Oct. 25, 1960 W. A. PATZER 2,957,387

TEST DEVICE FOR PRINTED PAPERS AND ELEMENTS OF SAME

Filed May 2, 1958 4 Sheets-Sheet 1

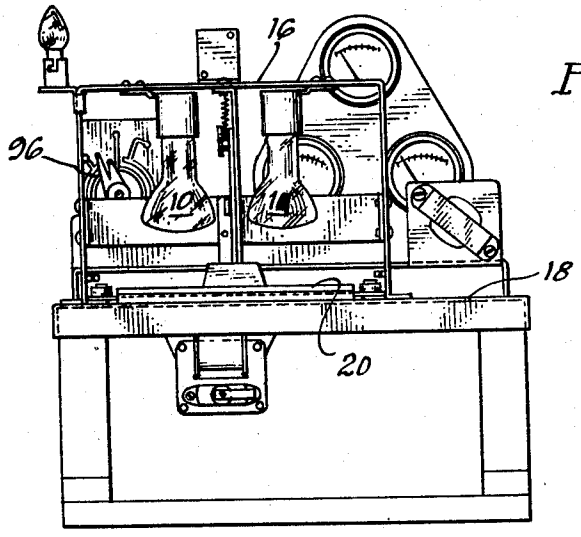
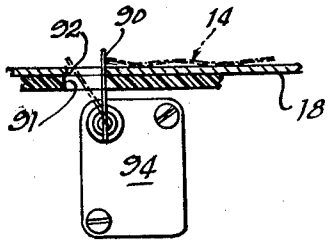


FIG. 1

FIG. 5



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TEST DEVICE FOR PRINTED PAPERS AND ELEMENTS OF SAME

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FIG. 2

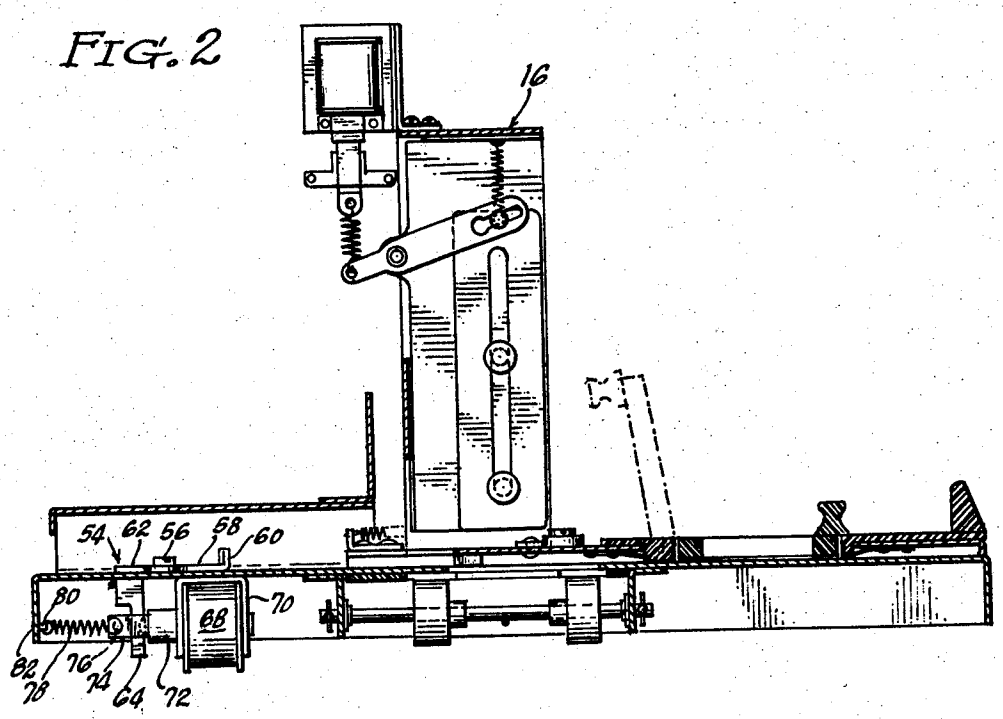
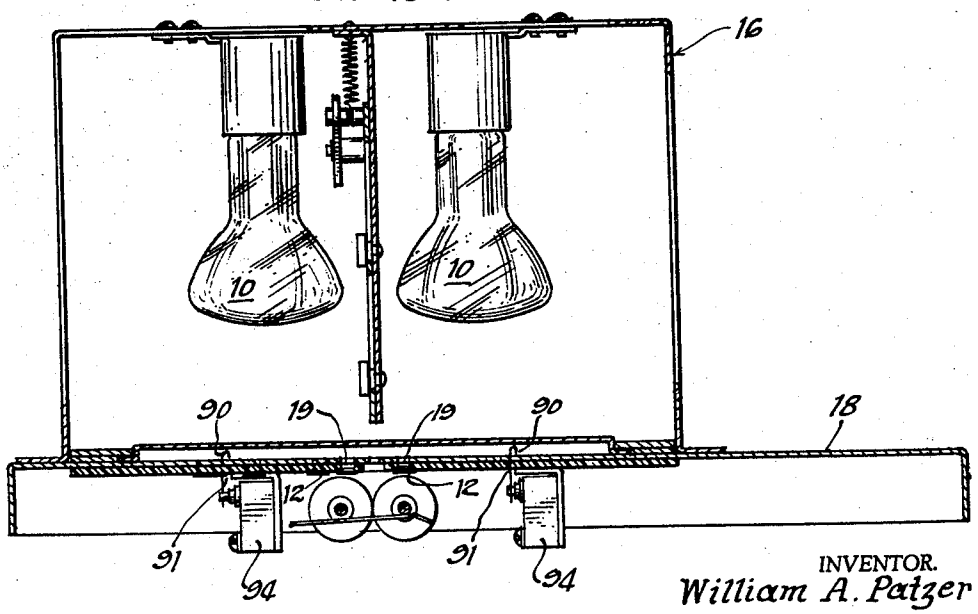


