

March 7, 1944.

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2,343,268

SORTING MACHINE

Filed Aug. 26, 1941

2 Sheets-Sheet 1

FIG. 1.

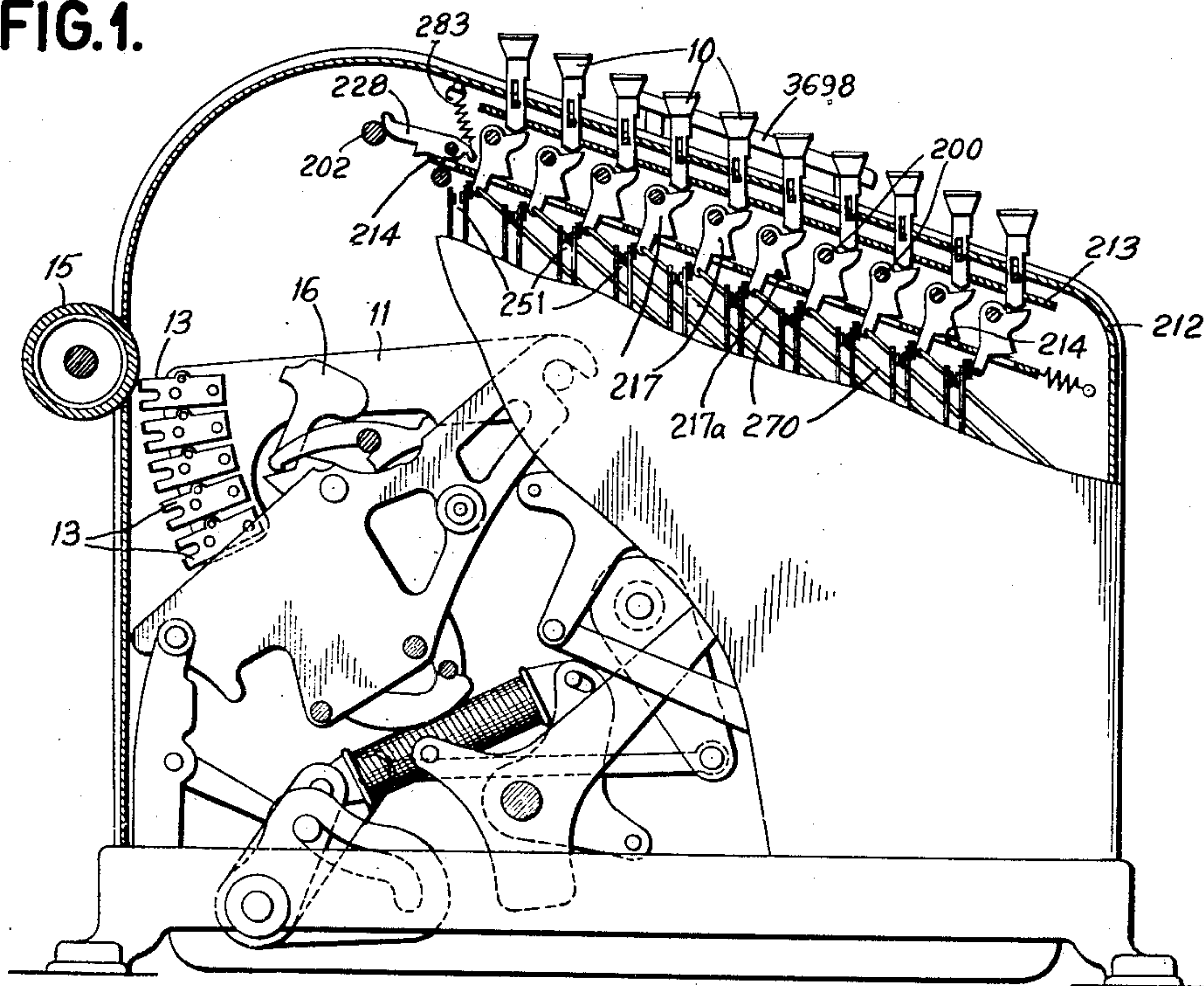
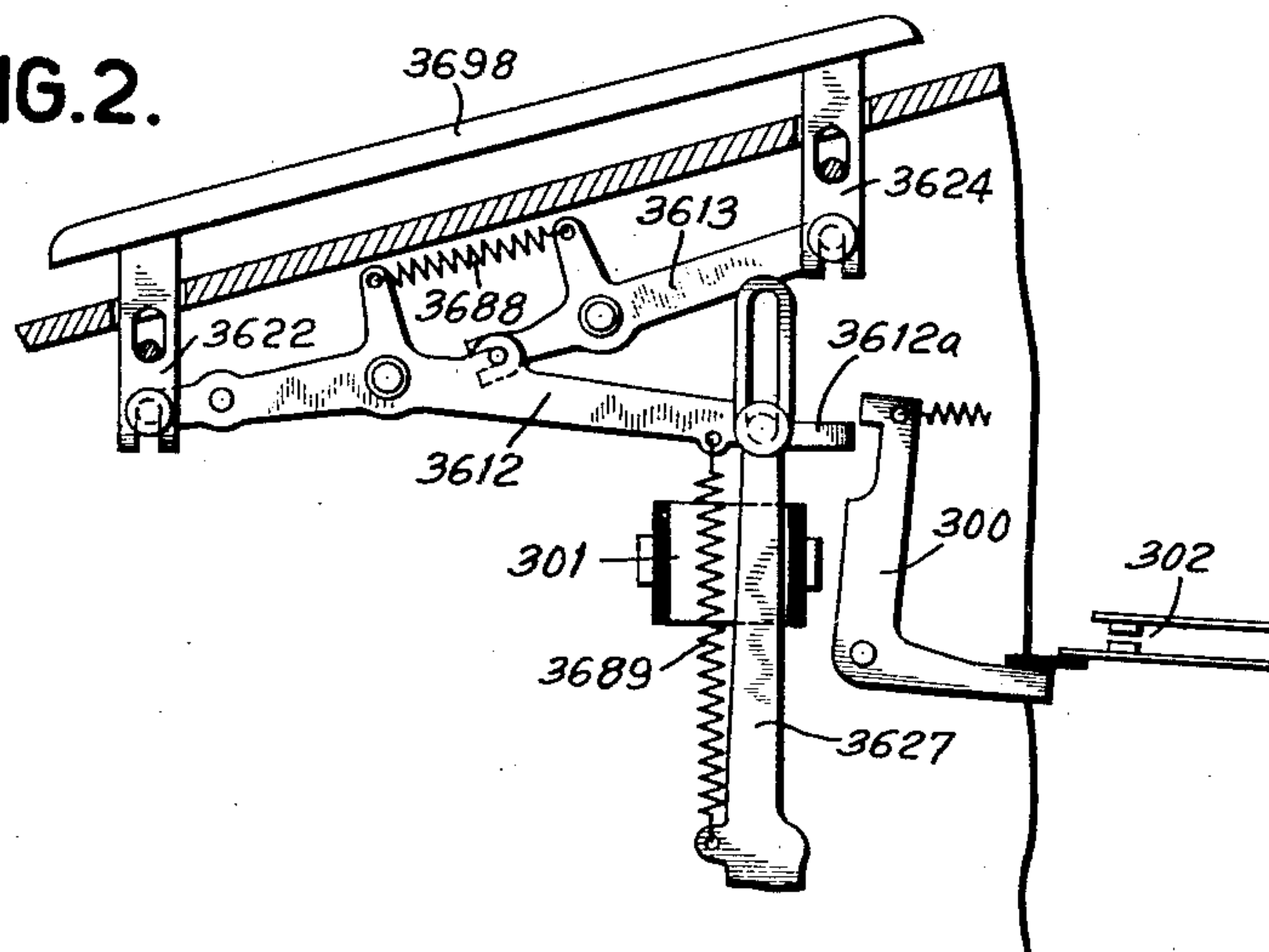


