

March 29, 1966

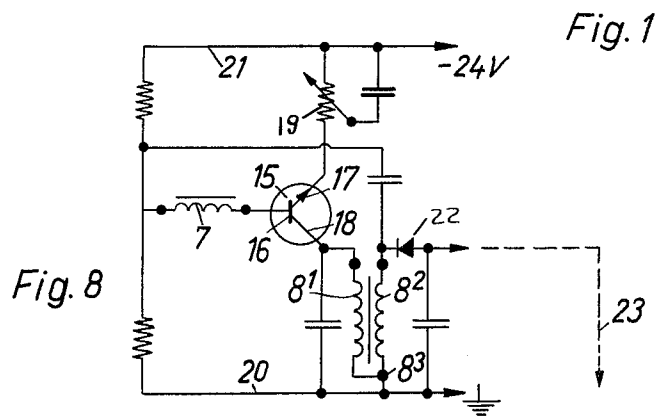
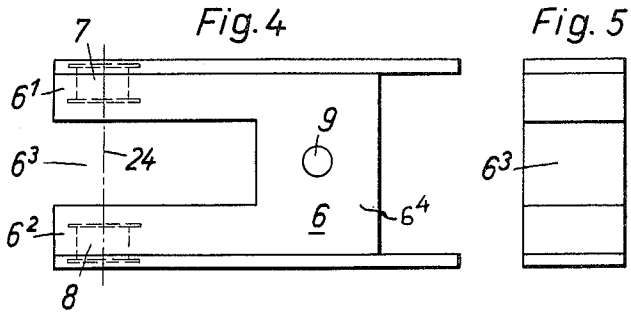
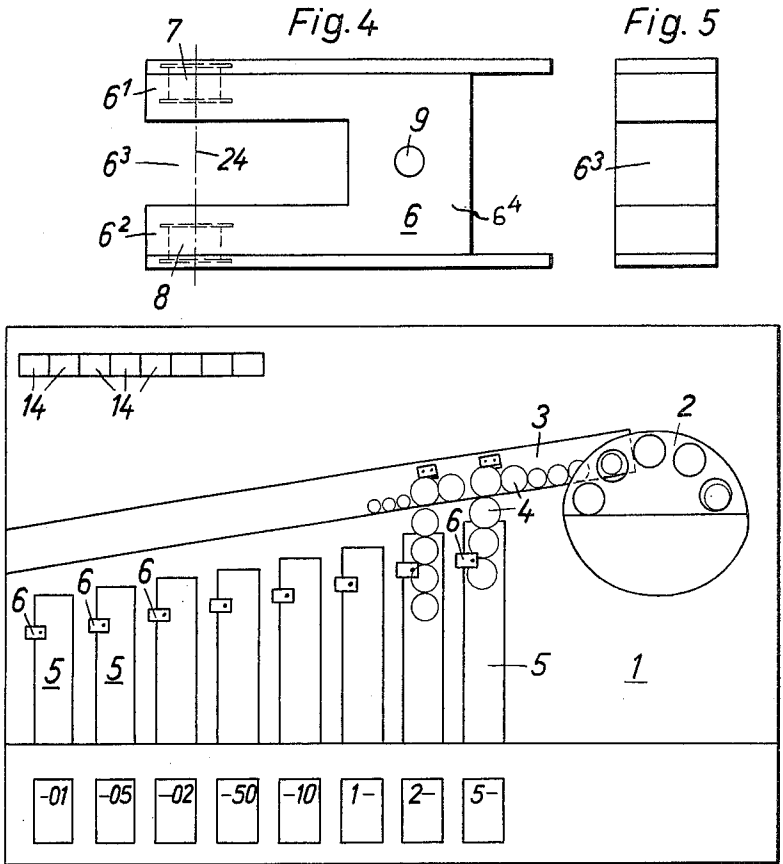
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3,242,932

