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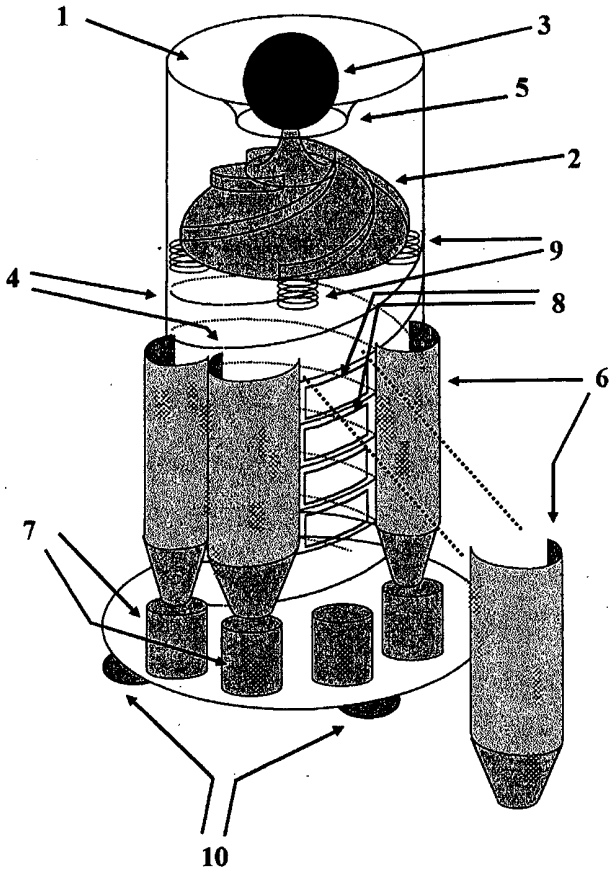
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(54) Title: AUTOMATIC POWER–FREE COINAGE SORTER

(57) Abstract

A coinage sorter which is compact, lightweight, portable and requires no provision of external power supply. The sorter has a hopper (1) into which a quantity of coins can be dropped, and catchment containers (7) into which the sorted coins are collected, saving the user the laborious and time–consuming task of sorting mixed coins by hand. The sorter may be adapted to count and perform the task of bagging coins.



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AUTOMATIC POWER-FREE COINAGE SORTER

This invention relates to an automatic power-free coinage sorter.

Electrical coinage sorters have been in use for many years in establishments which handle large quantities of loose change.

Despite their automated nature (not requiring manual agitation), these electrically driven coinage sorters are heavy, expensive machines requiring provision of mains power for operation, and very often because of their size, an installation process. Thus the whole business of coinage sorting by machine has become very centralised; small to medium handlers find it uneconomical to invest in expensive machines, and still do their sorting manually. As a result, high street banks, for example, will not accept mixed coinage, passing the responsibility of time-consuming sorting on to the customer.

There are numerous older types of coinage sorter, for example the "board" type which requires the user to pour a quantity of coins onto the board and shake the board until all the coins are sorted into different sized channels. These require constant manual agitation to perform the sorting process, and thus give little improvement over sorting by hand.

According to the present invention there is provided a compact, lightweight, portable, automatic power-free coinage sorter capable of sorting mixed coin, requiring **neither** electrical power **nor** manual agitation.. The sorter comprises catchment containers for the various denominations, means of guiding sorted coins thereinto, means for effectively sorting the various denominations, means for achieveing a steady flow and preventing unintentional clogging using self-agitation, and means of adapting the system to accommodate varying volumes of mixed coin, and indeed different currencies.

A specific embodiment of the invention will now be described by way of example with reference to the accompanying drawing in which:-

Figure 1 shows a perspective view of the automatic power-free coinage sorter which uses four radially parallel quadrature helical runner tracks.

Figure 2 shows a vertical cross-section through the hopper and feedback mechanism.

Figure 3 shows a plan (top) view of the quadrature smoothing distributor/weight sensor (bottom part of the feedback mechanism)

Figure 4 is an inner view of the discrimination region of the quadrature helical runner tracks, showing the operation of the discrimination apertures.