FIG. 2.



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2 Sheets-Sheet 2

FIG.3.

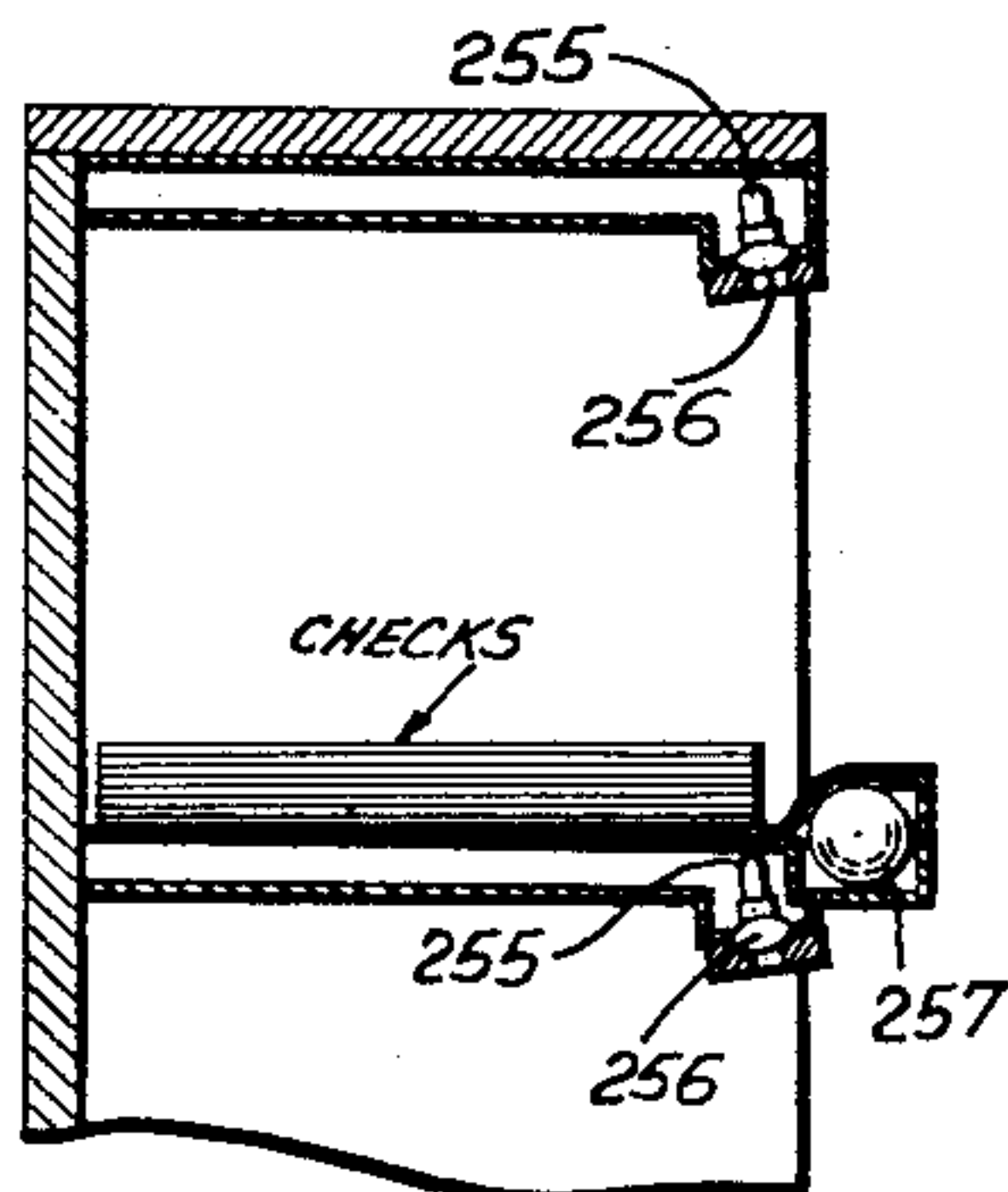


FIG.4.

