

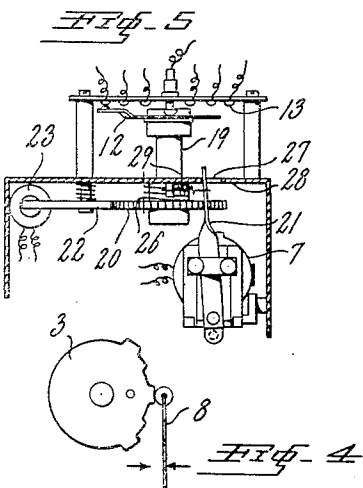
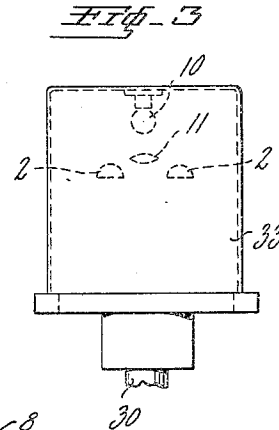
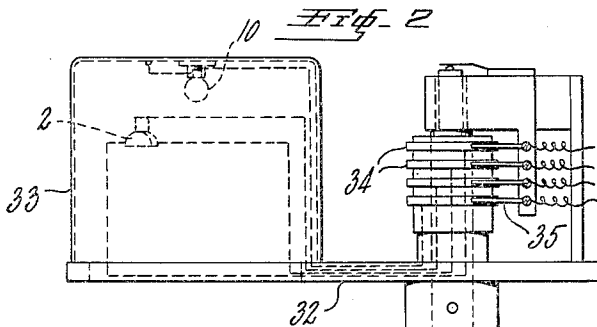
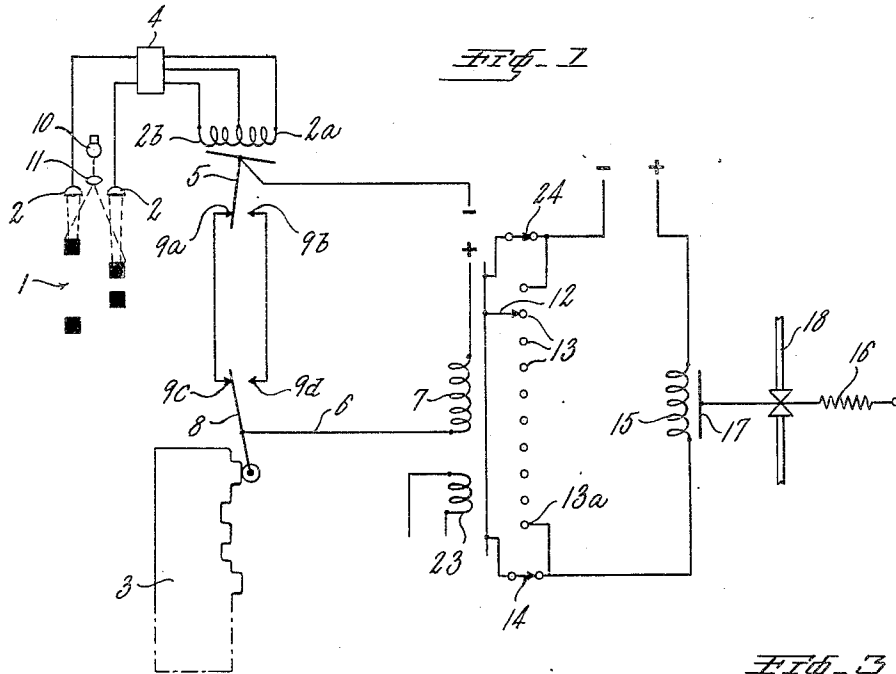
May 1, 1951

