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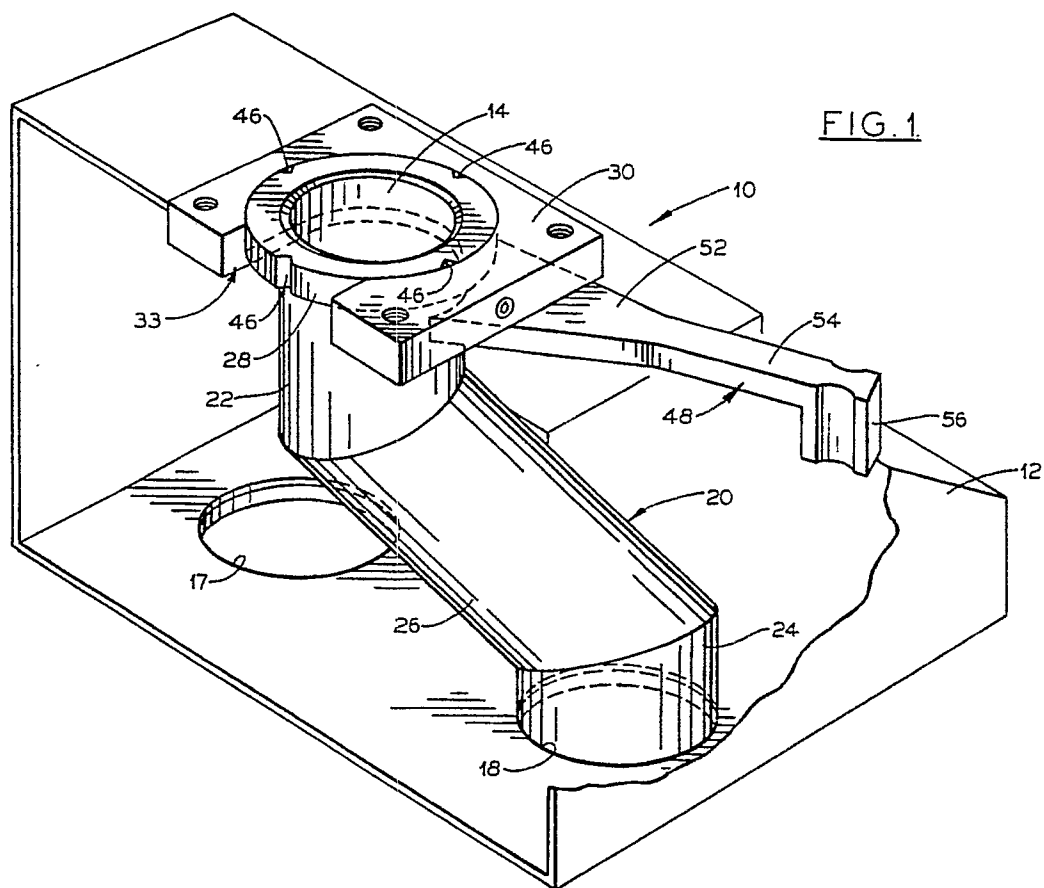
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D-8000 München 22(DE)(54) **Bag switching system for coin sorting apparatus.**

(57) An improved coin bag switching system is provided for coin sorting apparatus and includes means for reasonably supporting at least two coin bags each for at least one selected coin denomination, means for selectively establishing a channel between the exit chute for the selected coin denomination and a selected one of the releasably supported coin bags, means for temporarily suspending the sorting operation when the selected bag is found to be full or when a predefined coin count is determined to have been reached, means responsive thereto for displacing the previously established coin channel and establishing an alternate channel between the exit chute and a second selected coin bag, and means for resuming the sorting operation after the new channel has been established.

A coin switching module is provided for the establishment of channels between a coin exit tube

of a given denomination and selected ones of empty coin bags corresponding to that denomination. The module is adapted to be conveniently connected to a selected coin exit tube for a coin sorting machine with little modification, if any, to the existing coin bag arrangement for the sorter. An integrally formed channel member is displaceably affixed about a coin input slot inside the switching module and is pivotally mounted to the module in such a way that when the member is circularly displaced about a coin inlet section of the member, the coin outlet section of the member can register with selected ones of a plurality of coin exit slots corresponding to the plurality of coin bags provided for the selected coin denomination. Controllable displacement of the channel member is affected by means of a lever attached thereto and projecting outwardly of the switching module.

EP 0 391 403 A2



BAG SWITCHING SYSTEM FOR COIN SORTING APPARATUS

FIELD OF THE INVENTION

The present invention relates generally to improvements in apparatus for sorting coin currency by denomination. More particularly, this invention relates to an improved system for switching bags filled with sorted coins in such coin sorting apparatus with only a minimal interruption of the normal operational sequence of the sorting apparatus.

BACKGROUND OF THE INVENTION

The rapidly increasing use of coin-operated machines in today's economy has spawned a variety of commercial apparatus capable of automatically sorting mixed groups of coins by denomination. Such machines typically sort coins denominationally by using centrifugal force for separating incoming coins and provide a count of individual coin denominations by using some form of magnetic or optical sensing. The machines usually are capable of storing and displaying information about coin counts during the sorting process. In addition, such machines necessarily provide means for storage and removal of coins that have been sorted and counted by denomination.

Most of today's commercial coin-sorting machines provide highly accurate denominational sorting and counting of coins at high speeds by using microprocessor-based systems for sensing, storing, regulating, and displaying various critical parameters associated with the sorting/counting operation. The JetSort series of coin sorters marketed by Cummins-Allison Corp. of Mount Prospect, Illinois, for instance, provide accurate sorting/counting at speeds up to 6,000 mixed coins per minute using a microprocessor-controlled system for sensing and counting denominationally sorted coins as well as for providing a user-friendly interface for displaying and controlling various count parameters such as batch totals, day totals, etc.

The increasingly higher counting speeds realized by such machines have also generated an accompanying host of concerns, one of the most prominent of which is the disparity between the accelerated filling time for coin bags at high speeds and the relatively protracted operator time involved in replacing coin bags as they become filled with sorted and counted coins. Typically, when a particular coin bag becomes full, the counting process has to be halted so that the operator

may release the bag from the chute to which it is connected, fasten the bag for security or other purposes, and replace the full bag with an empty one. The time involved in this operation severely restricts the operational speed of the sorting machine and also limits the number of machines which can be manned by one operator, particularly at high sorting speeds.

The problem is significantly compounded when the coins to be counted include a high concentration of one particular denomination relative to the other denominations which the machine is capable of sorting. Such a disproportionate coin denomination ratio is, for instance, common in coins collected from commercial vending machines in the United States, which typically include a large number of quarters as compared to nickels, dimes or pennies. When such coin groups are processed by a sorter, the coin bag connected to the coin exit chute corresponding to the "quarters" slot gets filled much more rapidly than the other bags, thereby requiring the bag to be replaced much more frequently than the bags for the other coin denominations. Consequently, the sorting process has to be halted frequently and added operator attention is required, particularly at high speeds.

