **20**. The weight on the one leg of the deflector **84** will bias the other leg of that deflector into the passageway defined by the gate **30** and the center wall of the frame **20**.

A stud **86** is formed on the lower edge of the gate **30**, and that stud projects outwardly from that gate. A plate **88** is secured to the stud **86** and inclines downwardly and to the left from the stud **86**. An adjusting screw **90** is mounted in a threaded hole in the lower end of the plate **88**. The end of the screw **90** can be set at various distances from the center wall of the frame **20** by rotating the screw relative to the threads of the hole in the plate **88**.

An L-shaped baffle **92** is mounted to the left of the magnet **40**, a baffle **94** is mounted to the left and somewhat above the magnet **40** and a baffle **96** is mounted

above and to the left of the magnet **36**. These baffles are provided to keep coins from slipping into the space between the front surface of the movable wall **38** and the rear surface of the gate **30** whenever the gate **30** is moved away from the center wall of the frame **20**. If the coins tend to follow the gate **30**, the forward edges of those coins will strike the baffles **92**, **94** and **96** and will be kept from slipping to the front surface of the movable wall **38**. A spacer **98** is mounted on the baffle **96**, and that spacer extends outwardly from that baffle.

A stripping plate **100** is pivoted on the pivot pin **28**, and a spring **101** is provided to urge the stripping plate toward the center wall of the frame **20**. The spring **101** encircles the pivot pin **28** and has one end bearing against the flange **22** of the frame and has the other end bearing against the stripper plate **100**. An opening **102** is provided in the stripper plate **100** to accommodate the magnet **36**. The stripper plate **100** has stripping projections **104** and **106** formed at the free edge of that plate, and the stripping projection **104** extends through an opening **108** in the gate **30** while the stripping projection **106** extends through an opening **110** in the gate **30**. The stripping projections **104** and **106** are normally spaced outwardly of the openings **108** and **110** in the gate **30**; being held away from those openings by the spacer **98**. However, whenever the gate **30** is moved outwardly and away from the center wall of the frame **20**, the openings **108** and **110** will be telescoped over the stripping projections **104** and **106** respectively and thus the projections **104** and **106** will strip away any coins which tend to move with the gate adjacent the openings **108** and **110**. A roller **112** is pivoted to the upper edge of the gate **30** and a pressure plate **114** is mounted on a pivot **116** which is secured to the center wall of the frame **20**. The pressure plate is normally biased to the position shown in Figs. 1 and 6 by a spring **118** that surrounds the pivot **116** and has one end bearing against the pressure plate **114** and has the other end bearing against the guide **21**. A wiper blade **120** is secured to and moves with the pressure plate **114**, and a cam **122** is secured to and moves with the pressure plate **114**. The wiper blade will be movable into the coin passageway formed by the movable wall **38** and the center wall of the frame **20**, and will wipe out any coins which are held in that passageway by the magnets **36** and **40**. As the pressure plate **114** rotates about the pivot **116** to move the wiper blade **120** through the said passageway, the cam **122** will engage the roller **112** on the gate **30** and rotate the gate outwardly and away from the center wall of the frame **20**. This rotation of the gate **30** will clear the way for the wiper blade **120**, as by moving the runways **50** and **52** away from the center wall of the frame **20**.

The numeral **124** generally denotes a subframe which is secured to the frame **20** and extends rearwardly of that frame. This subframe supports testing mechanisms for coins, such as the United States dimes. These testing mechanisms are not directly part of the present invention and may be of the type used to test United States dimes in the said B. W. Fry patent.