J. D. COAKLEY
COMPARATOR DEVICE

2,551,364

Filed Oct. 22, 1948

2 Sheets-Sheet 1



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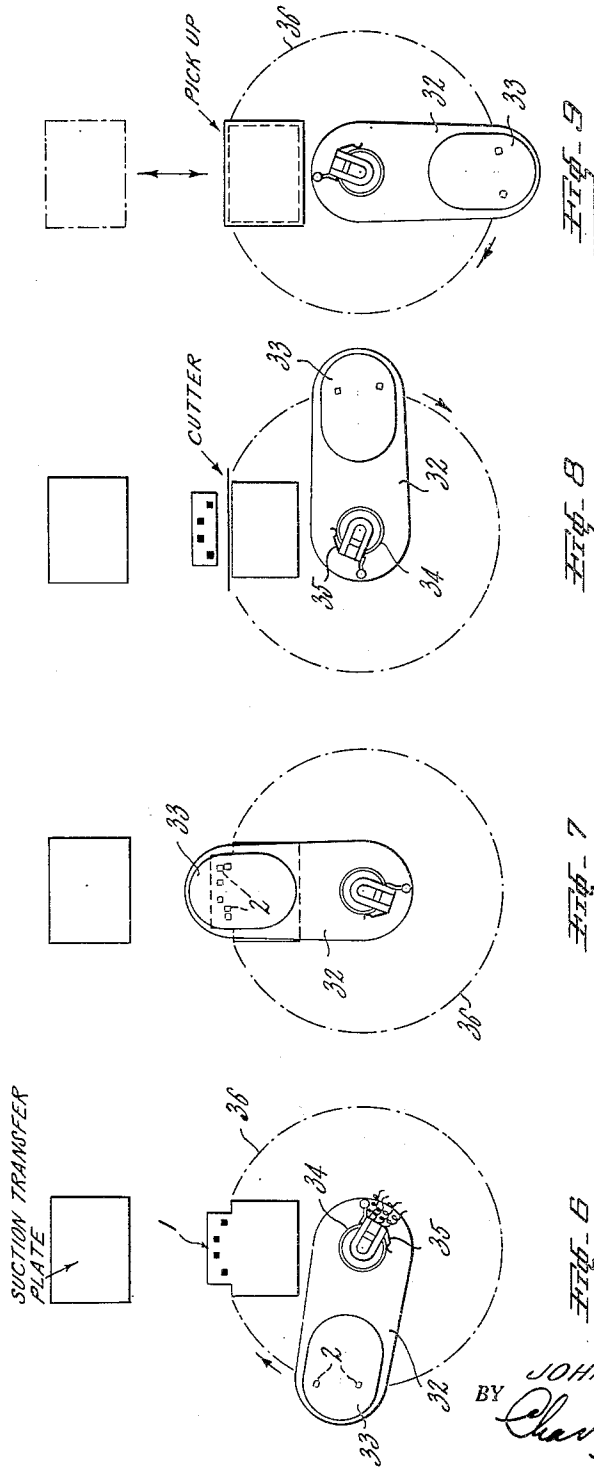
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UNITED STATES PATENT OFFICE

2,551,364

COMPARATOR DEVICE

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Application October 22, 1948, Serial No. 55,870

7 Claims. (Cl. 271-57)

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The present invention relates to devices adapted to checking articles with a view to assuring uniformity. More particularly, it relates to automatic scanning devices for labels to ensure the correct labeling of articles, such as drugs, where the mislabeling or false labeling constitutes a serious danger.

In the drug manufacturing industry many of the operations are conducted by automatic mechanical devices. Among these operations is the labeling of bottles or other containers and it is of extreme importance that each bottle or other type of container should bear a label correctly denoting its contents. It happens, however, that, either through negligence or because of other failure, a container may be mislabeled. It sometimes occurs where labeling machines are used that the wrong batch of labels is fed to the labeling machine. It more frequently happens when through inadvertence one or more wrong labels are mixed in a batch of correct labels. In this case the error is extremely difficult to detect.

It is an object of the present invention to provide a device to scan labels as they are fed from a stack to a standard labeling machine, and to accept and pass on all correct labels but to reject incorrect labels so that they will not be placed on the containers.