Attempts have been made to approach this problem by provision of means to deflect a stream of coins from a filled coin bag into an empty one. Such arrangements have been disadvantageous as they are relatively complex mechanically, can frequently lead to coin spill-over during the process of deflection, and, more importantly, provide inadequate continuity in adjusting the count data to account for the switching of bags.

SUMMARY OF THE INVENTION

It is a primary object of this invention to provide means for adapting the coin bag arrangement for a coin sorting machine to permit more efficient filling and handling of coin bags.

With regard to the above object, it is a related object of this invention to provide modular means that can be conveniently incorporated into a sorter machine, with minimal modification thereto, the modular means being adapted to provide selectively switchable exit channels for counted coins to be directed to desired coin bags.

A further object is to provide modular means of the above type which is adapted to maintaining a continuity between count data before and after coin channels have been switched.

Briefly, in accordance with this invention, these and other objects are realized by providing coin sorting apparatus with means for releasably supporting at least two coin bags each for at least one selected coin denomination, means for establishing a channel between the exit tube for the selected coin denomination and a selected one of the releasably supported coin bags, means for temporarily suspending the sorting operation when the selected bag is full or when a predefined coin count has been reached, means responsive thereto for displacing the previously established coin channel and establishing a channel between the exit tube and a second selected coin bag, and means for resuming the sorting operation after the new channel has been established.

According to a preferred embodiment of this invention, the establishment of channels between a coin exit tube of a given denomination and a selected one of empty bags corresponding to that tube is accomplished by means of a coin switching module adapted to be conveniently connected to a coin sorting machine with little modification, if any, to the existing coin bag arrangement for the machine. The module includes a coin receiving section having a generally circular coin input slot which corresponds to the exit slot on the coin tube to which the module is to be linked. At least two generally circular coin exit slots are provided on the module and correspond to coin slots provided on output chutes to which coin bags may be attached by means of a conventional clamping-ring arrangement. The chutes are attached to the external surface of the module in such a way that the coin slots on the chute and the coin exit slots on the module are substantially in alignment.

To divert sorted coins exiting the coin exit tube slot to the output chute corresponding to a selected coin bag, an integrally formed channel member is displaceably affixed to the coin input slot inside the switching module. The channel member includes a generally cylindrical coin inlet section having a coin inlet corresponding in circular dimension to the coin input slot of the switching module and a generally cylindrical coin outlet section having a coin outlet which corresponds in circular dimension to the coin exit slots. Preferably, the inlet and outlet sections of the channel member are substantially non-coaxial to each other and are integrally linked by an angularly disposed cylindrical section so that the coin outlet may be positioned over a plurality of circumferentially displaced coin exit slots while maintaining the coin inlet registered with the coin input slot.

At its coin inlet end, the channel member is pivotally mounted to the switching module cabinet in such a way that when the member is circularly displaced about the coin inlet, the coin outlet

swings about an arc which runs across the coin exit slots. Preferably, the extreme limits of circular displacement of the channel member at its inlet end cause the coin outlet of the member to be aligned with respective ones of the coin exit slots. Such displacement is affected by means of a lever attached to the channel member and projecting outwardly of the switching module.

According to a preferred embodiment, limit switches are provided about each of the coin exit slots and are positioned to be activated when the coin outlet on the channel member registers with the corresponding coin exit slot upon being activated by the displacement lever. Electrical signals from the limit switches are linked to the microprocessor typically used to control conventional sorting machines. These signals are used, in conjunction with similar signals from limit switches corresponding to the clamping-ring arrangement for the attachment of coin bags to corresponding chutes on the switching module, as a basis for monitoring and counting the coins being fed to a selected coin bag once the required channel is established between the appropriate coin tube and the coin bag by manipulating the channel member appropriately through the displacement lever.

BRIEF DESCRIPTION OF THE DRAWINGS

Other objects and advantages of the invention will become apparent upon reading the following detailed description and upon reference to the drawings in which:

FIG. 1 is a perspective view, in partial cut-out, of a switching module, adapted to be incorporated into coin sorting apparatus, according to a preferred embodiment of the bag switching system of this invention;

FIG. 2 is a front view of the switching module of FIG. 1 illustrating the relative disposition of the channel member and the coin input and exit slots defined on the module;

FIG. 3 is a partial exploded view illustrating the arrangement for rotatably mounting the channel member inside the switching module of FIGS. 1 and 2;

FIG. 4 is a partial exploded view illustrating sections of the channel member in detail;

FIG. 5 is a block diagrammatic illustration of a microprocessor-based control system with which the switch signals from the switching module of FIGS. 1-4 may be interfaced for implementing this invention;

FIG. 6 is a schematic block diagram illustrating the arrangement of limit switches according to a preferred embodiment of this invention;

FIG. 7 is a flow chart illustrating the preferred sequence of operations involved in utilizing the switching mechanism of FIG. 6 in conjunction with the switching module of FIGS. 1-4, in accordance with the system of this invention.

While the invention is susceptible to various modifications and alternative forms, specific embodiments thereof have been shown by way of example in the drawings and will be described in detail herein. It should be understood, however, that it is not intended to limit the invention to the particular forms disclosed, but on the contrary, the intention is to cover all modifications, equivalents, and alternatives falling within the spirit and scope of the invention as defined by the appended claims.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to FIGS. 1 and 2, they are shown, respectively, perspective front views of a switching module adapted to be conveniently incorporated into coin sorting apparatus, according to a preferred embodiment of this invention. As shown therein, the switching module 10 is housed within a substantially trapezoidal cabinet 12 the upper surface of which is provided with a centrally disposed coin slot 14 for accepting coins that have been processed by the coin sorting apparatus with which the illustrative bag switching system is to be used. More specifically, the coin slot 14 corresponds substantially in diameter to the coin output slot 15 provided on the coin exit tube 16 of conventional coin sorting apparatus for accepting and directing processed coins of a particular denomination to corresponding coin bags.

The structural details of the coin exit tube and the manner in which it is linked to the sorting channel, as well as the structural and operational details of the coin sorting arrangement itself are not of importance to the operation of the present invention and, accordingly, will not be discussed herein. The present invention may be advantageously incorporated into any of a variety of commercially available coin sorting apparatus, as long as the coin bag arrangement provided with the apparatus includes sufficient room to house the support cabinet which defines the switching module. The attention of the reader is directed to the above-mentioned JetSort series of coin sorters marketed by Cummins-Allison Corp. the construction of which is particularly suited for use with the switching system described herein. For purposes of this application, it suffices to state that the coin input slot 14 is disposed in such a way as to be capable of align-

ment with the coin slot 15 of the coin exit tube 16 corresponding to the selected coin denomination with which the present bag switching system is to be used.

Returning now to FIGS. 1-2, the cabinet 12 of the switching module 10 is provided on its bottom surface with at least two spaced apart coin exit slots 17 and 18 through which selectively channeled coins may be directed to corresponding coin bags A and B, respectively, which are each releasably attached to the slots through a conventional clamping-ring arrangement, as will be discussed below in detail. The exit slots 17, 18 and the corresponding clamping-ring arrangement connecting a coin bag to each exit slot provide, in combination, dual storage means which may be used to speed up the process of storing counted coins and replacing filled bags with empty ones. For a selected coin denomination, this function is accomplished by selectively establishing a channel between the coin exit slot for that coin denomination and a selected one of the releasably supported coin bags.

