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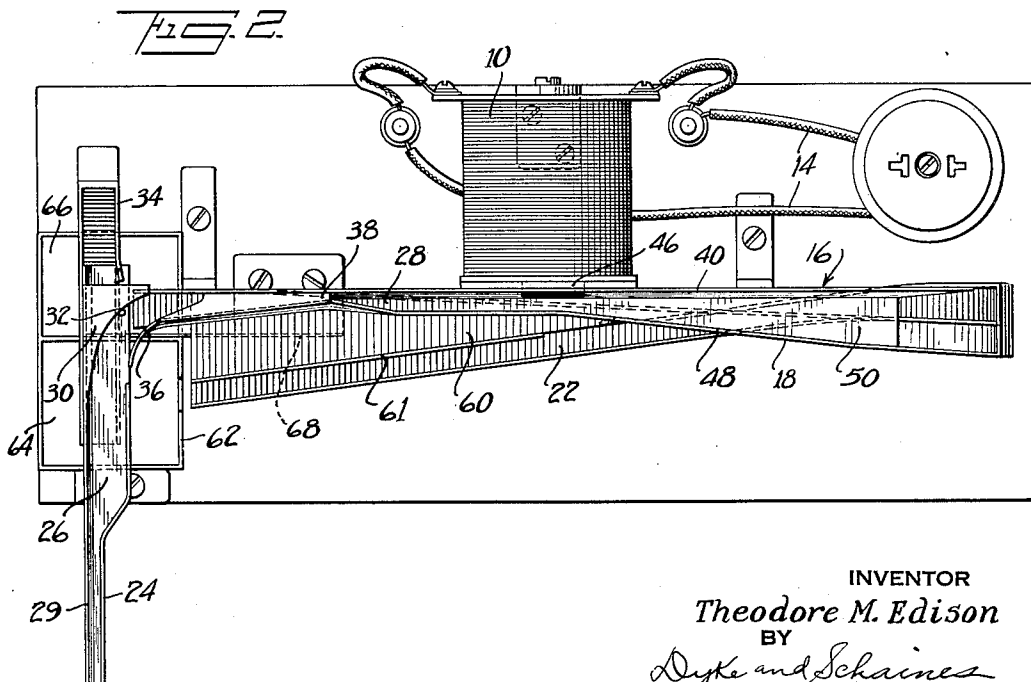
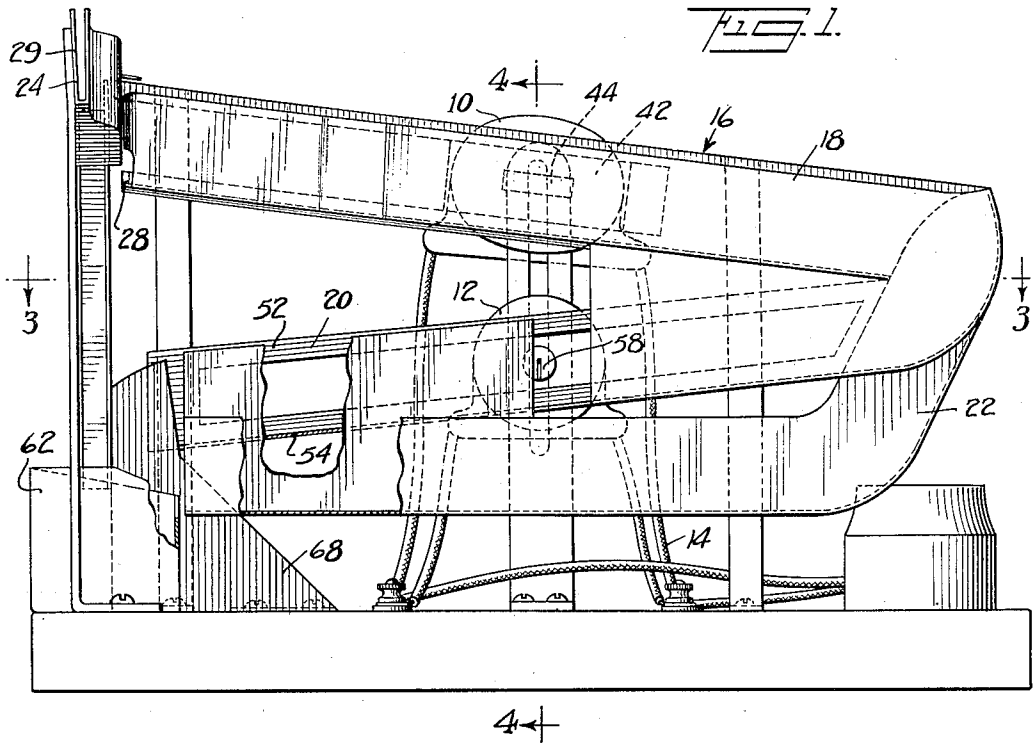
T. M. EDISON