Briefly described, the device includes a standard plate bearing a code indication corresponding to a similar code borne by a tab affixed to the label that is to be applied to the containers. The standard plate may be stamped out or it may be made up of removable lugs so that by readjusting the lugs the code indications may be changed for other drugs. The code is a binary numerical code—that is, a number written to the base two and this code is printed on the label at the same time that the label is printed. It is, however, not printed upon the label proper but upon a tab or extension of the label which is later cut off or otherwise removed from the label after it passes the automatic verifying device of the invention and before it is gummed on to the container. While the code is based on a numerical system, it is actually printed as a series of square blocks and spaces and for reasons of convenience these blocks and spaces are printed in two rows, one above the other. It is, however, within the contemplation of the invention that there might be a single row or more than two rows, and the blocks or squares may be printed either in black or colored ink on a light background. During the operation of the

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machine the label tab bearing the code indication is passed before appropriately positioned photoelectric cells and suitable circuits hereinafter described co-operating in conjunction with the standard plate to energize the system so long as the code on the tabs of the labels passing before the photoelectric cells conforms to the code indications on the standard plate. If, however, a wrong label bearing a different code indication comes before the photoelectric cells, there is immediate stoppage of the whole system which cannot begin to work again until the defective label is removed from the stack. When, however, the labels passing before the photoelectric cells are accepted by the machine, they are passed on to a cutting device which removes the tab bearing the code indication and they are then fed to the labeling machine which gums the labels to the bottles or other containers. Accordingly, the label as attached to the container shows no evidence of the code indication tab by which it was selected.

It has been previously suggested to print a code directly on the label or to perforate the label with code indications and then to scan the labels either visually or mechanically. Such systems are objectionable partly because of the error inherent in the human equation and partly because the label is changed in appearance and often marred. A well known label, for instance, is part of the good will of the concern using it as it frequently bears the trademark of that concern, and if it is printed over or perforated, the appearance thereof is changed so that it is not as easily recognized.

The device of the present invention is intended to be used with standard labeling machines. Such machines feed labels from a stack and irrespective of the label size the forward edge of the labels remains in the same location in the labeling machine.

According to the present invention it is proposed to locate the tab bearing the code indication preferably along the forward edge either at the center thereof or at either side. However, if the length of the tab bearing the code indication is kept short and the code is arranged in two rows, the cutting off and the handling of the tab will be facilitated.

The invention will be more clearly understood from the drawings in which Fig. I is a diagrammatic representation of an electric circuit operating the comparator mechanism of the device of the invention; Fig. II represents diagrammatically a scanning head of the comparator

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mechanism of the invention viewed from one side; Fig. III represents diagrammatically the scanning head of Fig. II viewed from the end; Fig. IV illustrates one form of standard plate, included in the circuit of Fig. I; Fig. V is a diagrammatic representation of a stepping relay also included in the circuit of Fig. I; and Figs. VI, VII, VIII and IX illustrate positions of the scanning head as it rotates during operation.

The comparator mechanism comprises an electrical system shown diagrammatically in Fig. I, the code on the tab of the label being indicated at 1, a pair of photoelectric cells indicated at 2, the code standard or code master indicated at 3, and an amplifier system indicated at 4 as tapped off from the center of the coil 2^a. A three position relay includes a contact arm 5 and a circuit controlled by the switch α and including the conductor 6, the coil magnet 7, the roller switch 8 and the co-operating contacts 9^a, 9^b, 9^c and 9^d. As the label tab is advanced in front of the photoelectric cells, which in the drawing (Fig. I) are shown as two in number and the code indications as in two rows, in the position shown there will be a less current through the circuit controlled by the photoelectric cell over the black square than in the circuit controlled by the photoelectric cell which is over the white space. Accordingly, the contact arm of the three way relay will be moved so as to effect connection with the contact point 9^a, the contact arm of roller switch 8 governed by the code master 3 moving synchronously to contact the contact point 9^c and thus to close the circuit including conductor 6 and coil magnet 7.