In order to divert sorted coins exiting the coin exit slot 15 to a selected coin bag, the switching module 10 is provided with an integrally formed channel member 20 which is displaceably affixed to the coin input slot 15 on the switching module. The channel member 20 includes a generally cylindrical coin inlet section 22 corresponding in circular dimension to the coin input slot 14 of the switching module, and a generally cylindrical coin outlet section 24 which corresponds in circular dimension to the coin exit slots on the switching module. The inlet section 22 includes a circular opening 23 corresponding in diameter to the coin input slot 14 and the exit slot 15 on the tube 16. Similarly, the outlet section 24 is provided with an opening 25 which corresponds in diameter to the coin exit slots 17 and 18.

In order to make the channel member 20 capable of establishing a channel between the coin input slot 14 and each of the coin exit slots 17 and 18, the inlet section 22 and outlet section 24 are designed to be substantially non-coaxial with each other. These sections are linked together by means of an angularly disposed, substantially cylindrical section 26 having a circular dimension corresponding to that of the two sections. The angular section 26 is connected, through an elbow-like connection, on one of its ends to the inlet section 22 in such a way that the axes of the joined sections are disposed at a predetermined angle relative to each other. The other end of the angular section 26 is similarly connected to the outlet section 24 with the axes of the sections being disposed at the same selected angle to each other.

The angular disposition of the cylindrical sec-

tion 26 relative to the inlet section 22 and the outlet section 24, as best illustrated in FIG. 2, is selected to be such that the section can be placed into registration with each of the coin exit slots 17, 18 by pivoting the channel member 20 sufficiently about the axis of the coin inlet section 22. When the coin inlet section 22 is coaxially aligned with the coin exit tube 16, any circular displacement of the inlet about its axis causes the outlet section 24 to traverse an arcuate path about the bottom surface of the switching module cabinet. Accordingly, the output slot 25 on the outlet section 24 can be made to register with any of a plurality of coin slots disposed about such an arcuate path by providing an appropriate circular displacement to the channel member 20 while anchoring the inlet section 22 about its axis. Thus, the channel member is particularly adapted to the selective establishment of channels between the coin input slot and one of a plurality of coin output slots, each linked to a corresponding coin bag for storing counted coins of the selected denomination.

In order to effectuate the circular displacement of the channel member required to establish selected coin channels, the switching module is provided with a collar/bracket arrangement which is best illustrated in FIGS. 3-4 and includes the provision of a circular collar section 28 disposed about the coin inlet on the outer surface of the coin inlet section 22.

The collar 28 is adapted to fit in a rotatable manner within a generally U-shaped support bracket 30. The bracket 30 includes an integrally formed, substantially circular platform 32 adapted to accept and support the collar section 28 of the channel member 20 in an axially fixed manner relative to the coin inlet section 22. The platform 32 is defined by a circularly extending wall 34 and a cooperating circularly extending ledge 36 having circumferential dimensions corresponding to that of the collar 28. The platform 32 opens outwardly of the U-shaped support bracket 30 through a throat section 33 and, accordingly, the channel member 20 can be slid into position through the throat of the support bracket 30 so that the circular bottom surface of the collar 28 on the coin inlet section is seated upon the circular ledge 36 in abutment with the adjoining circular wall 34. In this position, the collar 28 is held securely by the platform 32.

The circumferential dimension of the ledge 36 is selected to be slightly larger than the outer circumference of the collar 28 and, accordingly, the collar 28, and hence the coin inlet section to which it is attached, remains rotatably anchored within the support bracket 30.

For realizing the circular displacement of the collar 28, a radially projecting lever 48 is disposed about the coin inlet section 22 and includes a

substantially triangular section 52 tapering inwardly from around the outer surface of the inlet section 22 to an elongated segment 54 having a downwardly projecting handle 56 disposed at its end. The lever 48 is linked to the inlet section 22 in such a manner that it projects outwardly through the front of the switching module 10 from a longitudinally extending slot 50 defined in the upper section of the front surface of the cabinet 12 (See FIG. 2).

The bracket 30 is affixed to the inner side of the top surface of the cabinet 12 (where the coin input slot 14 is defined) by means of an appropriate screw arrangement or the like (not shown). When the collar 28 of the channel member 20 is disposed within the circular platform 32 with the lever 48 projecting outwardly of the cabinet 12 through the longitudinal slot 50, any lateral displacement of the lever 48 produces a corresponding circular displacement of the collar 28. The arrangement allows an operator to manually displace the lever 48 through lateral distances sufficient to generate the rotational displacement of the channel member 20 required to align the output section 24 with a selected coin output slot (17 or 18 in FIGS. 1-2). Thus, selective establishment of coin channels between the output slot 15 of the coin tube 16 of a particular coin denomination and a selected one of a plurality of coin bags (A or B) is conveniently realized.

In order to ensure optimum registration of the coin outlets on the channel member with corresponding coin exit slots and to provide a positive mechanical feedback indicative of such alignment, the circularly extending side wall 34 in the support bracket 30 is provided with at least one cylindrical cavity 38 extending transversely through the bracket to the outside (See FIG. 4). The cavity is adapted to hold a steel ball 40, which is biased inwardly through a spring 42 by a set screw 44. When the channel member is suspended from the bracket 30 with the collar 28 resting within the support platform 32, the set screw 44 is adjusted to bias the spring 42 against the ball 40, thereby projecting the ball through the inner opening of the cavity 38 into frictional contact with the surface of the collar 28.

A plurality of grooves 46 are defined on the circumference of the collar 28 and are adapted to support the steel ball 40 therein when the collar 28 is rotatably displaced to a point where a groove 46 is positioned immediately across the cylindrical cavity 38. In the preferred embodiment, a second cylindrical cavity (not shown) is provided on the support bracket 30 in a diametrically opposite position to that of cavity 38. An identical spring biased, set screw activated steel ball (not shown) is disposed within that cylindrical cavity.

The relative positions of the grooves 46 provided on the collar 28 are selected to be such that

at least one groove registers with one of the cylindrical cavities, and the steel ball carried therein, when the channel member is displaced to a position that places the coin outlet section 24 in alignment with either of the coin output slots 17 or 18. In the preferred embodiment of FIG. 3, for instance, two pairs of grooves 46 are provided on the collar 28. One pair of diametrically opposed grooves 46A are so positioned as to become aligned with respective ones of the diametrically opposed cylindrical cavities 38 when the channel member is displaced to establish a coin channel between the coin input slot 14 and the coin output slot 17 for bag A. The other diametrically opposite pair of grooves 46B on the collar 28 are arranged to be aligned with the respective cavities 38 when a channel is established between the coin input slot 14 and the coin output slot 18 for bag B.

The above-described arrangement is advantageous in that audible as well as tactile feedback is provided each time a pair of grooves becomes aligned with the corresponding cylindrical cavities, and the steel balls disposed therein are clicked into position within the corresponding grooves under the urging of the springs. Thus, an operator can rely on such feedback for ensuring, in a quick and simple manner, optimum alignment of the outlet section of the channel member with the output slot corresponding to a selected coin bag.