Referring to Fig.1, the sorter comprises a hopper (1), a quadrature smoothing distributor/weight sensor (2), a flow regulator (3) positioned in the mouth of the hopper aperture (5), quadrature helical runner tracks (4), means of discrimination and

separation of coins according to denomination using different sized apertures (8), catchment containers for the various denominations of coinage (7), and means of guiding sorted coins thereinto using guide tubes (6).

In order to operate the sorter, a quantity of coins is dropped into the hopper (1), the sorter generally being in an upright position.

Due to the internal shape of the hopper (1) the coins have a tendency to align themselves circularly around the flow regulator (3), which is firmly attached to the quadrature smoothing distributor/weight sensor (2), the coins laying as flat as the hopper floor will allow. The coins fall through the hopper aperture (5) onto the quadrature smoothing distributor/weight sensor (2), one of the purposes of which is to rarify the stream of coins into single file before it enters the quadrature helical runner tracks (4).

Referring to Fig.2, negative feedback is applied from the quadrature smoothing distributor/weight sensor (2) to the flow regulator (3) in the hopper, in order to provide a deliberate, controllable "clog" when the weight of coins on the quadrature smoothing distributor/weight sensor (2) becomes excessive. The feedback mechanism (3) and (2) is supported on springs (9). As the coins are dispensed from the quadrature smoothing distributor/weight sensor (2) onto the helical runner tracks (4), the flow regulator (3) is caused to rise, freeing the deliberate clog of coins in the hopper and allowing more coins to flow through the hopper aperture (5) and onto the quadrature smoothing distributor/weight sensor (2). Thus four smooth streams of single-file coins are allowed to flow onto the quadrature helical runner tracks (4) for sorting.

Referring to Fig 2 (in conjunction with Figs. 1 and 3), the quadrature smoothing distributor/weight sensor (2) has four degrees of rotational symmetry. Coins fall onto the central region, and are encouraged outwards by a continuous, constant scalar gradient. As they travel outwards along the four curved channels (12), the stream of coins has a natural tendency to become become rarefied by the effects of surface friction of the quadrature smoothing distributor/weight sensor (2) on those coins which may be underneath others, slowing them and allowing those coins on top to pass. The scalar gradient of the four curved channels must be large enough to prevent the "complete stalling" of coins (this can be found by experimentation to be of the order of 15 to 25 degrees from horizontal for a smooth plastic part).

Referring to Fig. 4, the four streams of coins enter the quadrature helical runner tracks (4), and are accelerated down the inner surface of the tracks by gravity, being held gently against the inner surface by the centripetal force which is a result of the constant radial curvature of the helical shape. The scalar gradient of the runner tracks should be steep enough to allow a general acceleration of the coins, but not so steep as to accelerate coins to a velocity whereby irregular coins may have a tendency to "bounce"". The optimum scalar gradient for a smooth plastic runner lies within the range 11 to 18 degrees.

Towards the end of the quadrature helical runner tracks (4), apertures (8) are provided to discriminate between the various denominations of coin, allowing the coins to leave the runner tracks due to their own linear momentum, causing different denominations

to leave the channel at their respective points. The apertures (8) must be arranged along the runner tracks in ascending order of height, so that the smallest coins leave the track first. In the event of a currency having two denominations of coin which have almost identical diameters (a situation which might otherwise result in the erroneous sorting of these two denominations), a shallow step (11) may be provided on the runner track along the length of the first of the two respective apertures, in order to provide further discrimination according to the thickness of the two coins, by raising the thickest coin as it passes the first aperture.

In this embodiment, each denomination has its respective aperture (8) positioned vertically above and/or below the corresponding aperture for the same denomination on the adjacent runner track(s), so allowing external vertical guide tubes (6) to marshal the sorted coins into the respective catchment containers (7).