FIG. 4



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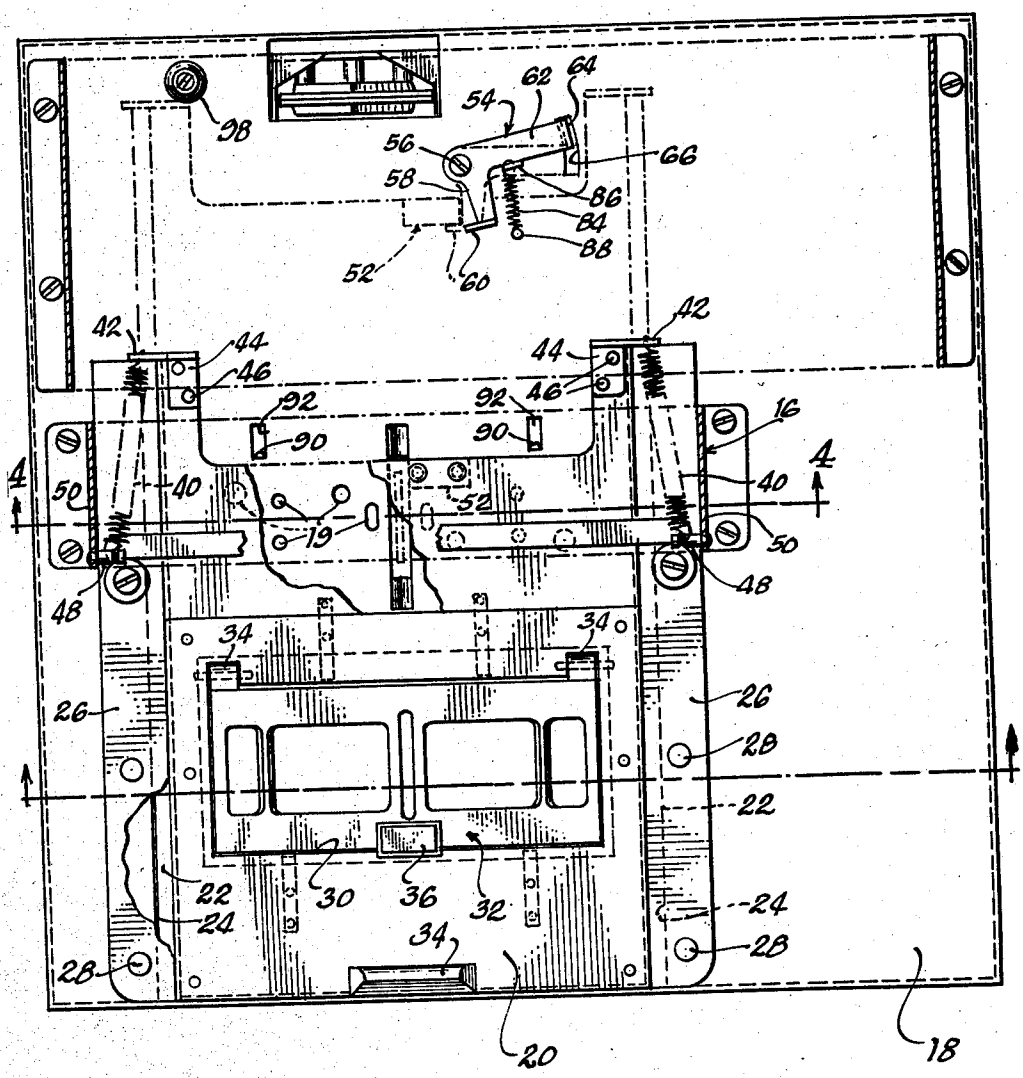
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TEST DEVICE FOR PRINTED PAPERS AND ELEMENTS OF SAME