1,945,740

ART OF TESTING COINS OR OTHER TOKENS FOR GENUINENESS

Filed May 5, 1932

2 Sheets-Sheet 1



INVENTOR
Theodore M. Edison
BY
Dyke and Schaines
ATTORNEYS

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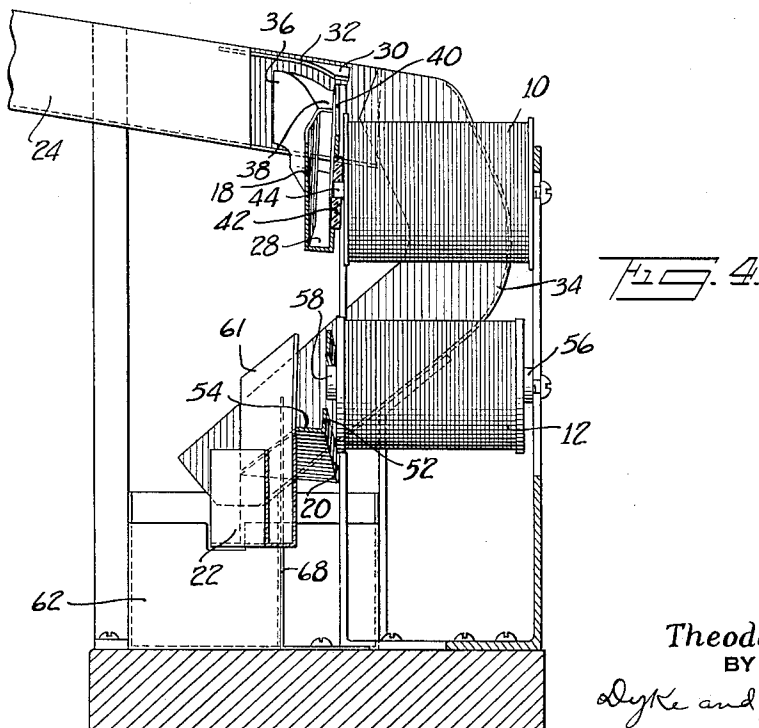
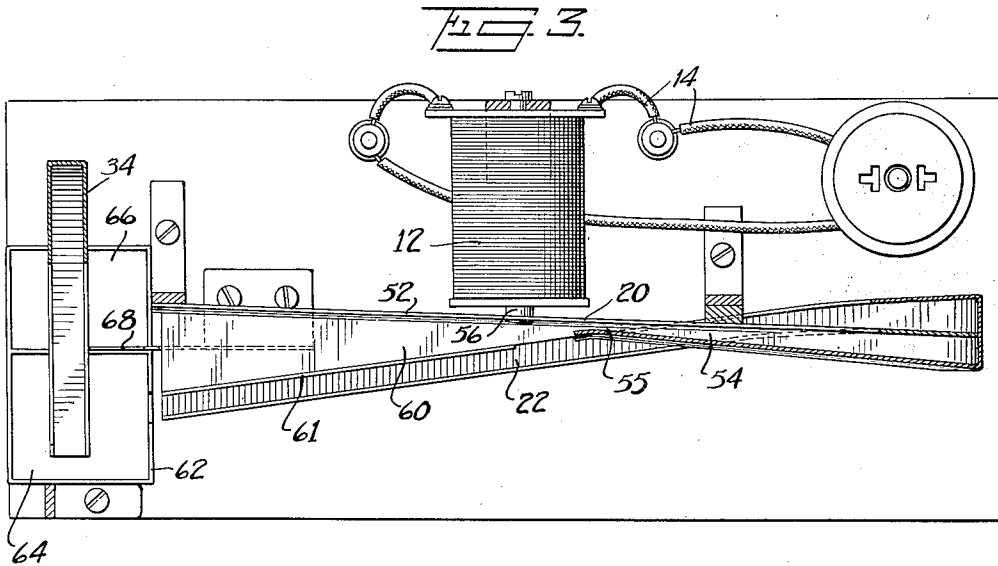
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UNITED STATES PATENT OFFICE