An opening **126** is provided in the center wall of the frame **20** to permit coins, such as United States dimes, to pass from the passageway between the gate **30** and the center wall of the frame **20** to the testing mechanisms mounted on the subframe **124**. This opening will be just large enough to accommodate those coins, but will be too small to accommodate coins such as United States pennies, which are to be tested by mechanisms on the front side of the center plate of the frame **20**. Included in those testing mechanisms for the pennies is an arcuate coin-intercepting plate **128** secured to the center wall of the frame **20**. The arcuate portion of the plate **128** is spaced above and to the left of the upper portion of the opening **126**; thus exposing an arcuate area of the center wall of the frame **20**. This arcuate area will be narrow and will reflect the difference in diameter between a penny and a dime. A small centering opening **130** is provided in the center wall of the frame **20**, and a coin-intercepting element **132** is mounted on the gate **30** in register with the opening **130** in the center wall of the frame **20**. The element **132** is provided with a pivot **134** that loosely secures that element to the gate **30**. A centering pin **136** in the form of a cone is carried by the free end of the element **132**, and that pin is in register with the opening **130** in the center wall of the frame **20**. The pin **136** extends through an opening **137** in the gate **30**, and that opening is large enough to permit the free end of the element **132** to move vertically a slight distance. When the gate **30** is spaced from the center wall of the frame **20**, as shown in Fig. 8, the free end of the element **132** will move downwardly under the influence of gravity until the shoulder that surrounds the pin **136** rests on the bottom edge of the opening **137**. At this time, the pin **136** will still be in register with the opening **130** in the center wall of the frame **20**, but the point of the pin **136** will not be precisely in register with the geometric center of the opening **130**. As the gate **30** moves toward the center wall of the frame **20**, the conical face on the pin **136** will coact with the edge of the opening **130** to raise the free end of the element **132** and thus place the upper surface of that element in precisely spaced relation to the stationary coin-intercepting element **128**. Variations in the position of the free edge of the gate **30**, due to manufacturing tolerances and wear, will be less than the centering made possible by the opening **137**, the pin **136** and the opening **130**. As a result, the coin-intercepting element **132** will always be restored to a precisely spaced relation with the coin-intercepting element **128** whenever the gate **30** is parallel to and adjacent the center wall of the frame **20**.

A subframe **138** is suitably secured in rigidly spaced relation to the front of the center wall of the frame **20**. That subframe **138** has a flange **140** at the left-hand side thereof and it has an ear **142** that is disposed to the right of the flange **140**. A pivot pin **144** extends between the ear **142** and an opening in the flange **140** at the left-hand side of the subframe **138**. A movable wall **146** is provided with ears **148**, and those ears telescope over the pivot pin **144** and permit the rotation of the wall **146** relative to the center wall of the frame **20**. A tab **150** is provided on the movable wall **146** adjacent the lower end of that wall, and that tab extends into an opening **152** in the flange **140**. The tab **150** will limit movement of the wall **146** relative to the flange **140** and thus relative to the center wall of the frame **20**. A support **154** is provided with ears **156**; and the ears **156** are spaced so they can fit between the ears **148** on the movable wall **146**. The ears **156** of the support **154** will receive the pivot pin **144** and the support **154** is thus movable about that pivot pin. The support **154** is movable relative to the movable wall **146** as well as movable relative to the subframe **138** and the frame **20**. The ears **156** on the movable support **154** normally hold the upper end of that support spaced from the upper end of the movable wall **146**. However, rotation of the support **154** about the pivot pin **144**, while the movable wall **146** remains stationary, will place the upper end of the support **154** in engagement with the upper end of the movable wall **146**. Thus, rotation of the movable support **154** relative to the movable wall **146** is not unlimited. A spring **158** encircles the pivot pin **144**, and one end of that spring bears against the movable support **154** adjacent the top thereof and the other end of the spring bears against the subframe **138**, as by engaging an ear **141** punched out of the flange **140**. The spring **158** will bias the movable support **154** for rotation in a counter clockwise direction about the pivot pin **144**, as that support and that pin are viewed in Figs. 3–5. This biasing action of the spring **158** will be assisted by the gravitational forces on the movable support **154** and by the gravitational forces on the movable wall **146**. It will be noted that the ears on