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FIG. 3



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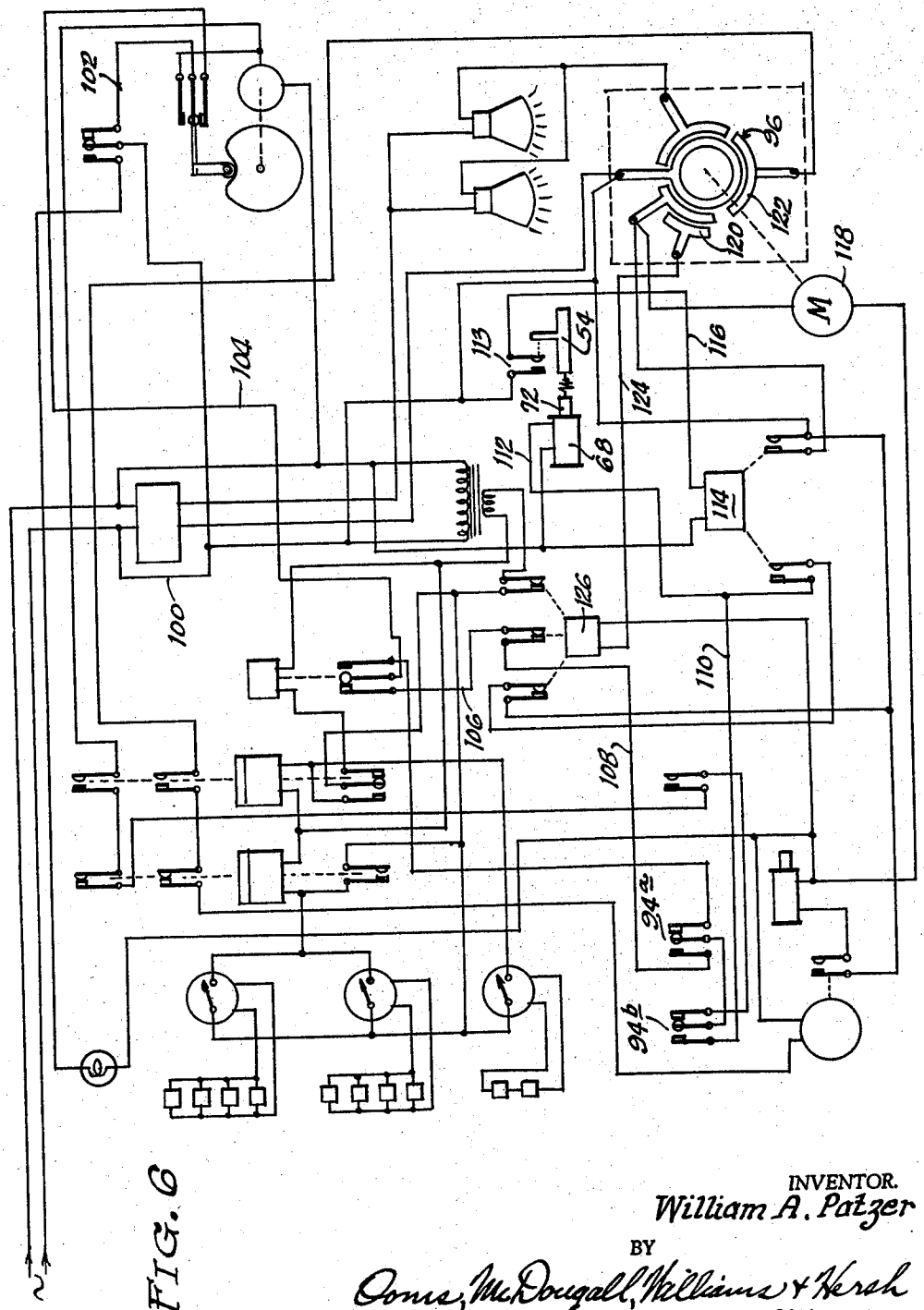