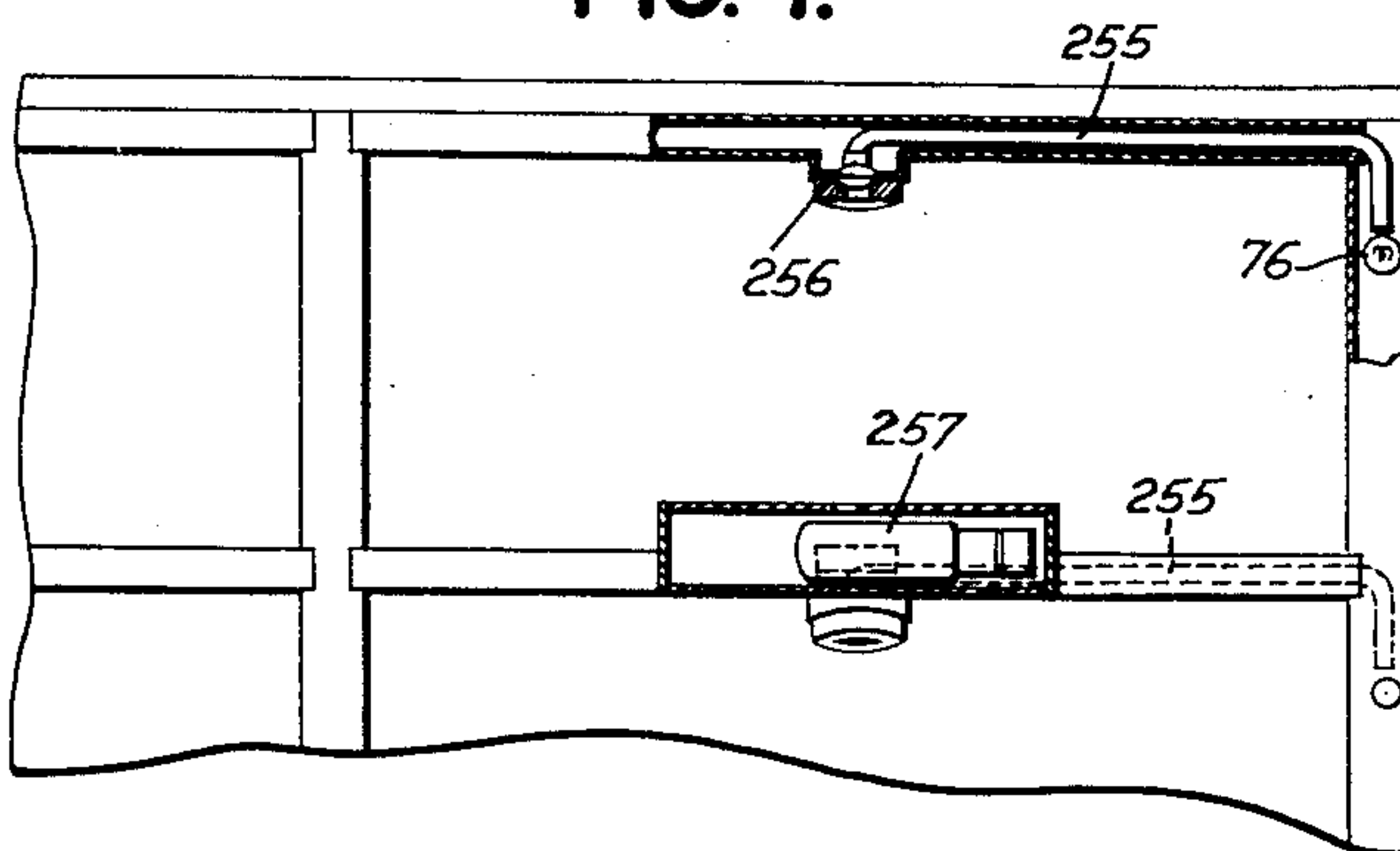


FIG.5.