Vibrational agitation caused by the movement of coins down the runner tracks and into the guides and catchment containers, further assists the operation of the hopper feedback mechanism (3) and (2). The whole assembly is mounted on elastic feet (10), which reduce vibrations imparted to the table or desk on which the invention is used and so reduce noise levels, and also to maximise the internal vibrational agitation.

CLAIMS

1 An automatic power-free coinage sorter comprising a portable cylindrical body, an input hopper which is capable of receiving bulk groups of mixed coins, an exit aperture in the base of the hopper, an integrated helical runner track to transport a stream of coins along its inner surface, means of ejecting coins through discrimination apertures cut into the helical track such that coins of different denominations leave the track at different points, and means of guiding each denomination into a separate catchment container.

2 An automatic power-free coinage sorter as claimed in claim (1), wherein multiple helical runner tracks are formed in the cylindrical body to transport streams of coins in a parallel fashion, thus enabling the throughput rate of coins to be increased relative to that achieved using a single helical runner track.

3 An automatic power-free coinage sorter as claimed in claim (1) or claim (2), wherein means are provided of continuously weighing the instantaneous bulk mass of coins which is in transit between the hopper and the helical runner tracks.

4 An automatic power-free coinage sorter as claimed in claim (3), wherein means are provided for applying negative feedback to the hopper output (in order to regulate the flow rate), according to the instantaneous total mass of coins which are is in transit between the hopper and the helical runner tracks.

5 An automatic power-free coinage sorter as claimed in claim (3) or claim (4), wherein the means of weighing the instantaneous mass is adapted such that, during the process of weighing, the coins in transit between the hopper and the helical runner tracks are rarefied into single file streams of coins.

6 An automatic power-free coinage sorter as claimed in claim (6), wherein the assembly is mounted on elastic feet, in order both to prevent damage to surfaces, and to assist with the self-agitation of the coin mass flow by mechanically de-coupling the sorter from the surface on which it is operated.

7 An automatic power-free coinage sorter as claimed in any preceding claim, wherein means are provided to easily remove the catchment containers, enabling subsequent counting and/or weighing and/or bagging of sorted coins.

8 An automatic power-free coinage sorter substantially as described herein with reference to figures 1 to 4 of the accompanying drawing.