the movable wall 146 and the ears on the movable support 154 extend to the right of those elements, as those elements are viewed in Figs. 3–5, and thus the center of gravity of those elements is to the left of the pin 144. This causes those elements to tend to rotate in a counter clockwise direction about the pin 144. Under normal conditions of operation, however, the spacer 90 carried by the plate 88, which in turn is mounted on the stud 86 of the gate 30, will press against the movable support 154 at a point below the level of the pivot pin 144 and will hold the movable support 154 and the movable wall 146 in the position shown in Fig. 3. When the spacer 90 is moved away from the subframe 138, as indicated particularly in Fig. 4, the action of gravity and the action of the spring 158 will cause the movable wall 146 and the movable support 154 to move together in a counter clockwise direction. However, when the tab 150 engages the right hand edge of the opening 152 in the flange 140, further counter clockwise rotation of the movable wall 146 will be halted, and thereafter the movable support 154 will continue to rotate in a counter clockwise direction to the position shown in Fig. 5.

A pivot 160 is mounted on the movable support 154, and that pivot rotatably supports a cradle 162. A slot 164 is provided in the movable support 154 to accommodate one of the fingers of the cradle 162, and the movable wall 146 is correspondingly cut away in register with the slot 164. A second slot 166 is provided in the movable wall 154, and a corresponding slot, not shown, is provided in the wall 146 to accommodate the other finger of the cradle 162. The slots and cut away portions of the movable wall 146 and movable support 154 permit free and ready rotation of the cradle 162 by a coin which it intercepts.

A sleeve 168 is mounted on the movable support 154 adjacent the cradle 162, and the center of that sleeve is in register with a point on the path which a coin intercepted by the cradle 162 must follow. A cylindrical magnet of the permanent type 170 is disposed within the sleeve 168 and can be suitably held in that sleeve by customary and usual means. One such means would be a set screw carried in the wall of the sleeve 168. This magnet will direct magnetic lines of flux into the space between the subframe 138 and the movable wall 146; that space constituting a coin passageway. The fingers of the cradle 162 will also extend into that space and will intercept coins passing downwardly in that space; and the cradle 162 will rotate under the weight of authentic coins and will deposit those coins on the runway 172 which is mounted on and is a part of the movable support 154. The coin which is transferred to the runway 172 will be able to roll into the accepted coin chute 174 and from there to a discharge point where it can drop into the coin box.

A deflector plate 176 is provided with pivots 178, and those pivots extend into openings in ears 180 on the subframe 138. The upper end of the deflector plate 176 can rotate between the upper edge of the subframe 138 and the center wall of the frame 20. A leaf spring 184 is suitably riveted to the subframe 138 by rivets 186, and that spring biases the deflector 176 for rotation against the upper edge of the subframe 138. However, an ear 182 on the deflector 176 is in register with the gate 30 and will normally be held adjacent the center wall of the frame 20 by the gate 30. When the ear 182 on the deflector plate 176 is held adjacent the center wall of the frame 20 by gate 30, the upper end of the deflector plate 182 will lodge in a notch 127 in the bottom edge of the opening 126. Thus, the deflector plate 176 will receive all coins which are presented to the opening 126 but which do not pass through that opening although they pass between the coin-intercepting elements 128 and 132. The deflector plate 176 will deliver those coins to the passageway between the subframe 138 and the movable wall 146.

A second deflector plate 188 is provided adjacent the opening 126. This deflector plate is mounted on the rear face of the center wall of the frame 20 and it tends to deflect coins which pass through the opening 126 to the testing mechanisms on the subframe 124.

The gate 30 has an inclined portion 31 at the upper edge thereof, and that inclined portion coacts with the center wall of frame 20 and with two spaced guides 19 and 21 on that center wall to define an entrance for coins. This entrance is in register with the coin-intercepting surfaces of the cradle 56, and each coin introduced through the coin entrance will pass toward the cradle 56. This cradle is dimensioned to intercept and hold all United States quarters and coins or slugs of that or larger size which are small enough to pass between the spaced guides 19 and 21. If the coins are of the proper size and weight, they will cause the cradle 56 to rotate in a clockwise direction and to transfer the coins to the runway 50.