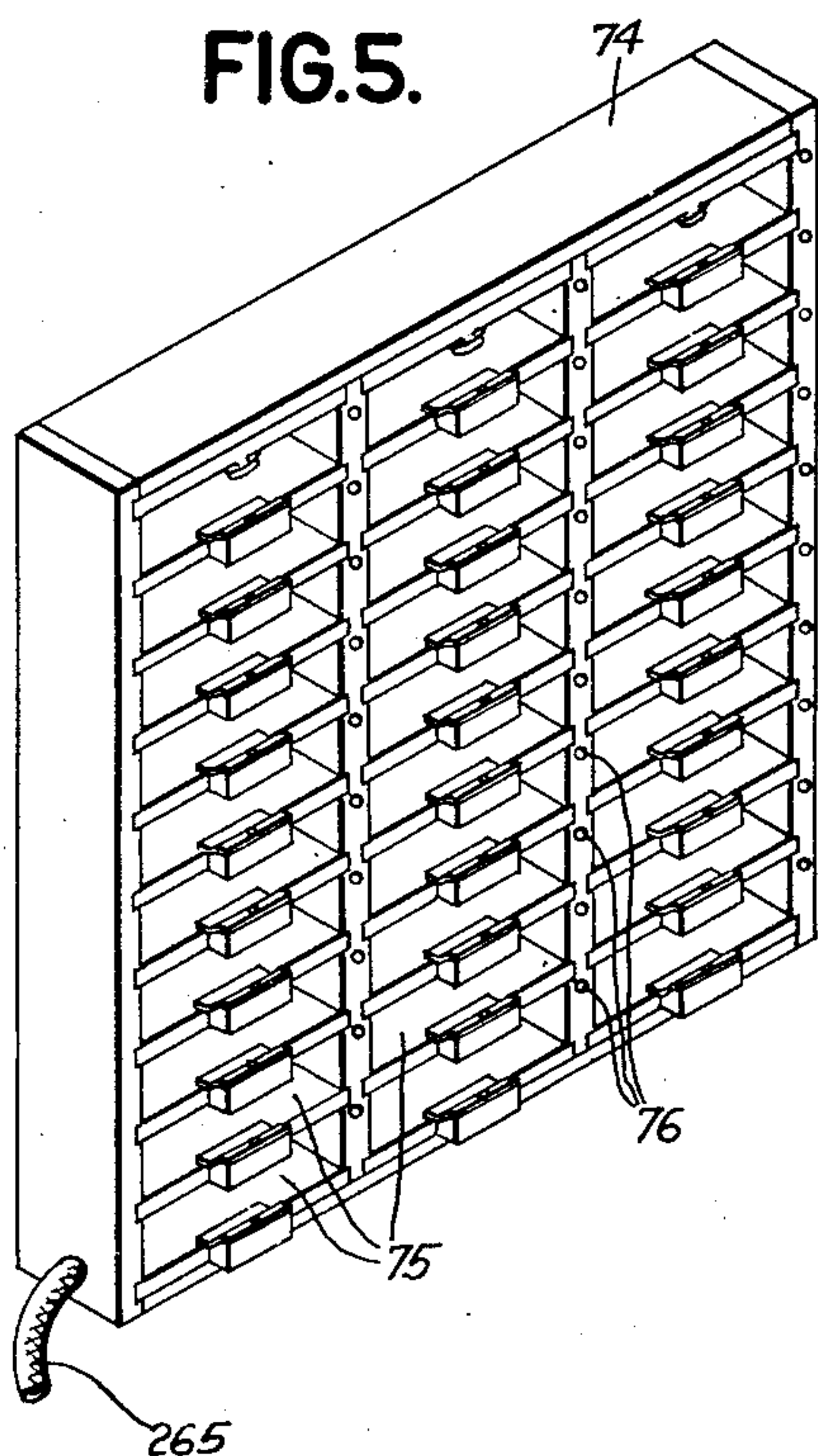
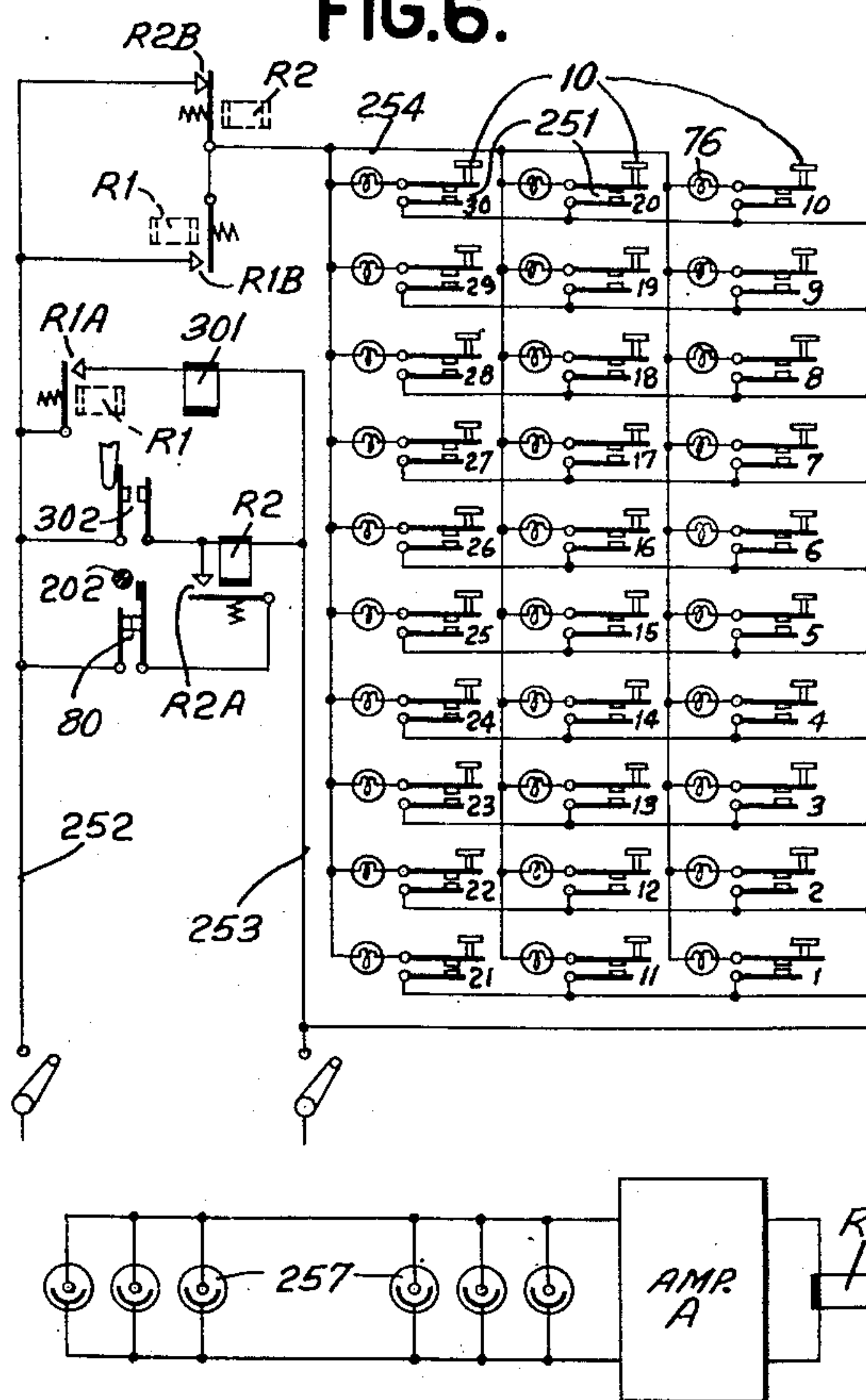


FIG.6.



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## UNITED STATES PATENT OFFICE

2,343,268

## SORTING MACHINE

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Application August 26, 1941, Serial No. 408,339

12 Claims. (Cl. 235—130)

This invention relates to sorting machines and particularly to the type in which sorting of records is performed by hand in accordance with signals which select the sorting compartments.