So long as the code on the label tab 1 is in conformity with the contour of the code standard or code master 3, there will be a variation of current through the photoelectric cells governed by the black squares and white spaces on the tab of the label, and the three position relay will move back and forth between the contacts 9^a and 9^b and a neutral point midway between these contacts. Similarly, the roller switch 8 will move between the contact points 9^c and 9^d. If, however, a wrongly coded label should be advanced before the photoelectric cells, the three position relay would at some point during the passage of the label be moved so that the arm would contact the wrong contact point as between contacts 9^a and 9^b. In such case, however, the roller switch 8 moving over the contour of the code standard or code master 3 would be in such position that the circuit would be broken since the contact arms would be out of the proper contact that the code standard required as between contact points 9^a and 9^b while the arm of the roller switch would be in the proper contact as between contact points 9^c and 9^d. A stepping relay, of which magnet coil 7 forms a part, would in the meanwhile move a contact arm 12 from one contact point 13 to another, step by step, until the three point relay arm 5 and roller switch arm 8 are out of agreement. In this case one or more steps of the stepping relay are missed so that the contact arm 12 of the stepping relay does not reach the final contact point 13^a before the scanning period is ended. At the end of the scanning period the switch 14 is opened by mechanical means such as, for instance, a cam (not shown) which may be on the main shaft of the labelling machine. With the contact arm 12 in contact with a contact point short of contact point 13^a and the switch 14 open, it will be obvious that the circuit including magnet coil 15

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will be broken and the magnet coil 15 will be de-energized. In that case the spring 16 will pull down the valve 17 to shut off the vacuum line 18. When this occurs, the pick up head of the labelling machine will fail to operate and the wrong label will not be picked up by the labelling machine. At the same time the contact arm 12 is reset at the first contact point 13 by action of the coil 23. When the wrong label is removed and a correct label appears at the top of the stack, the operation of the device is resumed.

It will be seen that the operation is as follows:

A lamp 10 and lens 11 project light upon the tab 1 of the label and the light is reflected back to actuate the photoelectric cells 2 if the code conforms to the code master 3. The light reflected from the white part of the tab surface will, of course, be greater than that from black or colored squares of the tab.

The two photoelectric cells 2 and the lamp 10 and lens 11 move over the tab of the label at the top of the stack. In the position shown in Fig. I, less current flows through the cell which is over the black square than through the cell that is over the light background of the tab. Consequently, the current in coil 2^a is less than the current in coil 2^b. The difference in current is amplified in the amplifier system 4 and applied to the polarized three position relay 5. As a result the contact arm of the relay swings into contact with contact point 9^a. The label code master 3, which is a properly shaped metal plate or cam shown in detail in Fig. IV, moving synchronously with the label tab 1, has at the same time moved the contact arm of the roller switch 8.

In normal conditions, i. e., where a label tab 1 conforming to the standard or code master 3 is under the scanning head, the contact arm 5 will be in contact with contact point 9^a at the same time that the arm of the roller switch 8 is in contact with contact point 9^c and thus the magnet 7 is energized through conductor 6, both of which are in the circuit now closed by arms 5 and 8 and contact points 9^a and 9^c. Again, as the photoelectric cells 2 move over the tab 1, the arms 5 and 8 will contact the contact points 9^b and 9^d, which position also closes the circuit and energized magnet 7. As a consequence the coil 15 is energized and this draws up the element 17, thereby opening the vacuum line 18 which operates the pick up head of the labelling machine. A tab bearing a wrong code, not conforming to code master 3, will, however, deenergize the coil 7 and the coil 15, whereupon the spring 16 will pull the element 17 down to close the vacuum line 18. When this happens, the pick up head cannot pick up the incorrect label. The operation of the device will not resume until the improper label is removed. The device fails but it fails safely. Thus, failure of the mechanism to operate results in rejection of the label as defective and not in accord with the code master or standard 3.

The operation of the stepping relay shown in Fig. V is as follows:

The code master 3 moves in synchronism with the label 1 of Fig. I and as the contact arm 5 of the three point relay is swung into contact with contact point 9^a the code master 3 has at the same time swung the contact arm 8 into contact with contact point 9^c, thus closing the circuit including the magnet coil 7, thus energizing the stepping relay that includes the contact arm 12 and the contact points 13. When the photoelec-

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tric cells have passed the first black square of the code on the label 1, both cells are over the white background between the black squares or places of the code, and the arm 8 of the roller switch co-operating with the code master 3 returns to center, a neutral point out of contact with either the contact point 9^c or contact point 9^d and the magnet coil 7 is consequently de-energized. The contact arm 12 of the stepping relay has in the meanwhile moved from the first contact point to the second. As the black dots or squares successively come before the photoelectric cells, the contact arm 12 of the stepping relay advances step by step along the contact points 13. Thus, unless the printed code and the code master are in agreement at each place, the circuit through the magnet coil 7 will not be closed for each place of the code tab and the contact arm 12 will miss one or more steps and will not reach the final contact point 13^a by the end of the scanning period.