The runway 50 will conduct the conduct coins through the magnetic field provided by the magnet 36. That magnetic field will generate eddy currents in the coins; the intensity of the eddy currents being determined by the electrical conducting characteristics of the coins. Proper electrical characteristics will enable the coins to fall toward an accepted coin chute, much in the manner of the coin which is shown as following the path C in the said B. W. Fry patent. If the coins have too high an electrical conductivity, they will be retarded by the magnetic field to the extent they will fall to the left of a deflecting bar, comparable to the bar 99 in the said B. W. Fry patent and will thus be directed to the rejected coin chute. If the coins have too low an electrical conductivity, they will strike an anvil, not shown, and rebound to the rejected coin chute. A coin which has been intercepted by the cradle 56 and which has been placed on the runway 50 for movement through the magnetic field of the magnet 36 is generally indicated by the numeral 190 in Fig. 1. Unduly thick coins will be too thick to pass between the movable wall 38 and the center wall of the frame 20, and thus they will be kept from passing to the accepted coin chute.

Coins, such as United States nickels, pennies and dimes will pass between the coin intercepting fingers of the cradle 56 and will fall downwardly towards the lever 70. The right hand finger of the cradle 56 will act to deflect coins, which pass through the cradle 56, to the left of the lever 70. The upper end of the lever 70 will normally be spaced from a guiding flange 35 on the free edge of the gate 30 a distance less than the diameter of a United States nickel. As a result, nickels which pass between the fingers of the cradle 56 will be forced into engagement with the lever 70 and will force that lever to rotate in a clockwise direction. The rotation of the lever 70 will force the wire 72 to rotate about its vertical axis in the slot in the plate 73 and thus withdraw the bottom end of that wire from the coin passageway. The lever 70 has sufficient mass and momentum that when a nickel strikes it and causes it to move the wire 72 out of the passageway, that lever will momentarily hold the wire 72 out of the passageway; thus enabling the nickel to reach the runway 52 and the coin-intercepting element 132. At such a time the element 132 acts merely as an extension of the upper end of the runway 52. Thereafter, the lever 68 will move the lever 70 and the wire 72 back to the position shown in Fig. 1, whereupon the lower end of the wire 72 will "feel" the surface of the nickel. If the nickel does not have a hole through it or does not have a serious surface cavity, the nickel will then roll along the runway 52 and past the magnet 40. Nickels will have an electrical conductivity that will enable them to follow a path comparable to the path E in the said B. W. Fry patent. Spurious coins that have too low an electrical conductivity will strike an anvil, not shown, comparable to the anvil 171 in the said B. W. Fry patent and will rebound with such force that they

will strike a stop and fall toward the rejected coin chute. If the electrical conductivity of the spurious coins is too high, the coins will fall short and thus fall into the rejected coin chute. A nickel that has passed the magnet **40** is denoted generally by the numeral **192** in Fig. 1. The structure for testing and separating quarters and nickels is not a part of the present invention, but is described here to illustrate the operation of the coin separator of the present invention.

A United States dime, and coins of comparable size, will fall through the space between the fingers of the cradle **56** and will move toward lever **70**. However those coins will not have sufficient weight to move the lever **70**. Instead, that lever will deflect those coins toward the upper end of the coin-intercepting element **132**. As those coins reach the upper end of element **132**, they will be in register with the opening **126**; and they will also be in engagement with the rear leg of the deflector **84**. The deflector **84** will urge those coins toward the opening **126**; and if they are no larger than a dime they will fall through that opening. The deflector **188** will guide those coins to the testing mechanisms, not shown, on subframe **124** where dimes will be accepted and spurious coins will be rejected. Those testing mechanisms will test coins for weight, diameter, thickness and electrical conductivity. Any coins which are larger than a dime will be unable to pass through the opening **126** because the distance between the upper left hand portion of that opening and the upper surface of the element **132** is carefully gaged to be just larger than the diameter of a United States dime. A dime which has passed through the cradle **56**, has been deflected through the opening **126** by the deflector **84**, and has passed into the testing mechanism on the subframe **124** is generally denoted by the numeral **194** in Fig. 1.