It is a main object of the present invention to provide means which will increase the accuracy of hand sorting to a measure that will approximate the efficiency obtained from that form of sorting machines which automatically sort records by directing the feeding of the records to selected compartments.

The invention appertains to an arrangement in which classification keys of an adding machine are utilized to select the compartments by lighting signals adjacent the compartments which directs the operator to deposit the records into the indicated compartments. The adding machine is preferably utilized to enable the addition of the amounts represented on the records, especially when such records constitute checks.

In the accounting procedure involving checks or similar records, large batches are sorted and due to fatigue or inattention of the operator, incorrect sorting is liable to occur. The incorrect sorting has produced incorrect records which are valueless in the accounting system, and it is, therefore, a principal object of the invention to provide a sensing means which will apprise the operator when a record has been deposited into the wrong compartment or not at all.

It is a further object of the invention to provide such sensing means of such a nature that the operator will not have to operate any parts for its actuation but will actuate solely by the positioning of a check in the normal manner.

More specifically it is an object of the invention to devise a sensing means which consists of a photocell, the actuation or non-actuation of which senses the interposition of the check in a beam of light falling on the photocell. Such inertialess sensing means operates automatically without any additional operations by the operator and therefore, does not slow up sorting operations.

More specifically it is an object of the invention to provide a photocell sensing arrangement at each sorting compartment which is operative in connection with the signal light customarily provided at that compartment, and to provide a common warning signal which will indicate the correct or incorrect performance of sorting operations.

In the preferred embodiment the warning sig-

nal consists of provision of means to extinguish the signal light at the selected compartment and to release or unlock the motor release bar of the adding machine; although it is obvious that other warning signals may be provided in a variety of forms, according to the desired procedure.

Summarizing, the novel organization to be hereinafter disclosed in detail eliminates the hitherto frequent incorrect sorting operations and insures sorting according to selected signals, and warns of incorrect sorting operations. Such signals, it should be understood, are, in the present embodiment, received from classification keys depressed according to the classification of the record, but in other embodiments which are within the disclosure and spirit of the invention, would enable such signals to be received from classification perforations from the records to be sorted, or the like. The invention, therefore, may be embodied and devised in a variety of forms and the present disclosure should be regarded as illustrative and not restrictive.

Other objects of the invention will be pointed out in the following description and claims and illustrated in the accompanying drawings, which disclose, by way of example, the principle of the invention and the best mode, which has been contemplated, of applying that principle.

In the drawings:

Fig. 1 is a representation of a well known form of adding machine known as the Burroughs type utilized in connection with the present invention, the casing being broken away to show some of the interior parts involved in the present invention.

Fig. 2 is a detail view of the motor release bar devised for the aforementioned adding machine and having shown in connection therewith an electromagnetically controlled locking mechanism.

Fig. 3 is a sectional view of one of the sorting compartments of the sorting box shown in Fig. 5.

Fig. 4 is a view in front elevation of one of the sorting compartments showing the construction of the photocell and associated signal light device.

Fig. 5 is a perspective view of the sorting box in which the operator deposits the checks according to the selection of the compartments therein.

Fig. 6 is an electrical wiring diagram of the machine, the upper portion thereof showing the



lamp and electromagnetically controlled interlock circuits and the lower portion thereof showing the circuit for the photocell amplifier control unit and associated relay.

#### General description of machine

In order that the advantages accruing from the present improvements may be better understood, the general operation of the machine will be outlined, it being assumed that the machine is used in an accounting procedure involving the sorting of checks into a plurality of compartments, and the adding of the amounts represented on the checks.

A plurality of promiscuous checks may represent on the faces thereof a bank or clearing house number and an amount which the operator enters on the keyboard of the adding machine in the regular manner. For instance, if a check bears bank number 18 and is issued for twenty-five dollars and seventy cents, these figures are set up in the keys. The adding machine shown in Fig. 1 is of the Burroughs type, but is shown for illustrative purposes only since other types will do as well. Several banks of keys are provided for the entry of the amounts while several banks of keys 10 are utilized to be set up to represent the classification number. The depression of the classification key numbered 18 will light a signal at compartment number 18, in the example assumed. This indicates to the operator the compartment in which the check should be deposited. The present improvements consist of a photocell controlled interlock which causes the motor release bar to be locked if the operator fails to deposit the check into the selected compartment or not at all and, conversely, if the check is deposited into the selected compartment, the motor release bar will be free for depression, thus enabling the actuation of the adding machine to enter the amount represented on the check.

The preferred arrangement also causes the extinguishing of the light at the selected compartment automatically when the check is deposited into this compartment, thus signifying to the operator that the sorting has been correctly performed. The lamp circuit is broken independently of the keys, and since the classification key is retained depressed, there will be a retained indication of the compartment selected until such key is released in the usual manner at the termination of the cyclic operation of the adding machine.

In the subsequent sections the several parts of the apparatus identified by the headings are described in detail.

#### Motor release bar

The motor release bar and the motor actuated mechanism for the Burroughs type adding machine is of a well known construction and is shown in a number of patents, notably the patents to J. G. Vincent, Nos. 866,750 dated September 24, 1907 and 894,550 dated July 28, 1908. For this reason, the mechanism for effecting the operation of the motor and the operating mechanism of the machine is not shown herein but for a clearer understanding of the invention it should be noted that the cyclic operation of the machine is effected by the depression of a motor release bar 3698 which extends along the right hand side of the keyboard and constitutes the manually controlled starting device when the machine is motor driven. The motor release bar is provided with legs 3622 and 3624 which engage levers

3612 and 3613, respectively, joined together between pivots and normally upheld as to their outer ends with a connecting spring 3688. Lever 3612 extends beyond its point of engagement with the lever 3613 to a bar 3627 with which it has a slot and pin connection. A spring 3689 connects said lever with said bar so that when the motor release bar 3698 is depressed and the rear end of the lever 3612 correspondingly elevated, the bar 3627 will be elevated through the medium of the spring 3689.