1,945,740

ART OF TESTING COINS OR OTHER TOKENS
FOR GENUINENESS

Theodore M. Edison, East Orange, N. J., assignor, by mesne assignments, to Fairfield Specialties Corporation, New York, N. Y., a corporation of New York

Application May 5, 1932. Serial No. 609,378

31 Claims. (Cl. 194—101)

My invention relates to improvements in means and methods for testing coins, tokens or like devices for genuineness, and for retaining or accepting the genuine pieces and devices and refusing or rejecting the spurious or counterfeit ones.

An object of the invention is to effect the elimination of the spurious devices and the acceptance of the genuine ones, primarily by the action thereon of electromagnetic forces serving to direct certain of the devices for elimination or acceptance without resorting to or relying upon the use of moving parts.

Another object of the invention is to distinguish between spurious and genuine devices which differ in electrical properties, such as resistance, but slightly from each other.

Another object of the invention is to effect the elimination of spurious devices of substantially all known metallic materials or compositions and the acceptance of silver alloy coins or devices by subjecting the same to alternating or pulsating magnetic fields.

Another object of the invention is to enable the detection or rejection of spurious devices of relatively high electrical conductivity or responsiveness to eddy current effect, such as copper and aluminum devices, by subjecting the same to a fluctuating magnetic field acting to kick or deflect the devices of relatively high conductivity into another path without affecting devices of lesser conductivity.

Another object of the invention is to render fluctuating magnetic fields effective for detecting or rejecting spurious devices of practically all the various metals and alloys, including copper and aluminum, by subjecting the coin or device to the action of said fields while supported on edge.

Other objects will in part be obvious and in part be pointed out hereinafter.

To the attainment of the aforesaid objects and ends, my invention consists of the novel features of construction, and in the combination, connection and arrangement of parts, and in the steps constituting my method, hereinafter more fully described and then pointed out in the claims.

In the accompanying drawings:

Figure 1 is a front elevation of one form of apparatus constructed according to and embodying my invention;

Fig. 2 is a plan thereof;

Fig. 3 is a section thereof on the line 3—3 of Fig. 1; and

Fig. 4 is a section thereof on the line 4—4 of Fig. 1.

The present invention is particularly adapted for detecting or accepting silver alloy coins, such as dimes, quarters, half dollars and dollars and rejecting their corresponding counterfeits of other materials or baser metals. The detection of the devices or their distinguishment is accomplished by causing the devices to roll on edge at a slight tilt through a chute subject to the effects of an alternating field or fields, utilizing either an alternating current or a direct current with an interrupter.

In my copending application Serial No. 302,299, filed August 27th, 1928, I disclose the use of a fluctuating magnetic field to kick or deflect coins or devices of high electrical conductivity or responsiveness to eddy current effect into another path of travel while supported on edge in a tilted position, thereby separating the same from devices of lesser responsiveness to eddy current effect.

The present application, constituting a continuation-in-part of the earlier application, is directed to the elimination of aluminum slugs and slugs of certain forms of copper from the genuine devices so that both devices of lesser responsiveness to eddy current effect and devices of greater responsiveness thereto than the genuine can be eliminated at a single operation.

Coins, tokens or devices of metallic composition moving through an alternating or pulsating magnetic field develop what is known, or herein termed, as eddy currents. These eddy currents and the magnetic field react on each other, the reaction tending to cause such a coin or device to be kicked or forced away from the electromagnet. The repulsive impulse developed in any case depends on various factors, such as the electrical resistance of the material of the coin or device, the diameter and thickness of the device, the time during which the device is in the magnetic field, the intensity and shape of the magnetic field and the frequency of the magnetic pulsations. The impulse required to effect a desired deflection of a given coin or device depends on certain factors, such as the mass, moment of inertia, inclination, and the diameter of the device, and the velocity at which it rolls or moves through the chute. It is therefore necessary to control, adjust or coordinate these factors so that slugs or spurious devices of diversified compositions, weights and dimensions can be readily detected and eliminated while acceptance of genuine devices or coins is insured.