It should be noted that more than two pairs of grooves, as well as more than two cylindrical ball-loaded cavities, may be provided on the collar 28 in order to extend the positive feedback arrangement described above, if more than two coin output slots are provided along the arcuate path traversed by the outlet section of the channel member as it is rotated about its inlet section.

For releasably supporting the coin bags A and B to the corresponding coin output slots 17 and 18, respectively, identical clamping-ring arrangements 58 are provided. As shown in FIG. 2, each arrangement 58 includes a support bracket 60 through which a coin output chute 62 is fixed externally to the bottom surface of the switching module cabinet 12 in such a way that the input opening 63 of the chute is aligned with the corresponding coin output slot 17. The chute 62 is substantially cylindrical at its input section 62A where it is supported by the bracket 60 and includes a lower portion 62B which tapers outwardly.

A clamping ring 64 having a diameter which is slightly larger than the diameter of the cylindrical section 62A of the chute 62 is slidably disposed on the chute. Accordingly, a coin bag can be releasably fastened to the chute 62 by positioning the bag over the chute and sliding the clamping ring down until it fits tightly over the outwardly tapered section of the chute 62. Releasing the coin bag

merely requires the clamping ring to be pushed up and away from the tapering section into the cylindrical section of the chute 62. The clamping-ring is preferably made of steel and a plurality of magnet 65 are disposed on the underside of support bracket 60. As the ring is slid onto the cylindrical section 62A, it is pulled upwardly and becomes attached to the magnets. As a result, the releasing operation is facilitated and the ring is securely retained during the time needed to replace the coin bag.

According to a feature of this invention, switching means are provided within the switching module 10 for monitoring the arcuate displacement of the channel member 20 and providing an indication as to whether or not the coin outlet section of the channel member is registered with the desired coin output slots. As shown in FIG. 2, limit switches 66, 68 are disposed about the coin output slots 17 and 18, respectively, and are each adapted to be activated on contact with the coin outlet section of the channel member when the section is aligned with the corresponding coin outlet slot. The switches are preferably of the "normally-closed" type and become "open" when the outer periphery of the coin outlet abuts contact members 67 provided on the switches. The relative positioning of each switch about the corresponding coin outlet slot is such that the contact members 67 come into abutment with the switching member only when there is exact alignment between the outlet section of the channel member and the coin output slot with which the switch is associated.

The clamping-ring arrangements 58 are also provided with a similar switching system for each coin bag. For instance, limit switches 70 and 72, also of the "normally-closed" type, are disposed underneath the bracket 60 corresponding to each of the coin output slots 17 and 18, respectively. The limit switch 70 is adapted to be activated when the corresponding clamp-ring 64 is slid into contact with the magnets provided on the support bracket 60; this normally occurs when a previously clamped full coin bag is released or when an empty coin bag is loaded onto the coin exit chute. A similar mechanism is provided for coin bag B. The limit switches 70, 72 may be replaced with magnetic reed switches which are activated when the clamping-rings 64 affect the magnetic field generated by the magnets 65.

Referring now to FIG. 5, there is shown an upper level block diagram of an illustrative microprocessor-based control system for controlling the operation of a coin sorter apparatus particularly suited to incorporating therein the bag switching system of this invention. The control system 80 includes a central processor unit (CPU) board for housing at least one CPU for monitoring and regulating the various parameters involved in

the coin sorting/counting operation. The CPU accepts signals from various interlock switches corresponding to the coin bags associated with the different coin denominations which the coin sorter apparatus is capable of recognizing. These switches typically provide an indication of the position of the clamping-ring or like mechanism which is used to secure coin bags to corresponding coin exit chutes and provide a signal to the CPU indicating whether or not the associated coin bag is in a secured or released state. The CPU is programmed to halt the coin-sorting operation when the signal from any of the interlock switches indicates that the corresponding bag is in a released position in order to avoid coin spillage.

The CPU is linked to an input/output (I/O) unit 84 and a serial interface unit 86 through a data bus 88, an address bus 90, and a control bus 92. The I/O unit 84, the CPU 82, and the serial interface unit 86 are all supplied with power through power line 94 fed by a power supply unit 96. The power supply unit 96 also serves, through appropriate transformer means 98, as the source of power for a mother board 99 which houses additional control components necessary for regulating the operation of the coin sorter apparatus. Such components may, for example, include relays 100, 102, respectively, for controlling the operation of the motor 104 for imparting rotary motion to the sorting channel, and the associated fan 106 for regulating the internal temperature of the machine.

The mother board is also linked to the solenoids 107 used for various machine operations and a circuit breaker 108 for providing surge protection. The I/O unit provides the interface between the CPU 82 and the external world and may be linked to a remote display unit 110. The I/O unit is usually linked to a display unit 112 for providing a visual indication of various machine parameters, an associated keyboard 114 for accepting user commands, and a speaker unit 116 for providing audible alarms. The I/O unit 84 is also linked to the plurality of coin sensors 117 associated with the sensing mechanisms for each of the coin denominations recognized by the sorting apparatus. These sensors typically correspond to sensing mechanisms for dimes (D), pennies (P), nickels (N), quarters (Q), half-dollars (H), and dollars \$.

The interlock switch signals fed to the CPU typically also include signals from bag switches corresponding to coin bags for pennies (P), nickels (N), dimes (D), quarters (Q), half-dollars (H), dollars (\$). During operation, the CPU is programmed in such a way that the sorting/counting process is activated only when all the interlock switch signals indicate that the corresponding clamping-rings are in the "secured" position. Sorting and counting are initiated concurrently and each sorted coin is di-

rected to the coin exit chute for the corresponding denomination, where it is sensed and counted. The CPU is also programmed to display the individual count for each coin denomination and possibly for providing count totals for a batch of coins, for coin sub-batches, date-wise coin totals, etc.

The bag switching system, according to the present invention, can conveniently be incorporated into a CPU-based control system of the above type. This is accomplished by connecting the output signals from the limit switches provided within the switching module 10 for the selected coin denomination and also providing signals from the corresponding clamping-ring limit switches to the CPU. The CPU 82 can then use these signals to regulate the sorting/counting operation in accordance with the selective establishment of coin channels to direct counted coins to desired ones of the plurality of coin bags associated with the switching module.

FIG. 6 illustrates a schematic representation of how the limit switches in the preferred two-bag embodiment of the switching module (described above with respect to FIGS. 1-4) are affected by the position of the channel member lever 48. As shown in FIG. 6 the limit switches corresponding to coin bag A, i.e., limit switch 66 for coin output slot 17 and the limit switch 70 for the clamping-ring for bag A are shown as corresponding to position A of the lever. The limit switches corresponding to bag B, i.e., the limit switch 68 for the coin output slot 18 and the limit switch 72 for the clamping-ring of bag B are represented as corresponding to position B of the lever.