FIG. 6

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2,957,387

TEST DEVICE FOR PRINTED PAPERS AND ELEMENTS OF SAME

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Filed May 2, 1958, Ser. No. 732,672

12 Claims. (Cl. 88—14)

This invention relates generally to a device for the examination of paper, currency or the like structures having indicia or other configurations written or imprinted on the surfaces thereof to effect a separation based upon the indicia, imprint or configuration, and it relates more particularly to a device for the selection of currency to effect a separation as between currency of one denomination from other denominations or as between a legitimate piece of currency from an illegitimate or counterfeit.

As used herein, the term "paper" or "currency" is meant to refer to paper, plastic, board, metal and the like sheets or films cut to a predetermined dimension and provided with certain configurations or designs imprinted or otherwise embodied in or on the surface whereby one paper can be separated from another such as in currency of various denominations in the United States or countries foreign to the United States, or as in bank checks wherein the separation can be made from the standpoint of the payee, payor, or the amount of the check, or as in tickets or stubs for amusement, sale, purchase or the like.

In a device of the type described, it is contemplated that the paper or currency will be received in one position readily accessible to the user of the machine for displacement to another position, preferably out of reach of the user, wherein the test or tests will be effected to determine whether the paper or currency is acceptable or not. If acceptable, means are provided to effect the removal of the paper or currency while still out of reach by the user. If unacceptable, means are provided for return of the paper or currency for removal by the user. It will be apparent that the device depends upon the retention of the paper or currency out of reach by the user and in test position for a time long enough to complete the test or tests, and to enable removal of the paper or currency by the machine in the event that the paper or currency is found to be acceptable.

Thus it is an object of this invention to produce a device of the type described embodying a new and novel means for controlling the movement of the paper or currency to and from test position, and it is a related object to produce a device of the type described which operates to hold the paper or currency in test position for a period of time sufficient to complete the various tests and operations thereon.

Another object is to produce a device of the type described embodying a means for testing whether a paper or currency of the proper character is being advanced to test position and means responsive thereto for holding the paper or currency in test position until a proper sequence of tests has been completed, and it is a related object to provide a means for determining whether a paper or currency of the proper dimension is advanced for testing and to provide means responsive thereto for initiating the cycle of tests and treatment applied thereto.

A further object of this invention is to produce a device of the type described which is simple in construction and easy in operation; which is adapted for use with various systems for testing; which is adapted for use with various materials to be tested, including elements formed of paper, plastics, wood, metal or other relatively thin or thick sheet stock having some indicia or configurations written, imprinted, or otherwise incorporated therein or thereon.