In my method, I subject the genuine devices, such as silver alloy coins, to the action of alternating or pulsating magnetic fields acting successively, the first field being adjusted to eliminate slugs of certain compositions, and the second field being adjusted to eliminate slugs of other compositions. In the embodiment of the invention disclosed herein the first or upper field is adjusted and arranged to kick or deflect from their initial path into another channel genuine coins and devices of greater responsiveness to eddy current effect, such as copper and aluminum, and the second or lower field is adjusted to act in like manner on the spurious devices of greater responsiveness to eddy current effect than that of the genuine device without deflecting the genuine. Slugs which are relatively inert to eddy current effect, such as brass, zinc, tin, and lead pass out without being affected by the upper field. Iron slugs are held magnetically by the first field and pass out when the current is shut off. The present invention includes within its scope however, the reverse arrangement of the fields so that the copper and aluminum are eliminated or deflected at the first field, the inert slugs and silver coins continuing their normal course into the path of the second field which is adjusted to throw out or deflect the silver coin and allow the inert devices to pass therethrough.

In the embodiment of the invention disclosed herein, the coin or device, instead of dropping by gravity through the field or fields, is allowed to roll past one or more of the fields while supported on edge in a leading position, the field being effective on the coin or device to force or kick the device from the path of travel thereof in a direction normal to the plane of the device and opposite to the direction of tilt, and the device as thus deflected, because of its gyroscopic action, continuing to roll on edge in its new path.

Referring to the drawings, the apparatus comprises electromagnetic means 10 and 12 for developing fluctuating or alternating magnetic fields, said means being connected by the leads 14 with a source of alternating or fluctuating current. Means 16 is also provided for guiding the coin or device gravitationally through or past the fields to be acted upon thereby and to be directed into its proper path for elimination or acceptance. This means comprises a downwardly inclined upper chute portion 18 extending past the upper magnet 10, and lower chute portions 20 and 22 in communication with opposite sides of the lower end of the upper chute portion, the portion 20 guiding the coin or device past the lower magnet 12, and the portion 22 guiding the coin or device over another path to be eliminated.

The coin or device is preferably inserted into a downwardly inclined chute portion 24 disposed at an angle to the chute portion 18 at the upper end thereof, the floor 26 of the portion 24 being elevated relative to the floor 28 of the chute portion 18. The wall 29 of the chute 24 is slightly inclined so that the coin or device tends to hug the same in its travel down the chute.

The chute portion 24 at the lower end thereof is provided with a deflecting member 30 having a curving edge 32 for directing the coin or device, if of the required size, into the chute portion 18. The member 30 is located at an elevation to allow undersized coins or devices to pass thereunder and out through a chute 34 to be returned or otherwise disposed of. The chute portion 18 is constructed at the upper end 36 thereof to facilitate entry of the device thereinto,

and gradually narrows down, as indicated at 38, so that the rolling coin or device is directed into contact with and leans against the wall 40 thereof, which wall 40 or floor 28 is transversely inclined slightly so that the device in rolling down tends to hug the wall 40. The wall 40 is preferably provided with an insert 42 of insulating material in which is located the end 44 of the core 46 of the magnet 10 serving to develop a fluctuating magnetic field across the chute portion 18 tending to kick or deflect the rolling devices towards the opposite wall portion 48. Below the core 46 the floor 28 of the chute 18 becomes wider, as indicated at 50, to provide room to allow the coin or device to be deflected, the eddy current force acting transversely on the coin, and being so applied that the coin or device when deflected continues to roll on edge in its deflected path.