The above mentioned parts are similarly designated in the patent to Vincent, No. 894,550 and as further explained in this patent the elevation of the bar 3627 will cause the engagement of the clutch, thereby connecting the motor drive shaft to the operating parts of the machine. It, therefore, should be understood that in the Burroughs type of adding machine the cyclic operation is effected by the depression of the motor release bar 3698, as is also customary with adding machines of other types as well. With the present invention, it is preferable under certain conditions to prevent the depression of the motor release bar 3698 and to this end the lever 3612 is provided with an extension 3612a which is engaged by a locking bell crank 300 when a magnet 301 is energized. Under conditions to be subsequently described, the energization of the magnet 301 will attract the locking bell crank 300, projecting a hooked portion thereof over the extension 3612a, thereby locking the motor release bar 3698. The bell crank 300 will also cause the closure of contacts 302 which have a function to be subsequently described in detail.

#### Keyboard of Burroughs adding machine

As is well known, the Burroughs type adding machine is of the multiple key bank type having a plurality of rows of keys representing different denominations increasing from right to left, each row representing the digits 1 to 9, the "1" keys being arranged at the forward end of the keyboard and the "9" keys at the upward or rearward end thereof.

In the present machine, a plurality of banks of keys are allocated for the entry of the amounts of the checks and such keyboard section will control the entry of amounts in an accumulator as well as printing of such amounts upon a record strip by the usual printing mechanism. Three other rows of keys are allocated for the control of the entry of classification numbers of checks and while such classification numbers may be printed upon the record strip, it is preferable that such amounts are not entered in an accumulator. Three rows of keys having ten keys each are provided for entry of classification numbers 1-30 as is obvious from the wiring diagram in Fig. 6, and one row of such keys is shown in detail in Fig. 1 of the drawings.

The construction of the keyboard shown in Fig. 1 is identical to that disclosed in the patent to H. L. Fisher, 899,965, dated September 29, 1908 but in order to more clearly understand the present invention, the description of the construction of the keyboard is repeated herein utilizing the same reference numerals.

The stems of the number keys 10 pass through suitable openings or slots in the keyboard plates 212 and 213 and are arranged to cooperate with a series of bell cranks 217 pivotally mounted upon the transverse rods 200. These bell cranks are operatively connected with a series of stop rods 270, whose forward ends control the setting of



printing segments 11 in the usual and well known manner. The latter bring their type 13 to a platen 15 and printing hammers 16 are used to effect the printing impressions. Each row of keys is provided with a sliding bar or strip 214, with which the bell cranks cooperate in such manner that when one key in the row of keys is operated, such bar is moved rearwardly from the position indicated in Fig. 1. When the bar has been moved rearwardly, as stated, it is retained in such shifted position by means of the pawl 228, which is spring-pressed by means of the spring 283, towards a position of engagement. It will be understood that after the bar 214 has been shifted rearwardly, by the depression of any one key in the row of keys, all the other bell cranks and keys are locked against depression, inasmuch as the solid part of the bar is brought below the shoulders 217<sup>a</sup> of the bell cranks. In the regular operation of a Burroughs machine, the sliding bar or bars 214 which may have been operated in the listing and printing of an amount or item, are released by the forward swinging of the transverse rod 202, which rocking thereof causes a movement of the pawls 228 in a clockwise direction and the consequent release and restoration of the bars 214.

In the present machine, the bell cranks 217 of the rows of classification keys engage one blade of contacts 251 and it will be understood that the contacts are mounted intermediate the keyboard sections. It will be further understood that when a key is depressed, it is latched in depressed position and accordingly its related contacts 251 will also be latched until the depressed keys are released at the end of the operation of the machine.

#### *Sorting compartments and selecting means therefor*

As previously stated, the checks are of different classifications representing the different banks upon which the checks are drawn and in the accounting procedure, it is necessary that these checks be hand sorted and to provide for this, there is provided a box 74 having a plurality of sorting compartments 75 and a number of lamps or lights 76, one for each compartment. The arrangement is such that when a classification key is depressed, the light at the related compartment will be illuminated to indicate to the operator that the check involved in the entry should be deposited into this compartment.

Referring to the wiring diagram in Fig. 6, reference numerals 252 and 253 represent the lines of the power supply, it being noted that the line 253 is connected to one side of all the contacts 251 associated with the three banks of classification keys. From the other side of each of the contacts 251, there is a wire connection to a related light 76, all of the lights 76 having a common wire connection 254 to relay contacts R2B, the other side of such relay contacts being connected to the line side 252. Obviously, from this simple circuit connection, the depression of any of the classification keys will close its related contacts 251 so as to illuminate the associated light 76. Since the classification key is held latched, contacts 251 will be retained closed so as to continue the illumination of the light at the sorting compartment which is to receive the check.

The sorting box 74 is preferably located at the right side of the adding machine so that the sorting compartments are in convenient access to the operator. The wire connection from the different

lights 76 to the contacts 251 in the adding machine may be effected by wires in a cable 265.

#### *Photocell controlled interlock.*

The present improvements incorporate a photocell controlled interlock which will, when the check has been deposited into the selected compartment, enable the normal operation and conversely warn the operator whenever the check has been deposited in the incorrect compartment, or not at all.

Preferably this interlock is controlled by the actuation and non-actuation of a photocell, the latter being conditioned according to the interruption of a beam of light impinging on the photocell from the signal light 76. This form of control operates, therefore, without requiring the actuation or tripping of any of the parts by the operator and, therefore, does not slow up sorting operations.

The photocell arrangement is shown in Figs. 3 and 4 for a single compartment, it being understood that the arrangement is duplicated for each of the sorting compartments. It will be noted that the signal light 76 for the compartment shown, and each of the other compartments as well, has associated therewith a rod 255 which is constructed of a material known as Lucite, the properties of which are such as to be capable of conducting and directing light rays, the rays following the contour of the rod so that the light rays may impinge upon one end and emanate from another. Accordingly, the illumination of the light 76 impinges on the Lucite rod 255 and follows its contour so that the light rays emanating at the end pass through a lens 256 to be converted into a beam to impinge upon the photocell 257. The photocell 257 may be of any suitable construction and as is well known, is affected by variation in light rays so that it may or may not pass current in a circuit depending upon whether the light rays fall upon the photocell or not. Such electrical properties are taken advantage of in the present arrangement to control the interlock which will subsequently be described in detail.