These and other objects and advantages of this invention will hereinafter appear and for purposes of illustration, but not of limitation, an embodiment of the invention is shown in the accompanying drawings, in which—

Figure 1 is an elevational plan view of the interior portion of a device embodying the features of this invention;

Figure 2 is a sectional elevational view taken lengthwise through the device, with portions omitted for a better showing of the arrangement of parts embodying the features of this invention;

Figure 3 is a top plan view partially in section of the device shown in Figure 1, with portions broken away to illustrate the construction thereof;

Figure 4 is a sectional view taken substantially along the line 4—4 of Figure 3;

Figure 5 is a sectional elevational view of the feeler means for determining the presence of a paper proper for testing, and

Figure 6 is an electrical diagram employed with the device shown in Figure 1.

Description will hereinafter be made with reference to a device which operates on the basis of light transmission through selected areas of the paper or currency to effect the separation of one paper from another, as defined in my copending application Serial No. 676,527, filed August 6, 1957. It will be understood that the concepts forming the subject matter of this invention will have application to devices embodying other means for testing, as by systems based upon reflection, photographic comparison, thread count, color, chemical or physical analysis or the like, or combinations thereof.

Referring now to the drawings, the device represented embodies a light source in the form of bulbs **10** in a test position and light-responsive cells **12** spaced from the light source and arranged in predetermined pattern of positions to underlie selected areas of the paper or currency **14** when the latter is advanced to test position, with the light source **10** on one side and the light-responsive cells **12** on the other underlying the preselected areas of the paper or currency.

The test area is adapted to be enclosed within a housing **16** to prevent access to the paper or currency while it is being tested. The paper or currency is adapted to be received outside the housing where free access can be made available for the placement of the paper or currency into a position for advancement into the housing to the test position. For this purpose, the device is provided with a flat table **18** which extends continuously from a distance outside the housing to a distance beyond the test area. The table, which is spaced from the light source, is provided with openings **19** in the test section corresponding to the positions of the light-responsive cells to enable the light transmitted through the paper or currency to strike the cells for effecting a corresponding response.

In the illustrated modification, the paper or currency **14** is displaced from receiving position outside of the housing to test position by means of a slide plate **20** having its lateral edges **22** slidably received within the channel grooves **24** of elongate guide strips **26** secured by screws **28** to the upper surface of the table **18** in the desired spaced apart relation. The slide plate or drawer **20** is provided with an opening **30** dimensioned to receive

the paper or currency in loosely fitting relation therein when arranged to lie flatwise in the opening, and the paper or currency is urged to rest in the base of the opening by a weighting means displaceable into and out of the opening, as represented by a door **32** dimensioned to be received in the opening and which is hingedly mounted, as at **34'**, along one of its edges for rocking movement between a lowered position into the opening and a raised position outside of the opening. The opening **30** in which the paper or currency is received is adapted to be positioned outside of the housing when the slide plate **20** is in retracted or normal position and in the test area when the slide plate is in operated or displaced position. The movement of both the door and the slide plate can be made automatic, or abutments **34'** and **36** can be provided on the slide plate and door respectively for manual actuation.

Description will hereinafter be made of the means for holding the paper or currency in test position and the means to which such holding or latching means is responsive so as to effect operation only when a paper or currency of the proper characteristics is being advanced into position for testing, and for return of the slide plate upon completion of the test or upon failure to make the test, or upon cessation of the actuation of the slide plate at a point short of the test position.

Referring now to Figures 2 and 3, means are provided constantly to urge the slide plate toward normal position, shown by solid lines in Figure 3. Such resilient means comprises coil springs **40**, each of which is anchored at one end to arms **42** extending laterally from brackets **44** secured, as by screws **46**, to the lateral edge portions of the rearward end of the slide plate. The other end of each of the springs **40** is secured onto a stud **48** fixed to the stationary wall **50** of the housing **16** at a point rearwardly of the brackets when the slide plate is both in the retracted and operated position. Thus, displacement of the slide plate to actuated position, shown by the broken lines in Figure 3, will serve to provide increased tension in the coil springs **40** resiliently to urge return movement of the slide plate to normal, retracted position. It will be understood that the coil springs **40** may be otherwise arranged and that other means well known to the trade may be employed constantly to urge the slide plate towards normal position with a force increasing in magnitude in accordance with the amount of displacement.