The device unaffected by the magnetic field continues to roll down the chute 18 against wall 40 and passes out through chute portion 22. The device if deflected drops into the chute portion 20 similar in construction to the chute portion 18, and extending at an inclination below chute portion 18. The chute portion 20 has a wall 52 and floor 54 which is also transversely inclined, so that the coin or device rolling down the chute tends to hug the wall 52, the chute narrowing down at 55 so that the device is directed towards and engages said wall 52. The core 56 of magnet 12 has the end 58 thereof terminating in said wall 52 beyond part 55 for developing a magnetic flux across the chute portion 20. The floor 54 of the chute portion 20 below the magnet 12 is of gradually increasing width, as indicated at 60, to provide room to allow the coins or devices to be deflected or kicked outwardly as they roll through the magnetic field at 12, the action of the lower field being similar to that of the upper field. Devices unaffected by the lower field continue to roll against wall 52 and out along one path, and devices deflected roll down the chute along the wall 61 thereof and out. At the lower ends of the chutes 20 and 22, I have shown for purposes of illustration a receptacle or receptacles for receiving the devices such as the box 62 having compartments 64 and 66, the compartment 62 receiving the devices from the chutes 34 and 20 and devices deflected by the magnet 12, and the compartment 66 receiving the devices passing through but unaffected by the field at 12. A separator 68 is provided between the two compartments and extends above the floor 60 to insure the delivery of each device into its proper compartment.

The intensity or strength of the magnetic field of each electromagnet 10 and 12 is determined by the amount of iron present in the core, the cross-sectional area thereof and the strength of current. The field at 10 is adjusted so that the number of lines of force, for a given longitudinal inclination of the chute 18, controlling the momentum of the device, and for a given transverse inclination thereof is sufficient to cause the silver coin and devices of aluminum and certain forms of copper to be kicked or deflected towards the wall 48 and pass into the chute portion 20, the more inert devices passing out through chute 22 without being affected by the field. Devices composed of iron or other magnetic material will stick at the core 44 and roll out through chute 22 when the current through the coils 10 and 12 is shut off by a switch of usual construction.

The field at 12 is adjusted so that the in-

tensity thereof, for given chute inclination and leaning angle, is sufficient to deflect as above described copper and aluminum slugs without affecting the genuine or silver device.

5 In operation, the circuit is energized and the coin or device inserted at 24. If the device inserted is a slug or spurious device relatively inert to eddy current effect, such as lead, tin, zinc and alloys of copper or aluminum, or non-metallic substances, it rolls past the magnet 10 without deflection thereby and out through the discharge passage 22.

10 If the device inserted is of soft copper or aluminum or a genuine coin, it is kicked or deflected at magnet 10 and guided through chute 20 to the second or lower magnetic field 12. Magnetic slugs, such as iron or nickel, lock at the first core and pass out through chute 22 when the circuit is de-energized. At the lower or second magnetic field 12 the good coin passes out along wall 52 without being affected by the field while the copper or aluminum slugs are deflected or kicked by the fluctuating field and pass out at the opposite side of the chute 20 into the return receptacle 64.

25 Good coins or tokens passing out through the outlet therefor may be received into a suitable container, or diverted for actuating other devices, such as a bell or other regulating or indicating devices, or mechanism to be controlled by the coins, such as telephone pay boxes, turnstiles, vending machines, money changers, or the like, with which mechanisms the detecting means embodying the present invention may be incorporated.

30 In my invention, the elimination or detection of spurious devices is accomplished electrically within a limited space without undue complexity in the number of tests imposed and without requiring the use of moving parts for diverting the coins or devices into their proper channels. The invention is universal in its application and adaptability for refusing or eliminating slugs of substantially all known metals, alloys, and, of course, nonmetallic slugs of glass, fibre or the like.

35 In my invention the devices tested roll by gravity through chutes or channels simple in arrangement, and the entire control of the disposition of the devices is accomplished by adjusting or controlling the momentum or kinetic energy of the devices, or the tilt thereof or both, and the electromagnetic fields available, and coordinating the same, so that effective distinguishment between spurious and genuine devices is obtained, particularly between devices which approximate each other in electrical properties, such as silver, aluminum and certain forms of copper.

60 Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. The hereindescribed method of distinguishing between genuine and spurious coins, tokens or like devices which consists in subjecting a device to the successive action of fluctuating magnetic fields, the eddy current effect of one field being such as to eliminate certain of the various spurious devices which may be presented for test and the eddy current effect of the other field being such as to eliminate other of the various spurious devices which may be presented for test.