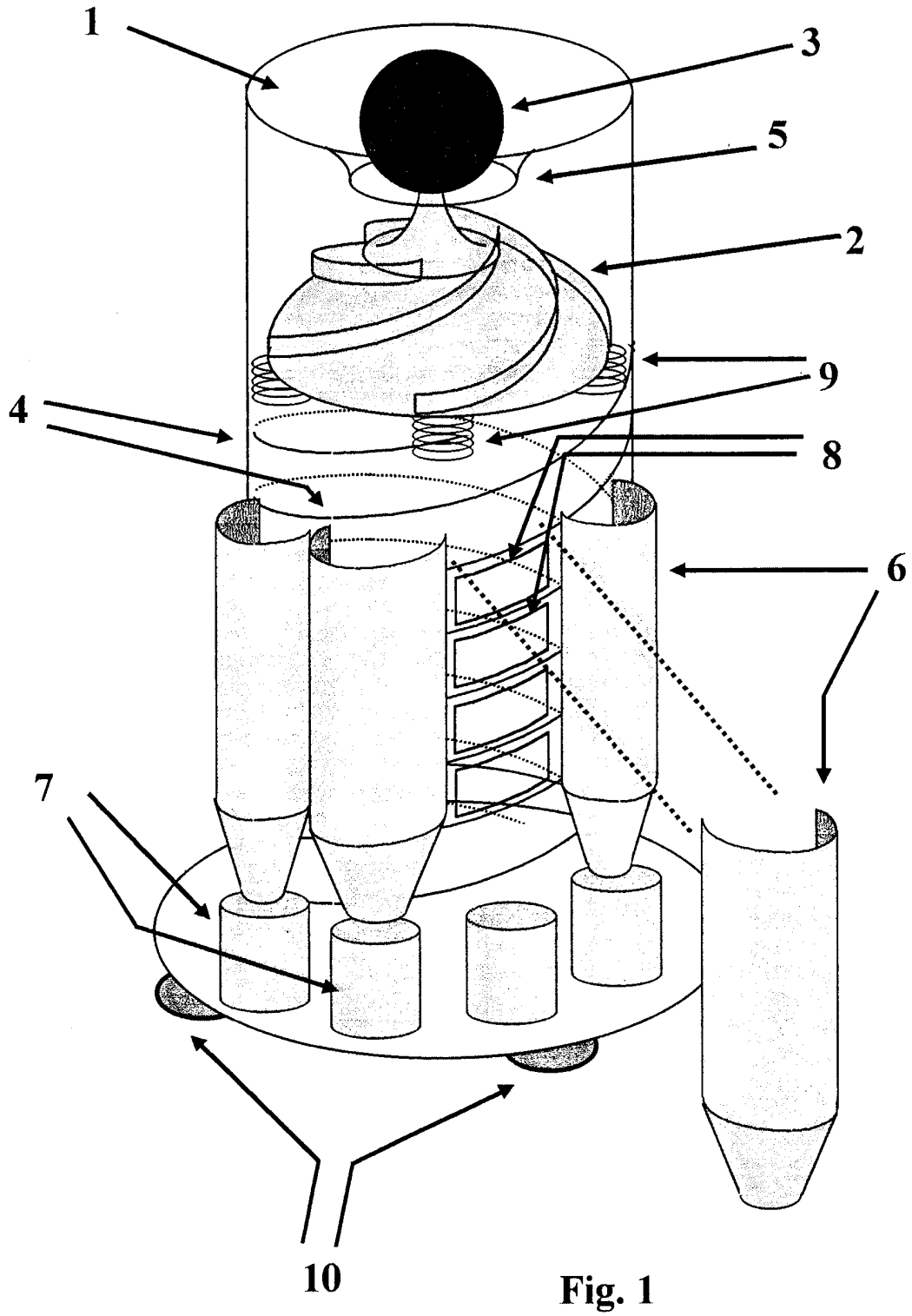


Fig. 1