Means are also provided for latching the slide plate in operated or test position and to render such means ineffective upon completion of the operation or tests whereby the described resilient means can become effective for return of the slide plate to normal or retracted position. In the illustrated modification shown in Figures 2 and 3, such means comprises a block **52** fixed to the underside of the slide plate in a forward end portion thereof and a latching means fixed to the table for engagement with the block when the slide plate is in test position. Such latching means comprises a bell crank lever **54** pivoted intermediate its ends upon a pin **56** fixed to the table for rocking movement of the bell crank in a horizontal plane between latching and unlatching position. One of the arms **58** of the bell crank is provided with a latching finger **60** which extends laterally from the end thereof into the path of the block **52** when the bell crank is rocked to latching position, shown by the dotted lines in Figure 3, and out of the path of the block when the bell crank is in unlatching position, shown by the solid lines in Figure 3. The bell crank is located on the table in a position to bring the latching finger **60** alongside the rearward face of the block when the slide plate is displaced to operated or test position to prevent return movement of the slide plate when the latching arm is in latching position.

The other arm **62** is provided with a flanged portion **64** which extends downwardly through an arcuate slot **66** in the table into engagement with an actuator means in the form of a solenoid **68** fixed by a bracket **70** to the underside of the table. The shaft **72**, displaceable into and out of the solenoid responsive to energization or de-energization, can be operatively connected to the depending portion **64** of the lever arm **62** for positive displacement of the arm to effect rocking movement of the bell crank about its pivot between latching and unlatching position. It is more expedient, however, to make use of the solenoid **68** for control of the operation but to achieve actual movement of the bell crank in response to a resilient force, thereby to avoid damage or breakage to parts when an unforeseen obstacle is encountered to resist positive actuation. Such resilient means under the control of the solenoid comprises a yoke **74** extending outwardly from the shaft **72** and between which the depending portion **64** of the lever arm is slidably received. The end of the yoke is closed by a stud **76** to confine the depending portion of the lever arm within the yoke, and a coil spring **78** is provided with one end anchored to the forward end portion of the yoke while the other end is anchored onto a hook **80** rigid with a depending portion **82** of the table constantly to urge the shaft towards its extended position. Another coil spring **84** is provided constantly to urge the lever arm **62** to rock in the direction towards latching position with a force greater than that exerted by the coil spring **78** when the shaft is in retracted position, thereby to dominate the coil spring in control of the movement of the bell crank lever. The coil spring **84** is anchored at one end to a flange **86** rigid with an intermediate portion of the arm **62**, while the other end is fastened to a stud **88** fixed to the table at a position rearwardly of the arm.

Energization of the solenoid will cause displacement of the shaft **72** inwardly to permit the spring **84** to become effective for displacement of the bell crank lever from unlatching position to latching position to bring the latching finger **60** into position to confront the block **52** to prevent return movement of the slide plate. De-energization of the solenoid will enable displacement of the shaft outwardly to enable actuation of the latching lever to unlatching position. It will be apparent that the bell crank lever will be displaced chiefly in response to resilient force.

Various means may be employed for controlling the operation of the latching means responsive to displacement of the slide plate to test position. It is desirable, however, to avoid the waste of effort and time which would occur in the event that the slide position is advanced to test position without a paper or currency therein for testing or without a paper or currency of the dimension or characteristics of the paper or currency for which the machine is set to test.

Thus, another concept of this invention resides in a control to determine the presence of a member in the slide plate suitable for test and in a tie-in between the latter and the latching means to effect operation of the latching means only when an element is in the slide plate which is suitable for testing. Such concept is embodied in the construction having two or more switch fingers **90** positioned to extend upwardly through openings **92** in the table and into the path of the leading edge of the paper or currency when in position of use in the slide plate and in endwise alignment therewith to be engaged by the leading edge of the paper or currency when displaced forwardly with the slide plate towards test position. The switch fingers are preferably arranged to extend through openings located within the housing and in alignment with recesses **91** in the underside of the slide plate to prevent engagement thereof by other than the paper or currency, and the switch fingers are preferably arranged in laterally spaced-apart relation with the outermost of the switch fingers aligned with the outer edge portions of the paper or currency so that all of the switch fingers will be engaged only by a paper or currency of the full dimension intended to be received within the slide plate for testing. The switch fingers are adapted to make switch