COIN COUNTING DEVICE

Filed April 15, 1965

2 Sheets-Sheet 1



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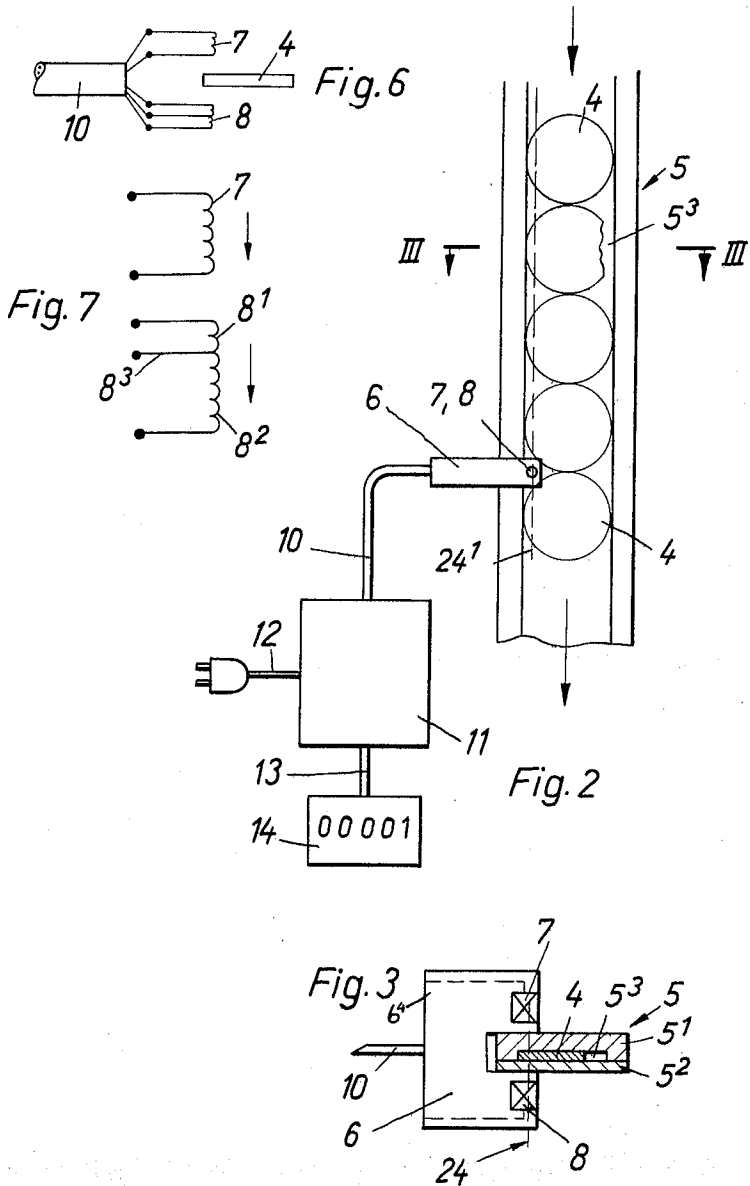
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2 Sheets-Sheet 2



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COIN COUNTING DEVICE

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Z 10,771

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This invention relates in general to coin counting devices, and, in particular, to a new and useful coin counting device employing an oscillating coil and a feedback coil which are arranged in the path of the coins at a location such that the center of the field produced by the coils is influenced by the coin as they pass at a location of the average value line of the coin path, i.e. at a location of the field center in which the distance across the coin and the length of the spaces between the coins when the coins are arranged in a row and abutting is substantially equal.

The invention relates, in particular, to a coin or money counting machine in which the coins are sorted and delivered by the sorting device into individual tubes in accordance with the coin denomination. Machines of this nature have heretofore operated in a mechanical manner. They usually employ a counting star which is arranged in a lateral recess of a coin passageway channel or chute. The coins have to pass the star one after the other. The counting stars are of a size comparable to the variety of coins which is counted and will be rotated or indexed in accordance with the number of coins which pass in engagement therewith. The feed of the coins when they are directed to the counting path is usually effected by a feed roller, which is rotationally driven. The counting output of such devices, although relatively high, is, however, limited. The arrangement of the counters is also dependent on the accommodation of the mechanical counting mechanism which usually requires a relatively complicated and space consuming total construction of the machine.

The present invention provides a uniform money counting device with different coin varieties which can be attached to the usual delivery chutes or tubes without making any change in the size of the coin channels.