At the end of the scanning period for each tab, the switch 14 is opened by a cam on the main shaft of the labelling machine. If by the end of the scanning period the contact arm 12 has not stepped all the way across the contact points 13, then the circuit through the magnet 15 is de-energized and a spring 16 pulls the valve 17 to close the vacuum line 18 leading to the pick up head of the labelling machine. Without vacuum it is obvious that the label pickup head will not pick up the label presented to it.

The stepping relay is shown diagrammatically in Fig. V. It will be seen that the contact arm 12 of the stepping relay rotates on the shaft 19 moving, as hereinbefore described, around the contact points 13 step by step as the coil 7 is energized as above described. The gear wheel 20 on the shaft 19 is engaged and moved step by step by a pawl 21 and checked by dog 22. As the coil 7 is energized, the pawl 21 moves the toothed wheel 20 and accordingly the shaft 19 so as to move the contact arm 12 from one contact point 13 to another and simultaneously the dog 22 engage the toothed wheel and checks it from moving backward. When the stepping relay contact arm 12 has reached the final contact point 13, it is returned to its original position by the closing of the cam switch 24 which energizes the coil 23 and thus releases the dog 22 permitting the toothed wheel 20 to rotate backwards to its original position by reason of the force exerted by spring 26 around the shaft 19.

The pawl 21 is moved by the pull of the magnet coil 7 but this motion is limited by an opening 27 in the base 23 through which the pawl extends. A spring 29 pulls against the force exerted by the coil 7 so that when coil 7 is deenergized the pawl 21 is pulled back to engage a following tooth which it will move in response to the next pull of the reenergized coil 7 and thus move the contact arm 12 to the next contact of the points 13.

The mechanism of the comparator is shown in Figs. II and III and its operation is illustrated in Figs. VI, VII, VIII and IX.

This mechanism is positioned behind the label stack of the labeling machine and rotates on a vertical shaft 30 which is moved by a self-contained gear box 31. The power may be taken from a line shaft of the labelling machine, not shown, the motion being converted into cyclic motion in known manner, or it may be otherwise powered. An arm 32 is keyed to shaft 30 and a scanning head 33 is carried thereon. The shaft

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30 carries a commutator 34 and brush block 35. The brush block 35 floats on an extension of shaft 30 and does not turn with it.

As the shaft 30 revolves, the arm 32 revolves carrying the scanning head in rotation about it. The scanning head carries the photoelectric cell or cells 2 which are so disposed as to read the code indications in sequence in response, of course, to the light projected to the code tab 1 by the lamp 10 through the lens 11 and reflected from the tab 1 to the photoelectric cells 2.

As stated, the scanning head rotates on the shaft 30 and, as shown in Figs. VI, VII, VIII and IX, describes a circle. In Fig. VI the scanning head 33 in its rotation on arm 32 approaches the code tab 1. In Fig. VII it is over the code tab 1 in reading position. As the scanning head 33 swings into reading position it decelerates to a uniform motion accommodating the operation of the relay contact arms 5, 8 and 12. After the scanning period is completed, the scanning head 33 accelerates to maximum speed and by the time it has reached the position shown in Fig. VIII the cutting mechanism which may be of any well known type has cut the tab 1 from the label. In the position shown in Fig. IX the label is ready to be picked up by the pick up head of the labelling machine and affixed to the container, while the scanning head 33 is ready to start again to verify the next label on the label stack.