The output signal from each of the four limit switches 66, 68, 70 and 72 is connected to the CPU board 82 according to the illustrative arrangement shown in FIG. 5. Since the switches are of the "normally-closed" type, limit switch 66 is activated or opened when the channel member lever is at its first extreme position, i.e., position A. When the lever is switched to its other extreme position, i.e., position B, the limit switch 68 is activated or opened. Limit switches 70 and 72 remain closed when the clamping-ring is in its secured position and are opened when the ring is moved up into the release position. The signals generated by the limit switches of FIG. 6 are processed by the CPU board and used as a basis for regulating the counting operation, particularly the display of count data, on the basis of preprogrammed instructions.

According to a preferred arrangement, the coin count for bag A is displayed when the channel member lever 48 is found to be in position A, i.e., limit switch 66 for bag A is found to be open and limit switch 68 for bag B is found to be closed. If the lever is found to be at position B, i.e., if limit switch 68 for bag B is found to be open and limit

switch 66 for bag A is found to be closed, the coin count for bag B is displayed. However, if the lever is not found to be at either position A or B, i.e., both the limit switches 66 and 68 are found to be closed, the sum of the coin counts for bag A and bag B is displayed. Of course, the CPU is programmed to halt the sorting apparatus if the limit switch corresponding to a selected coin bag is found to be open.

Referring now to FIG. 7, there is shown a flow chart 120 illustrating the sequence of operations involved in utilizing the bag switching system of this invention in conjunction with sorting apparatus of the type controlled by the microprocessor-based system discussed above with respect to FIG. 5. The sequence of operations is initiated at step 122 when the operator selects a particular bag, say bag A, for the storage of counted coins of the particular denomination for which the bag switching mechanism is being used. In effect, the machine operator moves the channel member lever to the position corresponding to the desired coin bag, i. e., position A. At the next step, i.e., step 124, the operator uses the keyboard associated with the display unit (see FIG. 5) to set the coin count limit for the selected bag. Subsequently, at step 126, the operator initiates the counting of coins, again through the keyboard.

The machine continues sorting and counting coins and keeps track of every coin exiting the sorting channel which has been identified immediately thereafter as being a coin of the selected denomination. When the predefined count limit has been reached (step 128) the CPU causes the machine to suspend its operation, and stores the coin count generated up to that point. It should be noted that suspension of sorting stops further in-feeding of coins into the sorting channel. However, there are, almost always, at least a few coins which are already inside the sorting channel at the time the signal to suspend sorting is generated. Conventionally, such coins proceed through the sorting operation and are directed to the corresponding coin bag. Accordingly, each time the sorting operation is suspended, there is a distinct possibility that the coin bag for which the count limit has been reached may contain more coins than the operator-defined limit.

According to a feature of this invention, the counting operation is controlled by the CPU in such a way that any coins that are processed by the sorting channel after the signal to suspend sorting operation is generated are counted and added to the total for the corresponding coin bag. However, the CPU is programmed to display the exact number of coins that have exceeded the predefined count limit, thereby providing the operator with an indication of how many coins need to be extracted

from the filled bag in order to achieve the exact predefined count.

Returning now to the flow chart of FIG. 7, at step 130, the operator selects the other bag, i. e., bag B, for storage of coins by appropriately shifting the position of the channel member lever. At step 132, the operator reactivates the sorting/counting operation and the storage of coins is directed to coin bag B.

Subsequently, after step 134, the operator proceeds with removing the filled coin bag A and replacing it with an empty one. The operator also has an opportunity to remove the excess number of coins, as indicated by the count display for bag A, from bag A and transferring the excess coins into bag B. This maintains the integrity of coin count in both the bags since the count for bag B has, at this point, already been credited with the excess number of coins. The above-described sequence of operations is reiterated each time a coin bag is found to be full.

It will be apparent from the foregoing that the present invention provides a simple bag switching system which is easily incorporated into conventional coin sorting apparatus. The switching module provides means for efficiently and selectively diverting coins from a filled coin bag to an empty one while consuming very little time and leaves the operator with sufficient time to replace filled coin bags. It will, of course, be obvious that the rotational displacement of the channel member for selective establishment of coin channels may also be handled automatically through direct electrical means or under the control of the microprocessor system.

Claims

1. In an apparatus for sorting and counting coins of different denominations, said apparatus including means for accepting coins of different denominations, means for processing the accepted coins through a sorting channel whereby coins of different denominations are directed to corresponding ones of different coin tubes leading to corresponding coin bags, and means for counting and displaying the number of coins of a particular denomination that have been directed to a corresponding coin bag, the improvement comprising: coin extraction means including means for releasably supporting at least two coin bags each for at least one selected coin denomination, means for establishing a channel for the flow of coins between the coin tube for said selected coin denomination and a selected one of said coin bags, and means for displacing the previously established

channel and establishing an alternate coin channel between said chute and a second selected coin bag.

2. The improved apparatus as set forth in claim 1 further including means for temporarily suspend- 5
ing the sorting of coins while retaining all count data prior to said suspension, said suspension means being responsive to a determination that the selected coin bag to which coins of a particular denomination are being directed is full or that a 10
predetermined count limit has been reached for said bag.

3. The improved apparatus as set forth in claim 2 further including means for resuming the sus- 15
pended sorting operation and continuing with the counting of coins based on said retained count data, said resuming means being responsive to a determination that said channel displacing means has been activated to establish an alternate coin channel between said chute corresponding to said 20
selected coin combination and a second selected coin bag.