The invention provides a construction in which the coins are delivered through a tube or chute defined by walls which provide a channel or passageway for the passage of the coins therethrough, which is of a size comparable to the coin to be measured. The exterior dimension of the tube defining the channels for the coins of various varieties are advantageously made of the same dimension or thickness. The invention provides a sensing head which may be fitted over the exterior walls of each channel and which creates an oscillating field within the channel through which the coins are passed. The field line center of the sensing head is situated adjacent an edge of the channel at a location so that it will be at the average value line of the coin spaces and the row of coins which fall through the channel (that is, when coins are directed through the channel in abutting relationship, the space underlying the center of the sensing head, as measured across the coins and as measured between the coins, will be substantially equal).

In accordance with a preferred arrangement of the invention, a sensing head is connected with an oscillator amplifier unit by means of a flexible cable. In the circuit of this unit, there is arranged an electrical impulse counter at a suitable location in respect to the device. As soon as a coin cuts the field lines, the oscillation is changed and an output signal is released.

In order to obtain an exact counting of the coins, it is not sufficient to build up, at any suitable place of the

coin channel, an oscillating field which is passed by the coins. Rather the oscillating field has to be changed by the interchange between coin and space between coins. For this reason, the windings or coils of the sensing head must be located with their sensor arranged about in the average value line of the coin spaces and the coins and should be adjustable on this line, for example, by using set screws or biasing means.

An advantageous embodiment of the invention is provided where the sensing head includes two legs which are arranged to straddle the chute defining the channel or path for the coins and includes a winding spool in each leg located in respect to the chute adjacent the edge thereof in a position so that sensing field will be at the value line of coin and interspace as mentioned above. For inductive sensing, the oscillating and feedback windings of the oscillator are arranged in the sensing head in a separated manner. Advantageously, the legs of the sensing head can be clamped onto the chute defining the coin channel at suitable areas due to the inherent springiness of the leg construction. The preferred location for the sensing head is at the upper end of a coin chute or tube. All of the coin channels for the various denominations of coins have the same exterior wall thickness while the interiors define coin channels or paths corresponding to the thickness of the individual coins which are to be counted. This permits the sensing head to be clamped to any one or all of the tubes for the various coin denominations with little difficulty and to be interchanged, if necessary.

The means defining the coin chute or coin channel for the passage of the coins advantageously comprises a non-metallic material preferably a thermal plastic material. The impulse counter may be an electric stroke counter known in and of itself with which it is possible to achieve counting outputs in the magnitude of about 3000 coins per minute. If higher counting outputs are required, then an electronic tube is employed which are also known per se. With such counting tubes, the counting output is practically unlimited. The counting output of the inventive counting device is essentially higher than in the known mechanical devices because the counting takes place without any contact with mechanical elements and may take place during the free fall of the coins. It is even possible to increase the speed of the coins which fall through the passage or channel for the coins by providing means, for example compressed air impulses.

Accordingly it is an object of the invention to provide a counting device comprising a sensing head which may be oriented in respect to a tube or similar element defining a passage for the coins and which advantageously includes an oscillating winding and a feedback winding arranged adjacent an edge of the path for the coins in a position such that the field line will intercept the coins and the spaces between the coins in substantially equal amounts, even when the coins are fed through in abutting relationship.

A further object of the invention is to provide a sensing head for a coin counting machine which may be clamped over the exterior of the tubes for each denomination of coins in a simple manner for electrically indicating the number of coins passing through the tube by means of an amplifier and a counting device.

A further object of the invention is to provide a coin sorting and counting device which is simple in design, rugged in construction and economical to manufacture.

The various features of novelty which characterize the invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of the invention, its operating advantages and specific objects attained by its use, reference should be had to the accompanying drawings and descrip-

tive matter in which there is illustrated and described a preferred embodiment of the invention.

In the drawings:

FIG. 1 is a somewhat schematic partial sectional and partial elevational view of a coin counting machine constructed in accordance with the invention;

FIG. 2 is a longitudinal sectional view of a coin tube with the sensing head and counting device schematically indicated in relation thereto;

FIG. 3 is a section taken on the line III—III of FIG. 2;

FIG. 4 is a bottom plan view on slightly enlarged scale of the sensing head;

FIG. 5 is a side view of the sensing head indicated in FIG. 4;

FIG. 6 is a somewhat schematic indication of the arrangement of the oscillating and feedback coils in the sensing head;

FIG. 7 is an electrical diagrammatic view of the oscillating and feedback windings indicated in FIG. 6; and

FIG. 8 is an electrical diagram indicating the oscillator circuit.