It will be noted from Figs. 3 and 4 that the light rays are directed from the top of a sorting compartment and fall upon the photocell located beneath. When the operator places a check in the compartment, the light beam is interrupted. From Fig. 3, it will be noted that the sorted checks are placed behind the photocell and far enough rearwardly so as to not affect the light rays except by the interposition of the sorted check. From the wiring diagram in the lower part of Fig. 6 it will be noted that the photocells 257 are connected in multiple and they are suitably connected to an amplifier A, the amplified current of which is utilized to energize a relay R1. Normally, the relay R1 is deenergized but whenever light rays fall upon one of the photocells 257, the affected photocell will pass current which is amplified by the amplifier A and accordingly energize the relay R1. The photocells 257 are in shunt or cascade so that any of them may control the energization of the relay R1, it being obvious that only one of such photocells is affected at one time. The photocell circuits and interconnecting amplifier are not shown in detail since they are well known and many forms thereof are in commercial use and well known in the art to which this part of the arrangement appertains.

It will be recalled, upon the depression of one



of the classification keys, the associated light 76 will be illuminated and the circuit for the light passes through relay contacts R2B which are normally closed. The light related to the selected compartment will accordingly in the manner just described cause its light rays directed through the Lucite rod 255 to impinge on the photocell 257, illuminating the latter so that it will pass current and the amplified current will energize the relay R1 to close its contacts R1A and R1B. Contacts R1B are also in the lamp circuits since they are in shunt with the contacts R2B, the closure of contacts R1B at this time having no effect. The closure of contacts R1A will energize the lock magnet 301 which will rock the locking bell crank 300 to engage extension 3612a (Fig. 2) to lock the motor release bar 3698. It should also be pointed out that the energization of the magnet 301 will close contacts 302 to cause the energization of a relay R2, the closure of its stick contacts R2A providing a stick circuit from the line 253 through the relay coil R2, its stick contacts R2A and back to the line 252 through contacts 80. The energization of the relay R2 will, of course, open its contacts R2B but since the relay contacts R1B are now closed, there will be no change in the lamp circuits, and the signal light 76 will remain illuminated. Therefore, if the operator attempts to depress the motor release bar without depositing the check into the selected compartment, a warning signal comprising the maintained locking of the motor release bar will be given to the operator.

Upon the insertion of the check in the selected compartment corresponding to the one in which the signal light 76 was illuminated, the breaking of the beam of light by the interposed check will affect the condition of the photocell so that the current energizing the relay R1 will decrease or even fall to zero to deenergize relay R1. The deenergization of relay R1 will enable its contacts R1A and R1B to open. The opening of contacts R1A will deenergize the magnet 301 to unlock the motor release bar 3698 and the opening of contacts R1B will open the lamp circuit for the selected light 76 and the photocell, therefore, will remain darkened and thereby the continued deenergization of the relay R1 will enable contacts R1A to remain open, and therefore, the locking magnet 301 deenergized. The operator is now able to depress the motor release bar 3698 at any time so as to effect the entry and recording operations in the adding machine of the sorted check.

From the preceding description, it will be recalled that the shaft 202 is actuated at the end of the operation of the adding machine to release the depressed keys. The rod 202 is utilized to open the contacts 80 at the termination of the operation of the adding machine to open the stick circuit of the relay R2. Contacts R2B will now shift to normal closed condition, thereby reconditioning the lamp circuits to normal for subsequent compartment selection.

While there has been shown and described and pointed out the fundamental novel features of the invention as applied to a single modification, it will be understood that various omissions and substitutions and changes in the form and details of the device illustrated and in its operation may be made by those skilled in the art without departing from the spirit of the invention. It is the intention, therefore, to be limited only as indicated by the scope of the following claims.

What is claimed is:

1. In a machine for checking the accuracy of the sorting of classified records, the combination of a plurality of sorting compartments, signal lights disposed at said compartments, means for causing said signal lights to be selectively illuminated in accordance with the classification of the records, and a plurality of photo sensitive cells selectively energized by the light beams emitted from the related signal light, and conditioned differently by the interposition of a record in the light beam as the record is moved to be positioned in the compartment selected by the effective signal light.
2. In a machine for checking the accuracy of the sorting of classified records, the combination of a plurality of sorting compartments, a plurality of photo sensitive cells, one disposed at each of said compartments, means to select, in accordance with the classification of the records, said photocells for energization by light beams emitted from a source of light, the selected photocell being conditioned differently by the interposition of a record in the light beam as the record is positioned in the compartment selected by the effective photocell, and means controlled by each of said photosensitive cells when conditioned differently for indicating the correct sorting of the record.
3. In a machine for checking the accuracy of the sorting of classified records, the combination of a plurality of sorting compartments, signal lights disposed at each of said compartments and selectively illuminated in accordance with the classification of the records, a plurality of photo sensitive cells selectively energized by the light beams emitted from the related signal light, and conditioned differently by the interposition of a record in the light beam as the record is positioned in the compartment selected by the effective signal light, and means controlled by each of said photo sensitive cells when conditioned differently for indicating the correct sorting of the record.
4. In a machine for checking the accuracy of the sorting of classified records, the combination of a plurality of sorting compartments, signal lights disposed at each of said compartments, means comprising keys for causing said signal lights to be selectively illuminated in accordance with the classification of the records, a plurality of photo sensitive cells selectively energized by the light beams emitted from the related signal light, and conditioned differently by the interposition of a record in the light beam when the record is positioned in the compartment selected by the effective signal light, and means controlled by each of said photo sensitive cells when conditioned differently for extinguishing the selected signal light independently of said keys.
5. In a machine for checking the accuracy of sorted records, the combination of a plurality of sorting compartments, signal lights disposed at the compartments, means for selectively illuminating the signal lights according to the classification of the records, a plurality of photo sensitive cells disposed at the compartments, each conditioned for effective operation by the beam of light received from the associated effective signal light, and differently conditioned by the interposition of a record in the beam of light from the selected signal light as the record is inserted in the associated compartment, and means rendered effective when a photo cell is



differentially conditioned for extinguishing the illuminated signal light.