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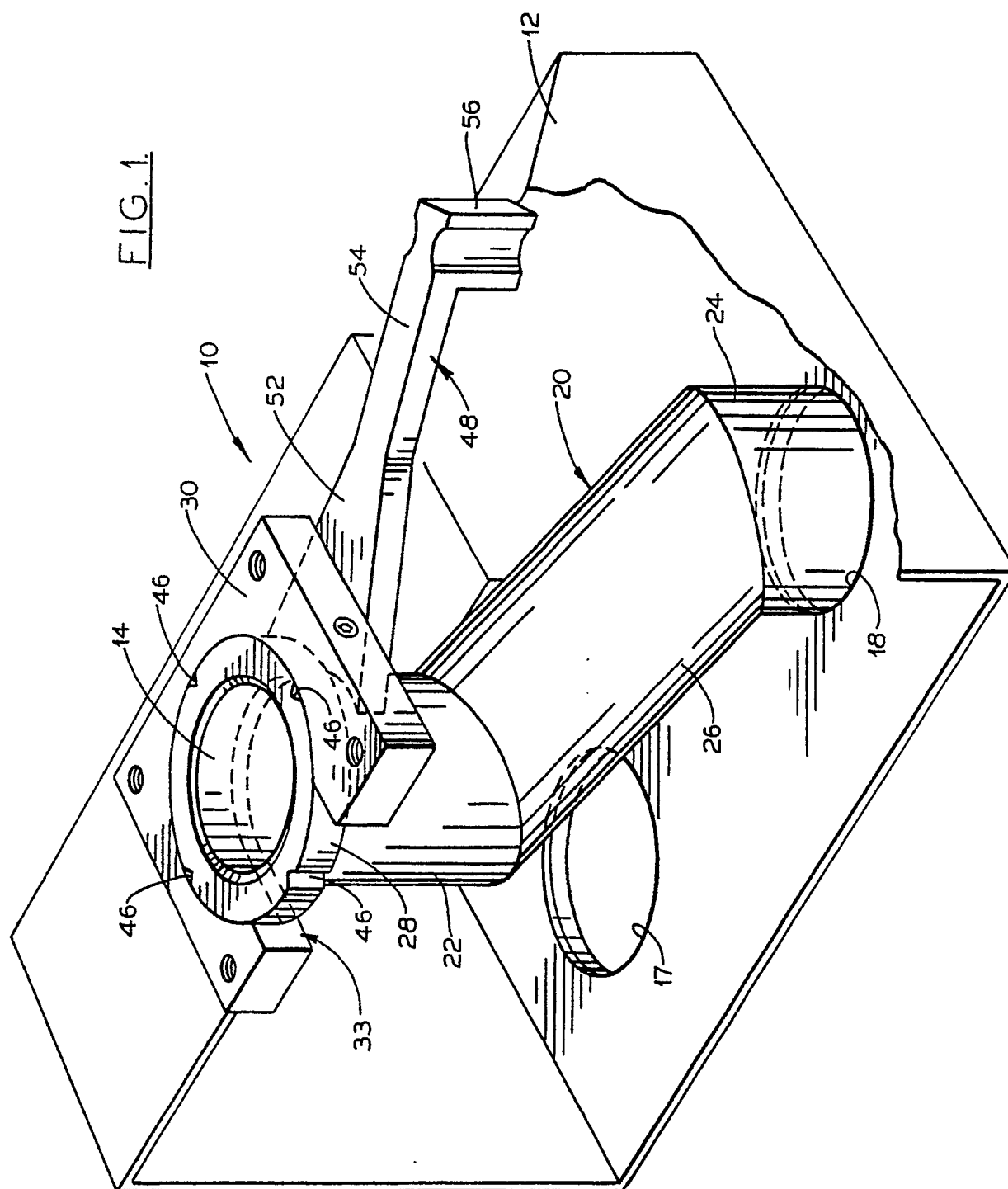
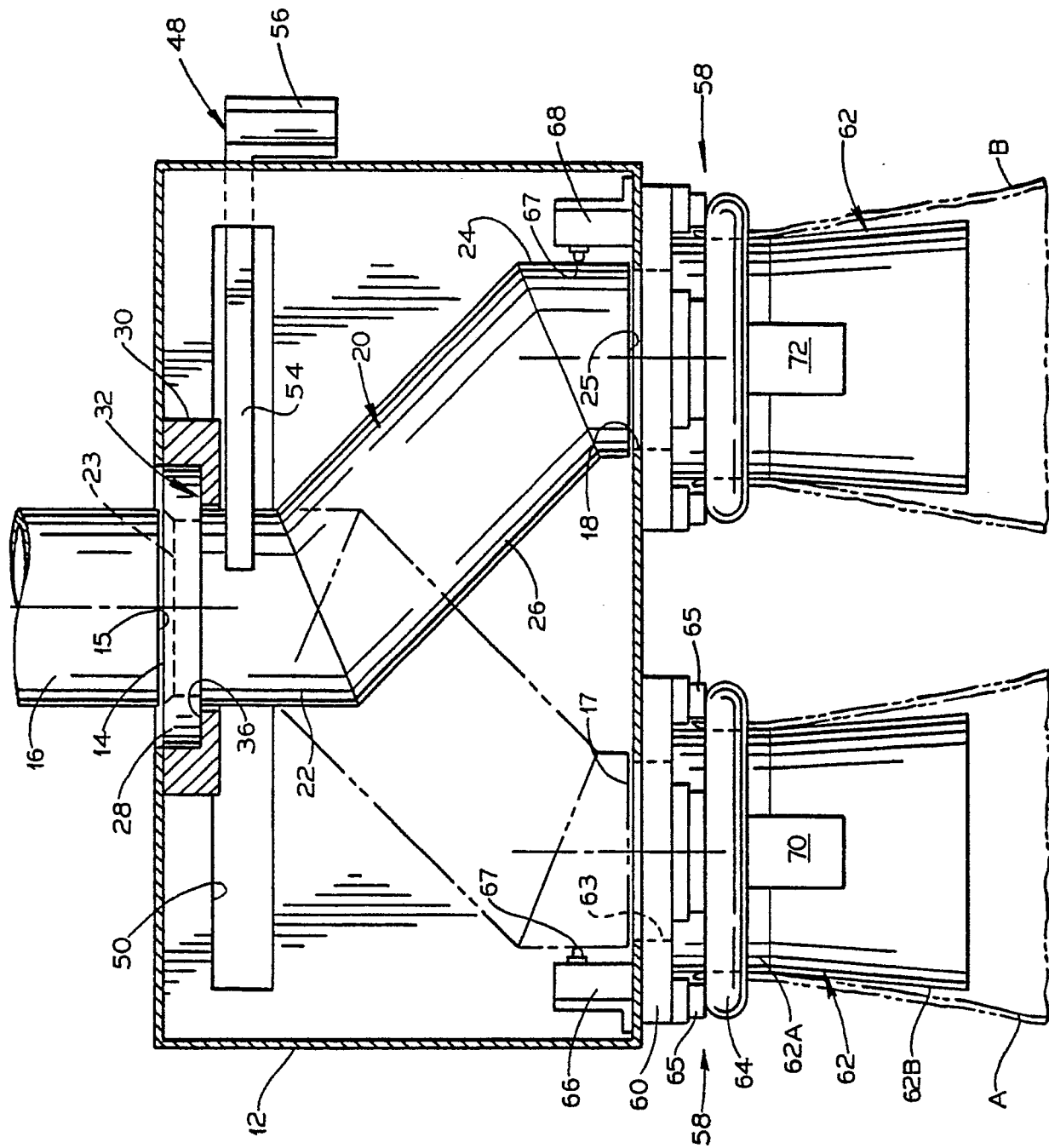


FIG. 2.