members 94 upon actuation, and the switches are connected in series so that failure to effect displacement of one switch finger will result in failure to complete the circuit, with the result that current will be incapable of flow through the line to the latching solenoid or to effect operation of the motor connected to a rotor in engagement with a printed circuit 96 which directs current to the latching solenoid and the test and other elements.

A bumper 98 extends upwardly from the top surface of the table in the path of the forward edge of the slide plate in position to stop the table in test position while the flanges 42 extending outwardly from the brackets 44 on the guide channels are effective to stop the slide plate in normal or retracted position. Other means for limiting movement of the slide plate between normal and test position may be employed within the skill of the art.

In the following description of the operation of the means for displacement of the paper or currency during operation of the device, reference will be made only to that portion of the wiring diagram in Figure 6 that is directly related to the invention that is described and claimed.

In operation, with the slide plate in retracted position outside the housing, as shown in solid lines in Figure 3, the door 32 can be rocked to open position to enable insertion of the paper 14, which will hereinafter be referred to as a dollar bill. Upon insertion of the bill in the opening, the door 32 is rocked down to closed position to confine the dollar bill within the opening.

The slide plate is then manually displaced forwardly toward test position; if the dollar bill within the slide plate is properly placed and if it has proper dimension for a legitimate dollar, both of the laterally spaced-apart switch fingers 90 of the switch members 94 will be engaged by the leading edge of the dollar bill to effect forward displacement to make the switch members, as indicated by the broken lines in Figure 5. Under such circumstances, current will flow through lines 100, 102, 104, 106 and 108 to the switch 94*a* and from the switch 94*a* to the switch 94*b* arranged in series for continuous flow through the lines 110 and 112 to the lock solenoid 68. This will cause energization of the solenoid 68 to effect retraction of the shaft 72 to enable displacement of the latching lever arm 54 to latching position behind the block 52 as the slide plate is advanced to test position.

It will be apparent that if less than all of the switch fingers are engaged to make the switches, electrical current will be incapable of flow to the lock solenoid 68. As a result, the latching arm will not be operated to latch the slide plate in test position. Under such circumstances, the slide plate will be immediately returned automatically with the paper therein to starting position to enable removal of the paper without operation of the testing elements.

If, on the other hand, the paper 14 is of the proper dimension within the slide plate and the switches 94*a* and 94*b* are made to activate the lock solenoid 68, displacement of the latching lever 54 to latching position will operate also to make a switch 113 directly connected to a starting relay 114 through connecting lines 116 which operates a timer motor 118 for rotating a pair of contacts on a printed circuit 96. The lock solenoid 68 remains activated to maintain the latching arm in latching position until the arm on the printed circuit contacts the re-set strip 120 after the lights have been turned on during contact with the strip 122 for testing and the strip, defined in my copending application filed concurrently herewith and entitled "Paper Testing Device-Removal Mechanism," has been operated to effect removal of the dollar bill in the event that the test shows it to be acceptable, all as explained in the aforementioned copending application.

Finally, upon continued operation of the timing motor 118 to effect contact with the re-set 120, current will flow through line 124 to the re-set relay 126 which operates to break the current to the lock solenoid 68 and to the bill switches 94*a* and 94*b* to inactivate the switches and the solenoid. Thus the shaft 72 is caused to be displaced outwardly to enable the latching lever to be rocked about its pivot to unlatching position. This releases the block 52 to enable return of the slide plate by the coil springs 40 to starting position.

It will be apparent that the means for testing to determine the presence of a paper in displacement to test position and the means for latching the displacement means for holding the latter in the test position while the various operations are being carried out, may be adapted to other concepts for achieving an effective test to determine the acceptability of a paper or currency or to effect separations between one paper or currency from others.

It will be understood that changes may be made in the details of construction, arrangement and operation without departing from the spirit of the invention, especially as defined in the following claims.