6. A machine for checking the accuracy of sorted records comprising a plurality of sorting compartments, a plurality of selectively illuminated signal lights, a plurality of photo sensitive cells at said compartments and selectively energized by the beam of light transmitted by the associated illuminated signal light, but differently conditioned by the interposition of a record in the beam of light as the record is inserted in the associated compartment, a relay, means to control the energization of said relay by the effective photocell as it is energized or differently conditioned, a plurality of keys operated in accordance with the classification of the record sorted, circuits controlled by said keys for causing the selective illumination of said signal lights, and means controlled by said relay when the effective photocell is differently conditioned to break the circuit of the illuminated signal to extinguish the signal when the record is inserted in the selected compartment and thereby indicate the correctness of the sorting operation.

7. In a device for checking the accuracy of sorting records and controlling item entry operations of a coordinated entry machine, said entry machine including an instrumentality which, when locked, prevents such item entry operations, the combination of a plurality of sorting compartments, a corresponding number of classification keys allocated for the selection of compartments, a plurality of photocells, one for each sorting compartment and disposed at said compartments, means to effect the selective energization of the photocells under control of said classification keys by light beams falling on the photocell, each energized photocell being differently conditioned by a record when the record is inserted in the associated compartment to intercept the light beam falling on the photocell, means for locking said instrumentality, and means controlled by said photocells when energized to cause said locking means to lock said instrumentality and for disabling said locking means to release said instrumentality when the selected photocell is differently conditioned upon insertion of the record in the selected compartment.

8. In a sorting machine for checking the accuracy of the sorting of records and for determining item entry operations of a machine coordinated with said sorting machine, said item entry machine comprising keys manually operated to represent data on a record and including a motor release bar operated to effect item entries in said machine according to the operated keys, the combination of a plurality of sorting compartments, a plurality of photocells, one for each sorting compartment and disposed at said compartments, key controlled means each of which is operated in accordance with the classification of the record for selecting the related photocell for energization by light beams falling on the photocell, each energized photocell being differently conditioned by the record involved when the latter is inserted in the sorting compartment to intercept the light beam falling on the selected photocell, means for locking said motor release bar, and means controlled by said photocells when energized for causing said locking means to lock said motor release bar and to disable said locking means to release said motor release bar when the selected photocell is differently conditioned

upon insertion of the record in the selected compartment.

9. In a machine for controlling the sorting of records, the combination of a plurality of sorting compartments, a corresponding number of photocells, one for each sorting compartment, means to support said photocells at said compartments so that a light beam falling on the photocell to energize the latter can be intercepted by a record, a plurality of compartment selecting means allocated for the selection of the compartments and said photocells, and means controlled by the compartment selecting means for effecting the selective energization of the photocells in accordance with the compartment selected, each photocell after having been energized being conditioned differently by the interception of the light beam falling on the energized photocell by the interposition of a record between the energized photocell and the light beam associated with the compartment selected by the compartment selecting means.

10. In a sorting machine for checking the accuracy of the sorting of records and for determining item entry operations of a machine coordinated with said sorting machine, said item entry machine comprising keys manually operated to represent data on a record and including a motor release bar operated to effect item entries in said item entry machine according to the operated keys, the combination of a plurality of sorting compartments, a plurality of photocells, one for each sorting compartment and disposed at said compartments, key controlled means, each of which is operated in accordance with the classification of the record for selecting the related photocell for energization by light beams falling on the photocell, each energized photocell being differently conditioned by the interposition of the record in the light beam when the record is inserted in the sorting compartment associated with the energized photocell, locking means for said motor release bar, and means controlled by said photocells when energized to cause said locking means to lock said motor release bar, and to disable said locking means to release said motor release bar when the selected photocell is differently conditioned upon insertion of the record in the selected compartment.

11. In a sorting machine for checking the accuracy of the sorting of records and for determining item entry operations of the machine coordinated with said sorting machine, said item entry machine comprising sorting control keys and other keys manually operated to represent data on a record and including a motor release bar operated to effect item entries in said item entry machine according to the keys operated, the combination of a plurality of sorting compartments, a plurality of photocells, one for each sorting compartment and disposed at said compartments, means controlled by each of said sorting control keys which are operated in accordance with the classification of the records to select the related photocell for energization by light beams falling on the photocell, each energized photocell being differently conditioned by the interposition of the record in the light beam when the record is inserted in a sorting compartment associated with the selected photocell, locking means for said motor release bar, and means controlled by said photocells when energized to cause said locking means to lock said motor release bar, and to disable said locking means to unlock said motor release bar when the selected photocell is differ-



ently conditioned upon insertion of the record in the selected compartment.

12. A sorting machine for checking the accuracy of the sorting of records and for determining item entry operations of a machine coordinated with said sorting machine, said item entry machine comprising sorting control keys, and other keys manually operated to represent data on a record and including a motor release bar operated to effect item entries in said item entry machine according to the keys operated, the combination of a plurality of sorting compartments, a plurality of photocells, one for each sorting compartment and disposed at said compartments, a plurality of signal lights, each associated with the related photocell, means controlled by said sorting control keys which are operated in accordance with the classification

of the record to cause the selective illumination of the signal lights to cause the selective energization of the related photocell by a beam of light received from the associated illuminated signal light, said energized photocell being differently conditioned when the beam of light is interrupted by the record inserted in the compartment associated with the illuminated signal light, locking means for said motor release bar, and means controlled by said photocells when energized to cause said locking means to lock said motor release bar, and for disabling said locking means to unlock said motor release bar and for extinguishing the illuminated signal light when the selected photocell is differently conditioned upon insertion of the record in the selected compartment.

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