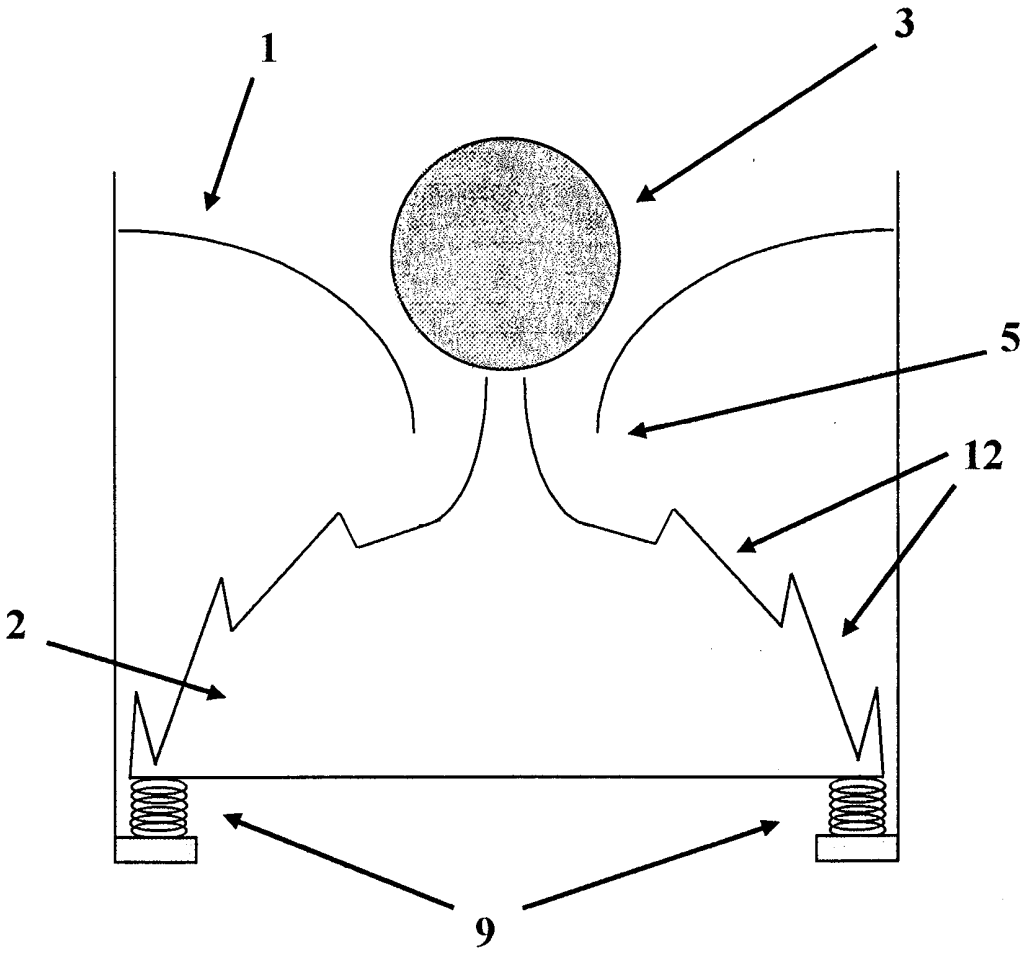


Fig. 2

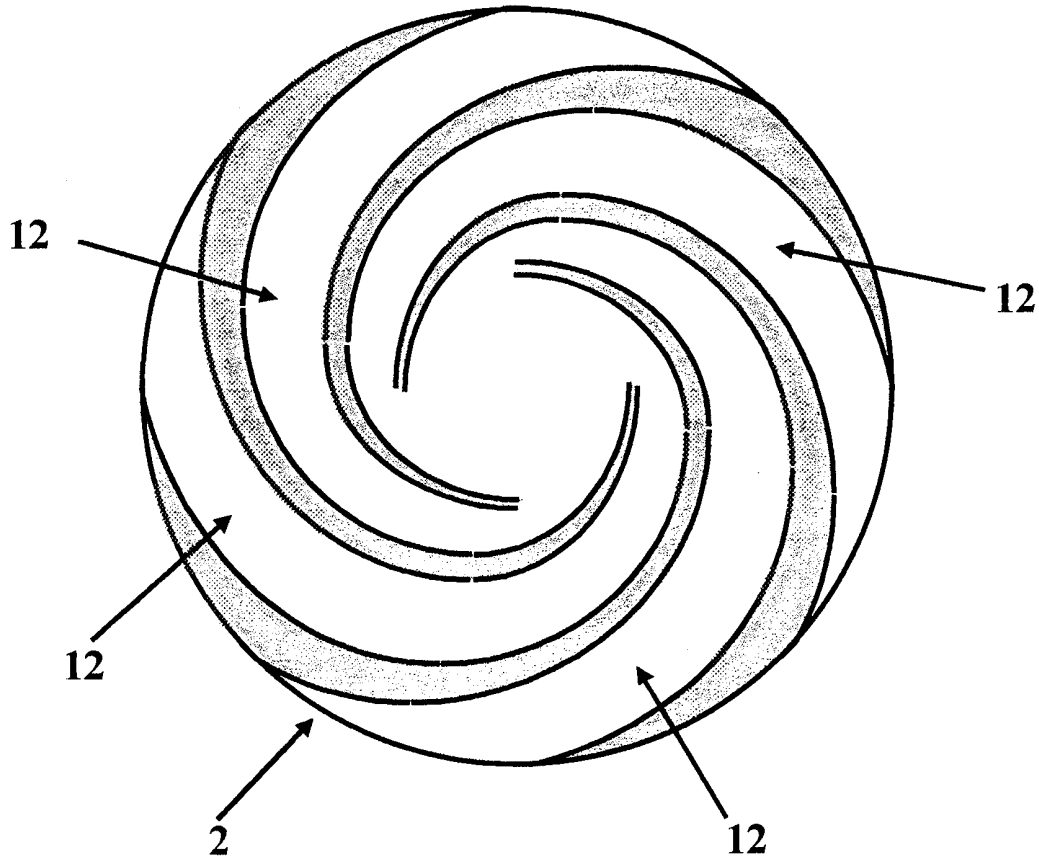