I claim:

1. In a paper acceptance testing device comprising means for testing a paper to determine the acceptability thereof, means for receiving the paper in a position offset from the position of test, means for effecting displacement of the paper from receiving position to test position and back, latching means positioned operatively to engage said displacement means for holding said paper in test position, means for activating said latching means responsive to displacement of a paper of proper dimension for testing from receiving position to test position and means for inactivating said latching means subsequent to the completion of the test.

2. In a paper acceptance testing device comprising means for testing a paper to determine the acceptability thereof, means for receiving the paper in a position offset linearly from the position of test, means for effecting linear displacement of the paper from receiving position to test position and back, latching means positioned operatively to engage said displacement means for holding said paper in test position, means for activating said latching means responsive to the displacement of a paper of proper dimension for testing from receiving position to test position, and means for inactivating said latching means subsequent to the completion of the test.

3. A testing device as claimed in claim 1 which includes a housing enclosing the test position and in which the receiving position is located outside of the housing.

4. In a paper acceptance testing device comprising means for testing a paper to determine the acceptability thereof, means for receiving the paper in a position offset from the position of test, means for effecting displacement of the paper from receiving position to test position and back, latching means positioned operatively to engage said displacement means for holding said paper in test position, and means for inactivating said latching means subsequent to the completion of the test and in which the means for testing the paper for acceptability comprises a light source and a plurality of light responsive cells for measuring the transmission of light through predetermined areas of the paper when the latter is disposed between said light source and cells in test position.

5. In a paper acceptance testing device comprising means for testing a paper to determine the acceptability thereof, means for receiving the paper in a position offset from the position of test, means for effecting displacement of the paper from receiving position to test position and back, latching means positioned operatively to engage said displacement means for holding said paper in test position, and means for inactivating said latching means subsequent to the completion of the test and in which the means for displacement of the paper from receiving to test position and back comprises a slide plate, and means for guiding the slide plate for movement between receiving and test positions.

6. A testing device as claimed in claim 5 in which the means for receiving the paper comprises an opening in the slide plate dimensioned to receive the paper flatwise therein and which includes a means removably received within the opening for holding down the paper.

7. In a paper acceptance testing device comprising means for testing a paper to determine the acceptability thereof, means for receiving the paper in a position offset from the position of test, means for effecting displacement of the paper from receiving position to test position and back, latching means positioned operatively to engage said displacement means for holding said paper in test position, and means for inactivating said latching means subsequent to the completion of the test and in which the latching means comprises an abutment rigid with the displacement means and a latching lever pivoted about a stationary pin for free rocking movement between latching and unlatching positions, a latching arm on said lever in position to confront the abutment when in latching position and out of the path of the abutment when in unlatching position, and means for actuating said lever for rocking movement between latching and unlatching position.

8. A testing device as claimed in claim 7 in which the latching lever is constantly urged towards unlatching position.

9. A testing device as claimed in claim 5 in which the slide plate is mounted for free sliding movement between receiving and test positions and which includes means resiliently urging the slide plate in the direction towards receiving position.

10. In a paper acceptance testing device comprising

means for testing a paper to determine the acceptability thereof, means for receiving the paper in a position offset from the position of test, means for effecting displacement of the paper from receiving position to test position and back, latching means positioned operatively to engage said displacement means for holding said paper in test position, means for activating said latching means responsive to the displacement of a paper of proper dimension for testing from receiving position to test position, and means for inactivating said latching means subsequent to the completion of the test and in which the means for activating said latching means responsive to displacement of the paper from receiveing toward latching position comprises switch arms extending into the path of the paper during displacement from receiving to test positions, and switch means responsive to the displacement of said switch arms upon engagement by the paper.

11. A testing device as claimed in claim 10 in which a plurality of switch arms are provided in laterally spaced apart relation with the outermost of the switch arms aligned with the outer end portions of the paper.

12. A testing device as claimed in claim 11 in which separate switches are provided for each switch arm and in which the switches are connected in series to prevent operation of the latching means in the absence of the displacement of all of the switch arms to make all of the switches.

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