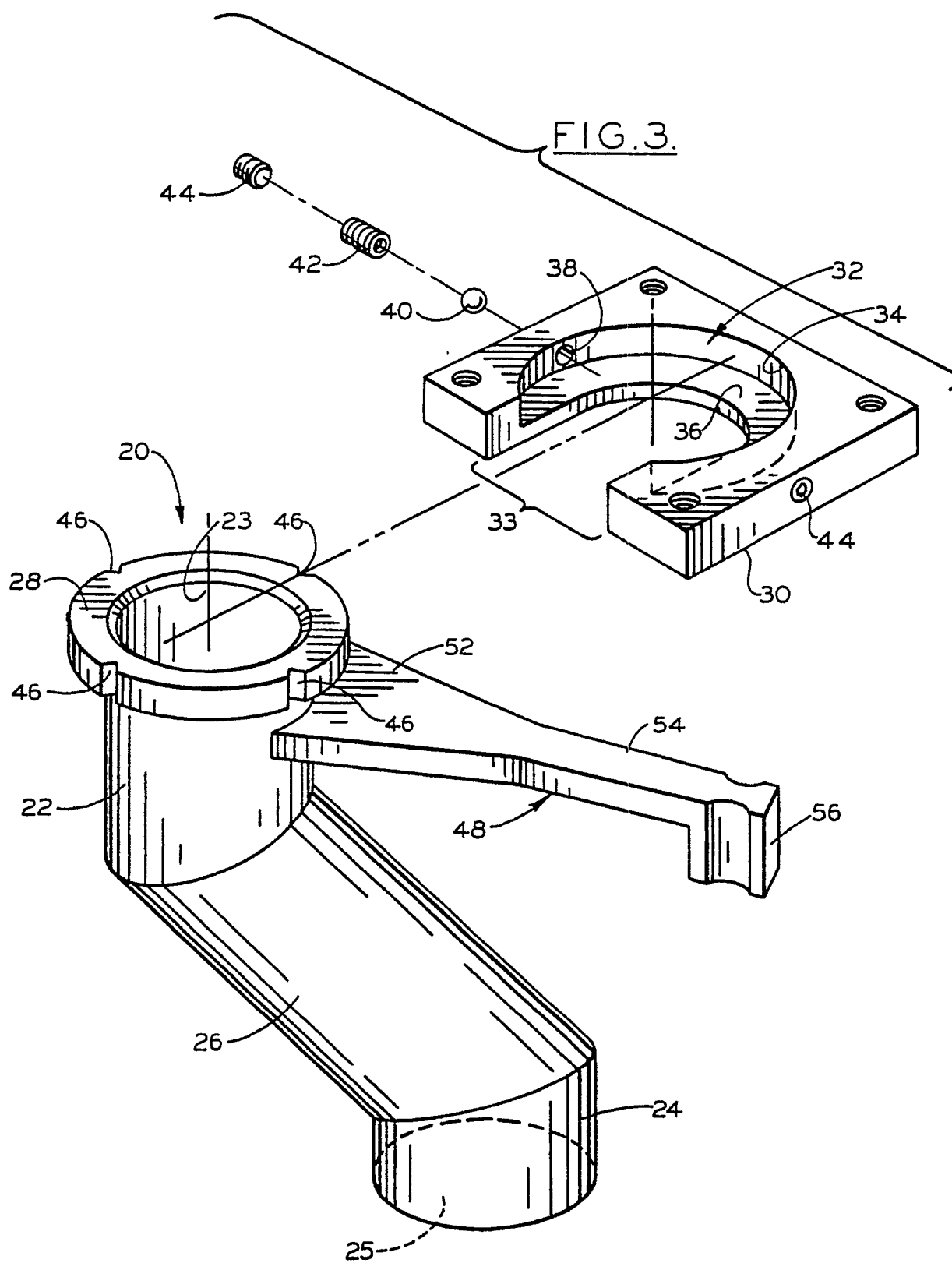


FIG. 4.