Fig. 3

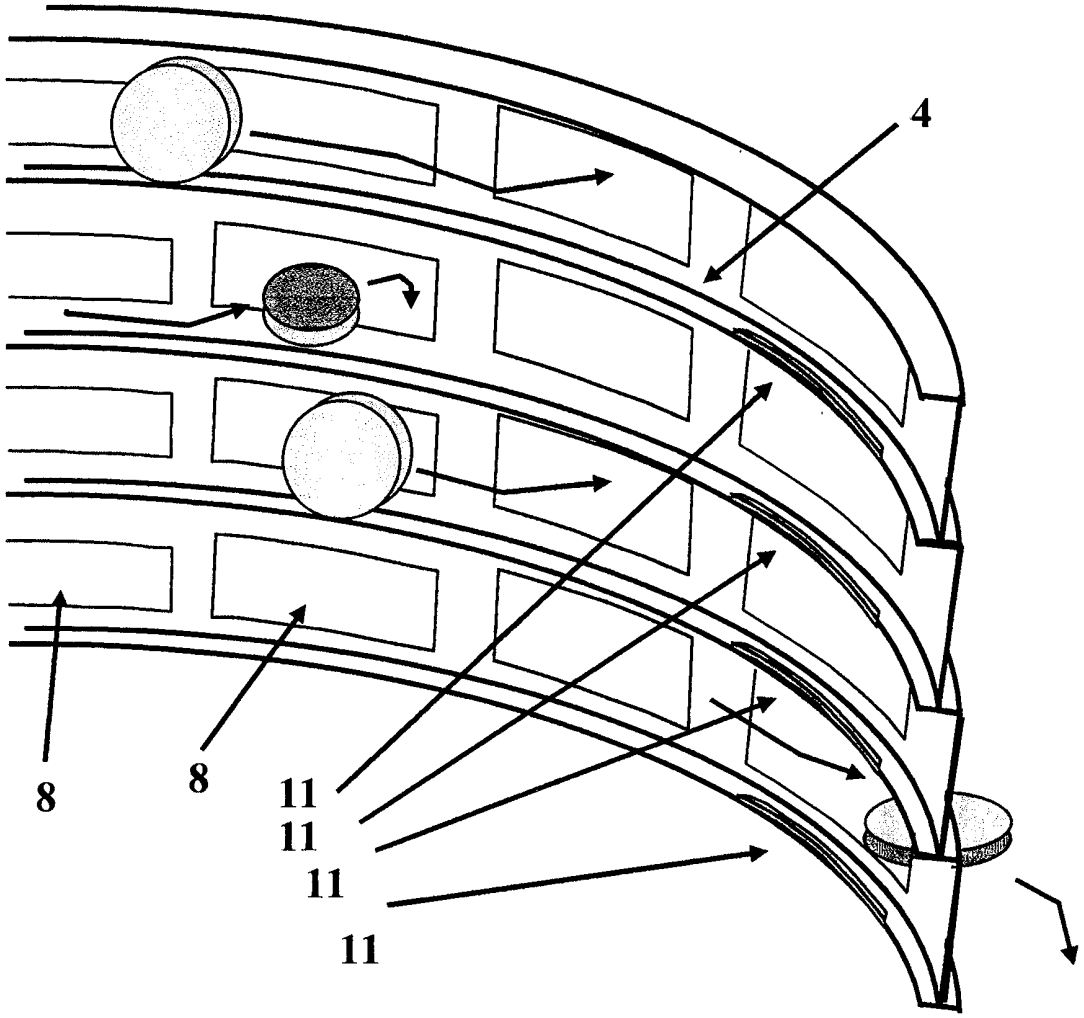


Fig. 4