2. The hereindescribed method of distinguishing between genuine and spurious coins, tokens or like devices which consists in subjecting a de-

vice to the successive action of fluctuating magnetic fields producing eddy current effects, one field being made to eliminate spurious devices having more responsiveness to eddy current effect than the genuine and the other field being made to eliminate spurious devices having less responsiveness to eddy current effect than the genuine.

3. The hereindescribed method of distinguishing between genuine and spurious coins, tokens or like devices, which consists in subjecting a device to fluctuating magnetic fields producing eddy current effects, one field being made to pass the genuine device and deflect devices more responsive to eddy current effect and the other field being made to deflect the genuine device and pass devices less responsive to eddy current effect, whereby to eliminate certain of the spurious devices at one field and other of the spurious devices at the other field.

4. The hereindescribed method of distinguishing between genuine and spurious coins, tokens or like devices which consists in subjecting a device presented for test to a fluctuating magnetic field acting to deflect devices more responsive to eddy current effect over a different path from devices less responsive thereto, eliminating the devices traveling the path for spurious devices, and again subjecting the devices traveling the path of the genuine device to a fluctuating magnetic field acting to deflect certain of the devices and pass other thereof over different paths according to their responsiveness to eddy current effect, whereby to eliminate the device, if spurious, and accept the same, if genuine.

5. The hereindescribed method of distinguishing between genuine and spurious coins, tokens or like devices which consists in subjecting a device to a fluctuating magnetic field acting to cause deflection into one path of certain devices responsive to eddy current effect and allowing passage over another path of devices less responsive to eddy current effect, and subjecting one of said paths to a second fluctuating magnetic field acting to cause deflection into one path of certain of the devices more responsive to eddy current effect and allowing passage over another path of other of the devices less responsive to said effect.

6. The hereindescribed method of distinguishing between genuine and spurious coins, tokens or like devices which consists in causing a device to gravitate towards fluctuating magnetic fields, causing the first field to react on devices more responsive to eddy current effect to deflect the same laterally, and to pass therethrough devices less responsive to eddy current effect, and then causing the second field to react on devices taking certain of the paths to deflect certain of the devices more responsive to eddy current effect, and to pass others therethrough.

7. The hereindescribed method of distinguishing between genuine and spurious coins, tokens or like devices which consists in subjecting a device to the action of fluctuating magnetic fields, the first field being made to pass certain of the various spurious devices which may be presented for test and deflect the genuine and other spurious devices and the second field being made to deflect spurious devices passing thereto and to pass the genuine.

8. The hereindescribed method of distinguishing between genuine and spurious coins, tokens or like devices which consists in causing a device to gravitate towards fluctuating magnetic fields,

causing the first field to react on the genuine device and devices more responsive to eddy current effect to deflect the same laterally, and to pass therethrough devices less responsive to eddy current effect, and then causing the second field to react to deflect the devices more responsive to eddy current effect than the genuine, and to pass the genuine therethrough.

9. The hereindescribed method of distinguishing between genuine and spurious coins, tokens or like devices which consists in passing the device while supported on edge through fluctuating magnetic fields, the first field deflecting by eddy current effect certain of the various devices which may be presented to cause the genuine device and a part of the various spurious devices to take different paths, and the second field deflecting by eddy current effect certain of the devices taking the path of the genuine from the first field to cause the genuine device and the remainder of the spurious devices to take different paths.

10. The hereindescribed method of distinguishing between genuine and spurious coins, tokens or like devices which consists in subjecting the device while disposed on edge in a leaning position to the action of fluctuating magnetic fields applied to the device at the side toward which it leans and relatively adjusted to eliminate certain of the various devices at one field and to eliminate other of the various spurious devices at the other field.

11. The hereindescribed method of distinguishing between genuine and spurious coins, tokens or like devices which consists in subjecting a device while rolling on edge in a leaning position to the action of a fluctuating magnetic field causing deflection of a genuine device and certain of the spurious devices, and subjecting devices deflected by the first field to the action of a fluctuating magnetic field deflecting the various spurious devices and allowing the passage of the genuine device.