United States pennies, and coins of the same size will fall between the fingers of the cradle **56** and will strike the lever **70**. The weight of such coins is less than that of the nickel, and the diameter of such coins is less than that of a nickel, and therefore the lever **70** is not rotated far enough to move the wire **72** out of the coin passageway. Consequently, the wire **72** deflects those coins to the left, as viewed in Fig. 1, until those coins engage the upper surface of the element **132**. Those coins will simultaneously engage the element **128** and will be gaged by those two elements. If the coins are slightly larger in diameter than a penny, they will be intercepted by the elements **128** and **132**. Those coins can be freed from those elements by pressing on the pressure plate **114**, thus causing the gate **30** to move away from the center wall of the frame **20** and laterally separate the surfaces **128** and **132**. Thereupon the coins will be insufficiently supported and will fall directly downwardly to the reject coin chute, not shown, below and in register with the elements **128** and **132**. If the coins are not oversized, they will roll between the elements **128** and **132** and fall downwardly until they strike the coin-intercepting fingers of the cradle **162**. Coins that are thicker than a penny will be too thick to pass between subframe **138** and movable wall **146** and will be held. The ear **150** on wall **146** engages the rear edge of opening **152** in flange **140** to set the depth of the coin passageway. If the coins are of the required thickness and are large enough to be held by the fingers of the cradle **162**, and if they have the proper weight, they will cause the cradle to rotate in a clockwise direction and deliver the coins to the runway **172**. One such coin which has been so delivered is denoted generally by the numeral **196**.

If a coin is of the proper size and of the proper weight, but is of magnetic material, that coin will be held on the fingers of the cradle by the magnetic lines of flux from the magnet **170**. This magnet need not be strong enough to support the coin by itself because the fingers of the cradle will assist in supporting that coin; the magnet need merely be powerful enough to coact with the fingers of the cradle **162** to hold the coin. The fact that the coin will virtually come to a stop as it strikes the cradle **162** further reduces the required size and strength of the magnet **170** because the coin will be virtually motionless when the magnetic lines of flux act upon it. Moreover, the cradle **162** is so weighted that the unbalance due to the presence of the coin is not great, and is readily compensated for by the magnetic lines of force of the magnet. It will be noted that the magnet **170** is above a line which extends between the normal positions of the fingers of the cradle **162**; and therefore that magnet applies a holding force which tends to hold the coin up and thus relieve the cradle of the gravitational force of the coin. The magnet **170** is also above the level of the pivot **160** for the cradle, and this further assists the magnet in holding the coin up rather than in pulling the coin down.

In the event coins which strike the cradle **162** are oversized, they will strike the oversized pin **163** adjacent the cradle **162**, and further rotation of the cradle will be halted. If the coin is too light in weight, it will not be able to rotate the cradle **162**; and if the coin is of magnetic material it will be held in the cradle **162** by magnet **170**. To free such coins for movement toward the coin reject chute, it is only necessary to depress the pressure plate **114**; and thereupon the gate **30** will be moved outwardly from the center wall of the frame **20**, and the plate **88** with its spacer **90** will be moved away from the movable support **154**. The spring **158** will then coact with the action of gravity to rotate the movable wall **148** and the movable support **154** away from the subframe **138**. This movement is shown particularly in Figs. 3–5; and this movement will enlarge the depth of the coin passageway, as shown particularly in Fig. 4, and will subsequently withdraw the fingers of the cradle **162** from that passageway. Moreover, that movement will introduce a sizable air gap between the magnet **170** and the passageway, as emphasized in Fig. 5. The coin will fall directly downwardly to the coin reject chute. As the movable wall **146** and the movable support **154** move, the deflector plate **176** also moves, thus permitting any coins which might have been held by the surface **132** and **128** to fall directly downwardly through the space between the center wall of the frame **20** and the subframe **138** to the coin reject chute therebelow.