Referring to the drawings in particular, the invention embodied therein comprises a counting device 1 having the usual conveying or feeding device 2 by means of which the different coins are supplied to a sorting rail 3. The sorting rail 3 is of the usual construction, having an inclined track way with slots of a size corresponding to the various denominations of coins which effectively feeds the coins to chutes or tubes generally designated 5 provided for each coin denomination.

As best seen in FIG. 3, the coin tube or chute 5 is advantageously made up of non-metallic elements, for example of a thermal plastic material, and advantageously includes a channel-shaped member 5¹ and a straight member 5². The members 5¹ and 5² are arranged as indicated in FIG. 3 and define therebetween a coin delivery channel or passageway 5³ for the passage of coins 4. The width of the passageway 5³ is made to correspond to the coin 4 which is to be handled thereby. The members 5² and 5¹ are advantageously secured together such as by adhesive.

All of the coin tubes 5 indicated in FIG. 1 are advantageously made of the same exterior thickness so that a unitary measurement for the leg distance of the sensing head 6 may be made. The sensing head 6, in accordance with the invention, is constructed with a rear or central web portion 6⁴ and with two leg portions 6¹ and 6². The leg portions 6¹ and 6² are provided with coils or windings 7 and 8 which are wound around suitable spools. The space between legs 6¹ and 6² defines an opening or gap 6³ which corresponds to the exterior thickness of the coin tubes 5. A hole 9 is provided in the web portion of the sensing head 6 to accommodate a flexible shielded cable 10 which is connected to the coils as indicated in FIG. 6. The winding 7 is an oscillating winding and the winding 8 is a feedback winding, and the direction of these windings is such that the field direction is as indicated by the arrows in FIG. 7. The feedback winding 8 consists of two winding portions 8¹ and 8² having a tap indicated by 8³. The windings are part of an oscillator amplifier unit 11 having a connecting cable 12 which can be applied to a network potential and is usually connected via a transformer and rectifier which is transformed to a low voltage potential, for example, of 24 volts. A connecting cable 13 extends from the amplifier to the impulse counter. The impulse counter, for example, may be an electro-magnetic stroke counter or an electronic counting tube, each of which devices is known in and of itself.

The oscillator circuit indicated in FIG. 8 includes a transistor 15 having a base 16 connected with the oscillating winding 7 and having an emitter 17 connected to a potential meter 19. The transistor also includes a collector 18, connected with the input of the feedback winding 8¹. The tapping point 8³ lies at the line 20, which

latter may be grounded. The other connection is through a line 21. It is applied, for example to -24 volts.

The coil 8² of the feedback winding 8 is connected to a diode 22 which, in turn, is connected to an amplifier (not shown). The amplifier preferably uses transistors. The impulse output is indicated at 23. As soon as metal cuts the field lines 24, the oscillation is changed and an output signal is released, which in the form of an impulse acts via lines 13 on the impulse counter and thus switches the counter about one digit while each coin is counted. The field line center 24 is adjustable by moving the clamped sensing head 6. The field line center must be situated at the interspace which is formed by two subsequent coins and coincides with the average value line 24¹ of coin and interspace so that the sensing head can clearly recognize define differences, namely coin-interspace-coin. Thus, for example, when the coins are feeding through the tube 5 in a stacked abutting relationship, as indicated in FIG. 2, the same length of coin will be passed beneath the center line of the windings 7 and 8 as the length of space between coins when they are abutting. Of course, when the coins are widely separated as they are being fed, there will be a much greater space between one coin and the next so that the sensing becomes easier. Thus, the speed of the coins can be counted and the occurring frequency thereby formed is merely limited by the given impulse frequency of the electro-mechanical stroke counter 14. Thus, if an electronic counting device is employed, the impulse frequency may be as high as necessary.

The inventive coin counting device operates with a unit sensing head which can operate both with inductive and with capacitive sensing. In the latter case, condenser plates (not shown) will be embedded in the sensing head. The coins to be counted are not contacted and are not obstructed in their passage through the device. They may pass the sensing head during their free fall and at high velocity. The arrangement by suitable construction can be used to count preset amounts of coins by means of a selective switch. It is important in this arrangement which metal the coins are made of and what diameter and what thickness they have. They can be attached to existing money sorting or money counting machines.