12. An apparatus of the character described comprising means for developing a plurality of fluctuating magnetic fields, one of said fields being adjusted to deflect devices of greater responsiveness to eddy current effect and pass others for effecting the elimination of certain of the spurious devices, and the other field being differentially adjusted to deflect the devices of greater responsiveness to eddy current effect not eliminated by the first field and to pass others for effecting the elimination of the remainder of the spurious devices, and means for guiding devices from the first field into operative relation to the second field.

13. An apparatus of the character described comprising means including core portions adapted to produce a plurality of fluctuating magnetic fields, and means controlling the direction and speed of coins and like devices bringing them into operative relation to the first of said fields and certain of them into operative relation to the second of said fields at such speed and in such position that each of said fields reacts thereon to deflect certain of said devices laterally into another path.

14. An apparatus of the character described comprising fluctuating current electromagnetic means including core portions adapted to produce a plurality of fluctuating magnetic fields differentially adjusted to deflect certain of the devices and pass others for effecting partial elimination of spurious devices at each field, and means for guiding coins and like devices into operative

relation to said fields, said last named means at each field having passage portions for guiding devices deflected by the field and passing therethrough, and certain of the passage portions of the first field serving to guide the devices to the second field.

15. An apparatus of the character described comprising means providing a plurality of fluctuating magnetic fields adjusted in strength to deflect devices of relatively greater responsiveness to eddy current effect and to allow passage therethrough of devices of lesser responsiveness to eddy current effect, and passage portions for receiving the devices deflected by and passing through each field, certain of the passage portions of the first field leading to the second field.

16. An apparatus of the character described comprising fluctuating current electromagnetic means including core portions adapted to produce a plurality of fluctuating magnetic fields, the first of said fields being adjusted to deflect the genuine device and devices of greater responsiveness to eddy current effect than the genuine, and to pass other devices, and the second field being adjusted to pass the genuine device and deflect devices of greater responsiveness to eddy current effect, and means for guiding the devices from the first field to the second field.

17. An apparatus of the character described comprising fluctuating current electromagnetic means including core portions adapted to produce a plurality of fluctuating magnetic fields, the first field being adjusted to pass certain devices and deflect others, and the second field being adjusted to pass certain of the devices deflected by the first field and to deflect others, and means for guiding coins and like devices into operative relation to said fields, said last named means at each field having passage portions for guiding devices deflected by the field and passing therethrough, and the passage portion for devices deflected by the first field serving to guide the devices to the second field.

18. An apparatus of the character described comprising means providing a plurality of fluctuating magnetic fields, the core of one field being adjusted to deflect the genuine device and devices having a greater responsiveness to eddy current effect than the genuine device and to pass other devices and the core of the other field being adjusted to deflect devices having a greater responsiveness to eddy current effect than the genuine device, and to pass the genuine device, and means for the passage of devices from one field to the other, said means leading from the deflecting side of the first mentioned field to the second field.

19. An apparatus of the character described comprising fluctuating current electromagnetic means including core portions adapted to produce a plurality of fluctuating magnetic fields differentially adjusted to deflect certain devices and pass others for effecting partial elimination of spurious devices at each field, and means for guiding the devices into operation relation to said fields, said means including inclined portions for rotatably supporting the devices on edge.

20. An apparatus of the character described comprising fluctuating current electromagnetic means including core portions adapted to produce a plurality of fluctuating magnetic fields differentially adjusted to deflect certain devices and pass others for effecting partial elimination of spurious devices at each field, and means for guiding coins and like devices into operative relation

to said fields, said means including at certain of said core portions means for supporting the device on edge in a position leaning towards the core portion.

at the other, the field passing the silver coin reacting on more responsive devices for elimination, and the remaining field passing less responsive devices for elimination.

21. An apparatus of the character described comprising fluctuating current electromagnetic means including core portions adapted to produce a plurality of fluctuating magnetic fields differentially adjusted to deflect certain devices and pass others for effecting partial elimination of spurious devices at each field, and means for guiding coins and like devices into operative relation to said fields, and supporting the same on edge in a position leaning towards said core portions, said last named means at each field having passage portions for guiding devices deflected by the field and passing therethrough, and certain of the passage portions of the first field serving to guide the devices to the second field.