The coin separator provided by the present invention will accept and test four United States coins, namely pennies, nickels, dimes and quarters. Each coin will be tested for size, weight, thickness and metallic property. The present invention separates these four coins from each other and from spurious coins with a high degree of accuracy. The dime and penny are separated with an unusual degree of accuracy because the spacing between the element **128** and the element **132** is always maintained precisely the same by the centering arrangement of the present invention. Heretofore, where coins were separated by one element on the gate and another element on the frame, variations in the path of the free edge of the gate would affect the sizing of the coin. However, this is completely overcome by the present invention.

Whereas a preferred embodiment of the present invention has been shown and described in the drawing and accompanying description, it should be apparent to those skilled in the art that various changes may be made in the form of the invention without affecting the scope thereof:

What I claim is:

1. A coin separator that has a stationary wall, a movable wall that normally coacts with said stationary wall to define a coin passageway, a coin-intercepting element supported by said stationary wall, a second coin-intercepting element supported by said movable wall, one of said coin-intercepting elements being movable relative to said stationary wall and said movable wall, and centering surfaces on said walls that precisely position the said one

coin-intercepting element relative to the other coin-intercepting element whenever said movable wall is adjacent said stationary wall.

2. In a coin separator that has a pair of spaced, relatively movable walls to define a coin-receiving passageway, the improvement that comprises a coin-intercepting element in said passageway, a lost-motion connection between said coin-intercepting element and one of said walls and interfitting centering surfaces on said coin-intercepting element and on the other of said walls.

3. In a coin separator that has a pair of spaced, relatively movable walls to define a coin-receiving passageway, the improvement that comprises a coin-intercepting element in said passageway, a lost-motion connection between said coin-intercepting element and one of said walls and interfitting centering surfaces on said coin-intercepting element and on the other of said walls, one of said surfaces being a conical projection and the other of said surfaces defining a recess to receive said projection.

4. A coin separator that has a stationary wall, a movable wall that normally coacts with said stationary wall to define a coin passageway, a coin-intercepting element supported by said stationary wall, a second coin-intercepting element supported by said movable wall, one of said coin-intercepting elements being movable relative to said stationary wall and said movable wall, and centering surfaces on said walls that precisely position the said one coin-intercepting element relative to the other coin-intercepting element whenever said movable wall is adjacent said stationary wall, a coin-receiving opening in one of said walls adjacent said coin-intercepting elements, the said one coin-intercepting element being contiguous with said coin-receiving opening and the other of said coin-intercepting elements being spaced from said opening, whereby the said one coin-intercepting element and said opening can pass a coin of a predetermined diameter but can reject coins of larger diameter and whereby said coin-intercepting elements can gauge such larger diameter coins.

5. A coin separator that has a stationary wall, a movable wall that normally coacts with said stationary wall to define a coin passageway, a coin-intercepting element supported by said stationary wall, a second coin-intercepting element supported by said movable wall, one of said coin-intercepting elements being movable relative to said stationary wall and said movable wall, and centering surfaces that precisely position the said one coin-intercepting element whenever said movable wall is adjacent said stationary wall.

6. A coin separator that has a stationary wall, a movable wall that normally coacts with said stationary wall to define a coin passageway, a coin-intercepting element supported by said stationary wall, a second coin-intercepting element supported by said movable wall, one of said coin-intercepting elements being movable relative to said stationary wall and said movable wall, and centering surfaces that precisely position the said one coin-intercepting element whenever said movable wall is adjacent said stationary wall, a coin-receiving opening in one of said walls adjacent said coin-intercepting elements, the said one coin-intercepting element being contiguous with said coin-receiving opening and the other of said coin-intercepting elements being spaced from said opening, whereby the said one coin-intercepting element and said opening can pass a coin of a pre-determined diameter but can reject coins of larger diameter and whereby said coin-intercepting elements can gage such larger diameter coins.

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