The counting device requires very little space and does not require any additional space which is not present, in any event, between the coin channels and the shafts or channels through which the coins fall. The mechanical elements for the mechanical mechanisms and their lines which usually lead to the counting mechanisms are not required. Instead, very thin cable connections are only required which permit the attachment of the impulse counters to any suitable area of the machine. Thus the counters may, for example, be arranged in a ledge which is formed on the tubes in front of the machine if it is desired. An adding device may also be included with a counter 14.

Furthermore, there is a possibility to fit the arrangement with a switching device for optional switching by which previously set quantities of coins are countable. In such event, as is usually the case, the arrangement actuates the stopping device which stops the sequence of the coins after the preset amount of coins has been counted. The inventive device can be used in connection with the counting of any kind of coin varieties independently of the kind of material of which they are made, the diameter and the thickness of the coins and without changing the construction of an existing sorting machine.

While a specific embodiment of the invention has been shown and described in detail to illustrate the application of the inventive principles, it will be understood that the invention may be embodied otherwise without departing from such principles.

What is claimed is:

1. A coin counting device permitting the rapid counting of rapidly fed identical coins comprising means de-

fining a passageway of a size for the passage of coins of identical denomination therethrough, a sensing head arranged adjacent said means and having field producing means thereon creating an oscillating field extending across said passageway, said oscillating field being located to intercept said coins when they are fed most rapidly and in abutting relationship to sense substantially equal lengths of coins and the space between coins which are fed along said passageway, and amplifier and counter means connected to said field producing means for sensing and counting variations thereof in accordance with the passage of coins thereby.

2. A coin counting device permitting the rapid counting of rapidly fed identical coins comprising means defining a passageway of a size for the passage of coins of identical denomination therethrough, a sensing head arranged adjacent said means and having field producing means thereon creating an oscillating field extending across said passageway, said oscillating field being located to intercept said coins when they are fed most rapidly and in abutting relationship to sense substantially equal lengths of coins and the space between coins which are fed along said passageway, amplifier and counter means connected to said field producing means for sensing and counting variations thereon in accordance with the passage of coins thereby, and means adjustably connecting said sensing head to said means defining a passageway to permit said head to be located along the mean value line of the particular denomination of coin being fed along said passageway.

3. A coin counting device permitting the rapid counting of rapidly fed identical coins comprising means defining a passageway of a size for the passage of coins of identical denomination therethrough, a sensing head arranged adjacent said means and having field producing means thereon creating an oscillating field extending across said passageway, said oscillating field being located to intercept said coins when they are fed most rapidly and in abutting relationship to sense substantially equal lengths of coins and the space between coins which are fed along said passageway, and amplifier and counter means connected to said field producing means for sensing and counting variations thereof in accordance with the passage of coins thereby, said sensing head having first and second leg portions adapted to be positioned on each side of said passageway, said field producing means including an oscillating winding in said first leg portion and a feedback winding in said second leg portion.

4. A coin counting device comprising means defining a passageway for the passage of coins therethrough, a sensing head arranged adjacent said means and having field producing means thereon creating an oscillating field extending across said passageway, said oscillating field being located to sense substantially equal lengths of coins and the space between coins which are fed along said passageway, and amplifier and counter means connected to said field producing means for sensing and counting variations thereof in accordance with the passage of coins thereby, said sensing head having first and second leg portions adapted to be positioned on each side of said passageway, said field producing means including an oscillating winding in said first leg portion and a feedback winding in said second leg portion, said first and second leg portions being connected by a central web portion and being of a resilient material and being in resilient tight engagement with said means defining a passageway.

5. A coin counting device comprising a plurality of tubes defining passageways therein for the passage of coins to be counted therein, each of said coin tubes having the same exterior thickness, said tubes defining passageways therethrough of thicknesses corresponding to the coins to be fed therethrough, a sensing head comprising a web portion and first and second leg portions extending outwardly from each end of said web portion,

said leg portions being engaged around each tube, said leg portions being made of a material and a spacing therebetween being such that they are resiliently biased against said tube, an oscillating coil located in said first leg portion, a feedback coil located in said second leg portion, an amplifier connected to said feedback coil, and a counter electrically connected to said amplifier and said feedback coil, said sensing head being adjustably positioned in respect to its associated tube for location adjacent the edge of the passageway so that the length of the spaces between coins when they are abutting in the passageway is at least as great as the distance across the coins which is sensed by said oscillating field effected by said oscillating winding and said feedback coil.