27. The hereindescribed method of distinguishing between genuine and spurious coins, tokens or like devices which consists in subjecting a device to the successive action of fluctuating magnetic fields relatively adjusted in intensity to eliminate certain of the various spurious devices which may be presented for test at one field and to eliminate other of the various spurious devices which may be presented for test at the other field, the device being disposed on edge in a leaning position at certain of said fields and subjected to the action thereof on the side towards which it leans.

22. An apparatus of the character described comprising electromagnetic means having pole pieces providing a plurality of fluctuating magnetic fields adjusted in strength to deflect devices of relatively greater responsiveness to eddy current effect and to allow passage therethrough of devices of lesser responsiveness to eddy current effect, means for supporting the device on edge in a position leaning toward certain of said pole pieces, and passage portions for receiving the devices deflected by and passing through each field, certain of the passage portions of the first field leading to the second field.

28. The hereindescribed method of distinguishing between genuine and spurious coins, tokens or like devices which consists in subjecting a device to the successive action of fluctuating magnetic fields relatively adjusted in intensity to deflect spurious devices having more responsiveness to eddy current effect than the genuine at one field and to pass spurious devices having less responsiveness to eddy current effect than the genuine at the other field, the device being disposed on edge in a leaning position at certain of said fields and subjected to the action thereof on the side towards which it leans.

23. An apparatus of the character described comprising electromagnetic means for producing fluctuating magnetic fields, means for guiding the devices from one field to the other, said means including a portion at certain of the fields for supporting the device on edge in a leaning position, one of said fields being adjusted in intensity to deflect the genuine device and allow passage of more inert devices, and the other field being adjusted to deflect devices of greater responsiveness to eddy current effect than the genuine and to pass the genuine.

29. The hereindescribed method of distinguishing between genuine and spurious coins, tokens or like devices which consists in disposing a device on edge in a leaning position, subjecting the device on the side towards which it leans to a fluctuating magnetic field acting to cause deflection into one path of certain devices responsive to eddy current effect and allowing passage over another path of devices less responsive to eddy current effect, and subjecting one of said paths to a second fluctuating magnetic field acting to cause deflection into one path of certain of the devices more responsive to eddy current effect and allowing passage over another path of other of the devices less responsive to said effect.

24. An apparatus of the character described comprising an electromagnet having a pole producing a fluctuating magnetic field having an intensity sufficient to deflect certain devices and pass others, means for guiding a device to the pole while supported on edge and leaning towards said pole, means for receiving and guiding the device deflected by said pole, and means associated with said last named means for producing a second fluctuating magnetic field having an intensity sufficient to deflect certain of the devices passing through said receiving and guiding means and to pass others.

30. The hereindescribed method of distinguishing between genuine and spurious coins, tokens or like devices which consists in subjecting a device while supported on edge in a leaning position to the action of a fluctuating magnetic field causing deflection of a genuine device and certain of the spurious devices, and subjecting devices deflected by the first field to the action of a fluctuating magnetic field deflecting the various spurious devices and allowing passage of the genuine device.

25. The hereindescribed method of distinguishing between genuine and spurious coins, tokens, or like devices which consists in subjecting devices to the eddy current effects of fluctuating magnetic fields so related that one field allows the genuine device to pass and reacts on more responsive devices for elimination, and the other field allows the passage of devices less responsive thereto than the genuine for elimination and reacts on the genuine to prevent passage thereof over the path of the less responsive devices.

31. The hereindescribed method of distinguishing between genuine and spurious coins, tokens or like devices which consists in subjecting a device while disposed on edge in a leaning position to the action of a fluctuating magnetic field on the side of the device towards which it leans so as to deflect from the path of travel thereof the genuine device and devices of greater responsiveness to eddy current effect and to allow the relatively inert devices to pass out for elimination, and then subjecting the device thus deflected while on edge in a leaning position in like manner to the action of another fluctuating magnetic field of less intensity than that of the first field so as to deflect the devices more responsive to eddy current effect than the genuine, and to allow passage of the genuine device.

26. The hereindescribed method of distinguishing between genuine and spurious coins, tokens or like devices which consists in causing the silver coin to gravitate into operative relation to fluctuating magnetic fields producing eddy current effects such as to allow direct passage of the silver coin at one field and deflect the same