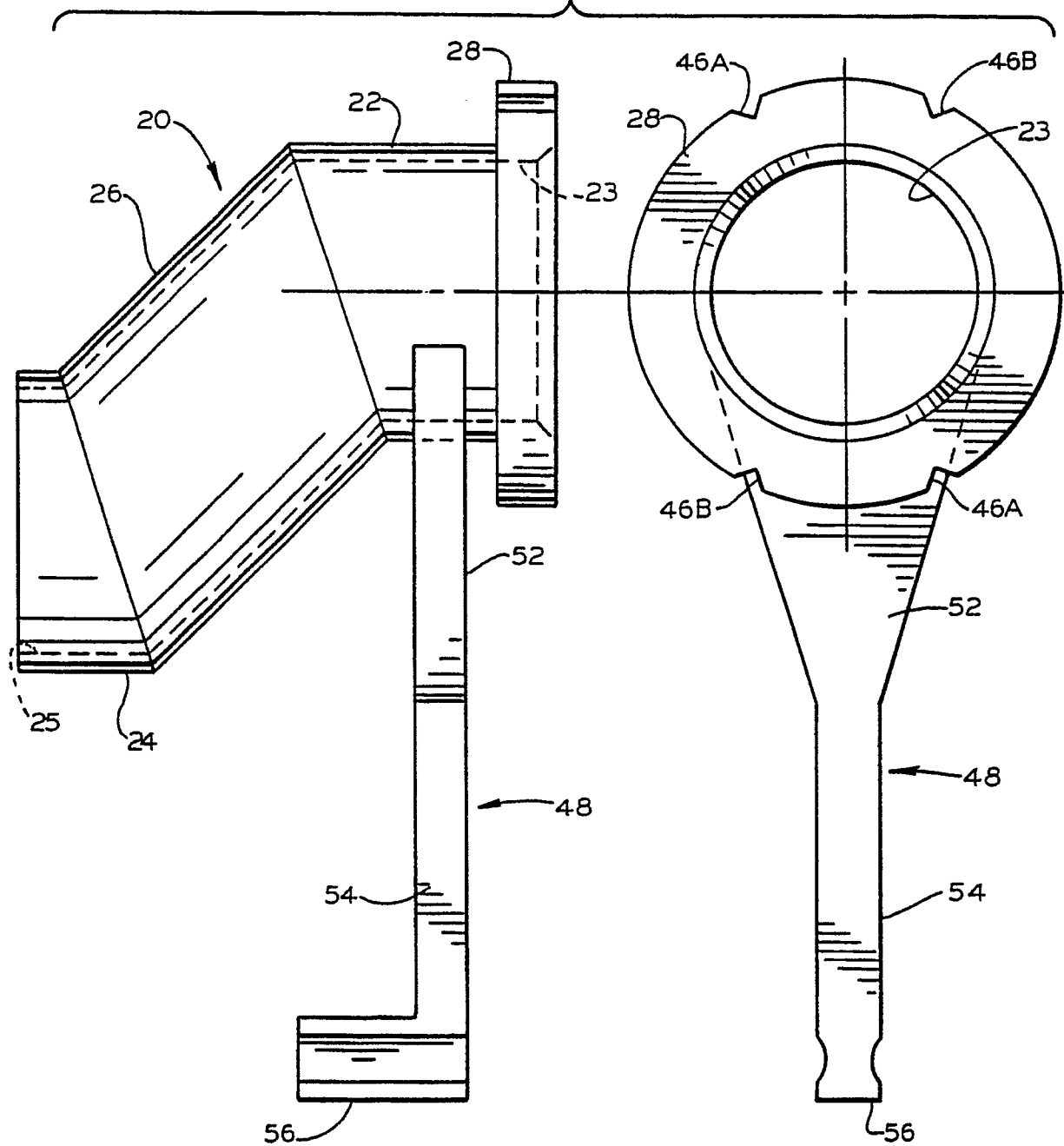


FIG. 5

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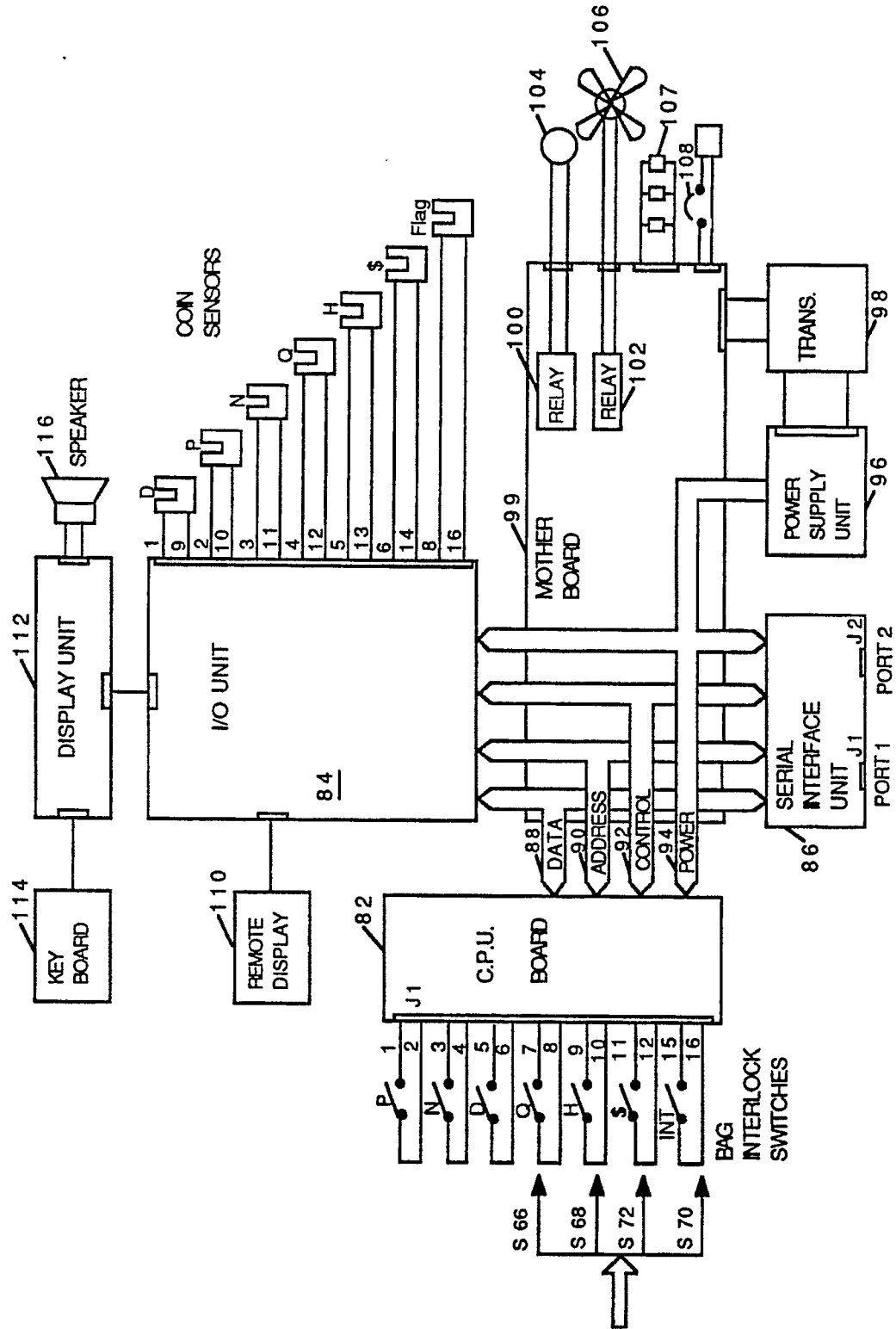


FIG. 6.

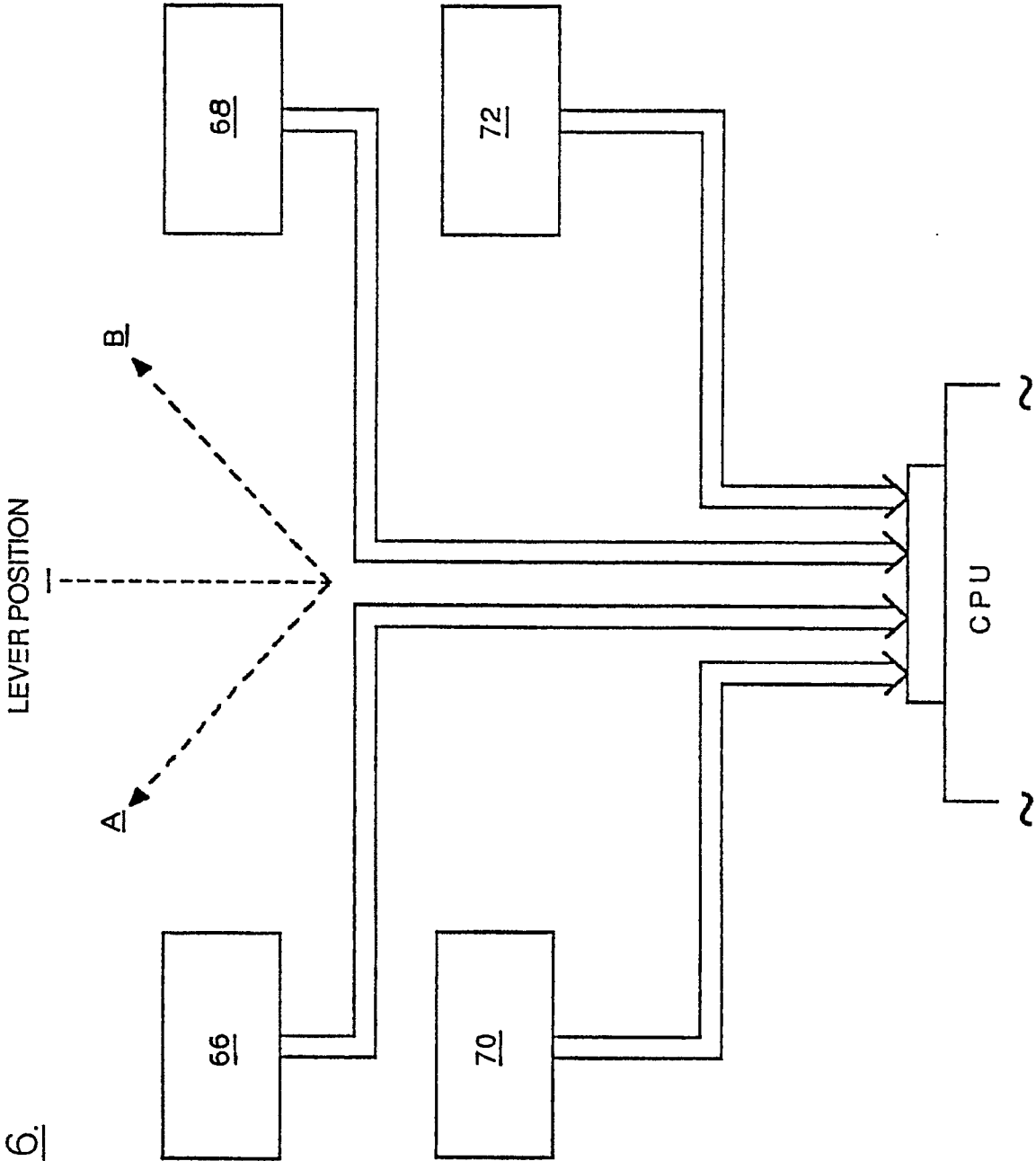


FIG. 7