6. A coin counting device comprising an inclined sorting rail having a plurality of slots defined at spaced locations along the length of the lower portion thereof, means for conveying and feeding coins to said inclined sorting rail, a plurality of tubes located below said inclined sorting rail with one tube arranged below each slot, said slots being of a size such that they permit coins of respective size to fall into respective tubes, each of said coin tubes having a similar exterior thickness, said tubes defining passageways therethrough for coins to be counted of thicknesses corresponding to the coins to be fed therethrough, a sensing head comprising a web portion and first and second leg portions extending outwardly from each end of said web portion, said leg portions being engaged around a respective tube, said leg portions being made of a material and a spacing therebetween being such that they are resiliently biased against said tube, an oscillating coil located in said first leg portion, a feedback coil located in said second leg portion, an amplifier connected to said feedback coil, and a counter electrically connected to said amplifier and said feedback coil.

7. A coin counting device comprising an inclined sorting rail having a plurality of slots defined at spaced locations along the length of the lower portion thereof, means for conveying and feeding coins to said inclined sorting rail, a plurality of tubes located below said inclined sorting rail with one tube arranged below each slot, said slots being of a size such that they permit coins of respective size to fall into respective tubes, each of said coin tubes having a similar exterior thickness, said tubes defining passageways therethrough of thicknesses corresponding to the coins to be fed therethrough, a sensing head comprising a web portion and first and second leg portions extending outwardly from each end of said web portion, said leg portions being engaged around a respective tube, said leg portions being made of a material and a spacing therebetween being such that they are resiliently biased against said tube, an oscillating coil located in said first leg portion, a feedback coil located in said second leg portion, an amplifier connected to said feedback coil, and a counter electrically connected to said amplifier and said feedback coil, said sensing head being adjustably positioned in respect to its associated tube for location adjacent the edge of the passageway so that the length of the spaces between coins when they are abutting in the passageway is at least as great as the distance across the coin which is sensed by said oscillating field effected by said oscillating winding and said feedback coil.

8. A money counting device for use on a money sorting or money counting machine having a plurality of tubes through which the coins are directed, comprising a sensing head having spaced first and second legs adapted to engage around a respective tube, means in each of said legs for creating within the tube and oscillating field having a field line center arranged about at the average value line of a coin and coin interspace of a row of abutting coins which fall through said tube, and an oscillator amplifier unit connected to said means for producing an oscillating field for electrically measuring varia-

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tions of the field for indicating the coins passing beyond through the field.

9. A money counting device for use on a money sorting or money counting machine having a plurality of tubes through which the coins are directed, comprising a sensing head having spaced first and second legs adapted to engage around a respective tube, means in each of said legs for creating within the tube an oscillating field having a field line center arranged about at the average value line of a coin and coin interspace of a row of abutting coins which fall through said tube, and an oscillator amplifier unit connected to said means for producing an oscillating field for electrically measuring variations of the field for indicating the coins passing beyond through the field, said means for creating an oscillating field including a separate oscillating winding and a feedback winding.

10. A money counting device for use on a money sorting or money counting machine having a plurality of tubes through which the coins are directed, comprising a sensing head having spaced first and second legs adapted to engage around a respective tube, means in each of said legs for creating within the tube an oscillating field having a field line center arranged about at the average value line of a coin and coin interspace of a row of abutting coins which fall through said tube, and an oscillator amplifier unit connected to said means for producing an oscillating field for electrically measuring

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variations of the field for indicating the coins passing beyond through the field, said measuring means being an electromagnetic stroke counter.

11. A money counting device for use on a money sorting or money counting machine having a plurality of tubes through which the coins are directed, comprising a sensing head having spaced first and second legs adapted to engage around a respective tube, means in each of said legs for creating within the tube an oscillating field having a field line center arranged about at the average value line of a coin and coin interspace of a row of abutting coins which fall through said tube, and an oscillator amplifier unit connected to said means for producing an oscillating field for electrically measuring variations of the field for indicating the coins passing beyond through the field, said measuring means being an electronic measuring device.

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