Having thus described my invention, what I claim is:

1. In combination with a labeling machine including a stack of labels, each label bearing code indicia and a vacuum operated device to pick up a label from said stack, a scanning device adapted and arranged to rotate in an orbit passing over said code indicia of said labels, said scanning device including a light source and optical system projecting the light from said light source on to said code indicia, and photoelectric cells in a circuit energized by the reflected light from said code indicia; a three way relay and circuit including the same and also including a code master element conforming to said code indicia, and a magnet coil adapted and arranged to be energized and deenergized by said three way relay and said code master element; a stepping relay operable by said magnet and a second magnet included in said stepping relay circuit adapted and arranged to open and shut a vacuum system connected with the pick-up head of said labeling machine whereby when said code indicia on said label is not in agreement with said code master element, said vacuum system will close.

2. In combination with a labeling machine including a vacuum pick-up system, a scanning device including a light source and photoelectric cells in a rotating scanning head adapted and arranged to pass over a stack of labels bearing code indicia in a labeling machine and to project light on the top label of said stack, said photoelectric cells being activated by reflected light from said top label; a three way relay, a code master element, and magnetic means responsive to said photoelectric cells for operating said relay in agreement with said code master element; other magnetic means adapted to be energized and de-energized by said three way relay and included in the circuit of a stepping relay whereby when said other magnetic means is energized a vacuum system is opened and said labeling machine will pick up the top label from said stack and when said magnetic means is de-energized

said vacuum system is closed and said labeling machine cannot pick up said top label.

3. In combination with a labeling machine including a stack of labels bearing code indicia thereon and a suction device to pick up one label at a time from said stack, a scanning device including a rotating scanning head adapted and arranged to pass over said stack of labels, said scanning head including means for projecting light upon said code indicia on a label at the top of said stack and photoelectric cells arranged to receive light reflected from said code indicia and thereby to energize a circuit including magnets, a three way relay operated by said magnets, a code master element in agreement with said code indicia and magnetic means for opening and closing the suction lines of said pick-up device of said labeling machine, whereby when said code indicia on any label under said scanning head is out of agreement with said code master element said suction lines will be closed and said pick-up device will fail to operate.

4. In combination with a labeling machine including a stack of labels bearing code indicia and a suction device adapted to pick up one label at a time from said stack, a circuit controlled by a code master element in agreement with said code indicia and including photoelectric means adapted to be energized by light reflected from said code indicia and magnetic means adapted to render said suction device inoperable when said code master element and said code indicia are not in agreement.

5. In a labeling machine adapted to hold a stack of labels and provided with a suction device to pick up one label at a time from said stack, a rotating scanning head adapted and arranged to control said suction device, said scanning head including a code master element in agreement with a code printed on said labels, an electrical circuit including said code master element and a source of light adapted to project light upon the code indicia on said labels, photoelectric cells adapted to receive reflected light from said code indicia and thereby to activate said circuit and a stepping relay also in said circuit adapted to open and close the vacuum system of said suction device whereby so long as said code indicia on said labels of said stack are in agreement with said code master element,

said suction device will operate to pick up labels from said stack.

6. In combination with a labeling machine including a suction device adapted to pick up labels bearing code indicia from a stack placed in said machine, a photoelectric system adapted to operate a three way relay in response to light reflected from said code indicia through said photoelectric system; a code master element in agreement with said code indicia co-operating with said three way relay to close and maintain closed a circuit when said code master element and said code indicia are in agreement and to break said circuit when they are out of agreement; a stepping relay in said circuit and adapted to operate when said circuit is closed; and magnetic means controlled by said stepping relay to keep open the suction lines of said suction device when said code master circuit is closed and to permit closure of said suction lines when said code master circuit is broken.

7. In a labeling machine, a pick-up device suctionally operated and a scanning device controlling the suction line of said pick-up device, said scanning device consisting of a circuit including a photoelectric system to energize the same, a three way relay, a code master element and a stepping relay adapted to energize a magnet controlling a valve to open and close said suction system; said code master element being in agreement with predetermined code indicia affixed to labels worked on by said pick-up device, whereby when light is reflected to said photoelectric system from said predetermined code indicia said circuit operates to maintain said suction line open but when code indicia varying from said predetermined code are presented to said photoelectric system said circuit is deenergized and said valve closes said suction line.

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