

July 23, 1968

S. S. KINTIGH

3,394,262

CODE ESCORT HAVING SELECTIVELY OPENABLE APERTURES
AND SELECTIVELY PLACEABLE PHOTOCELLS

Filed April 19, 1965

4 Sheets-Sheet 1

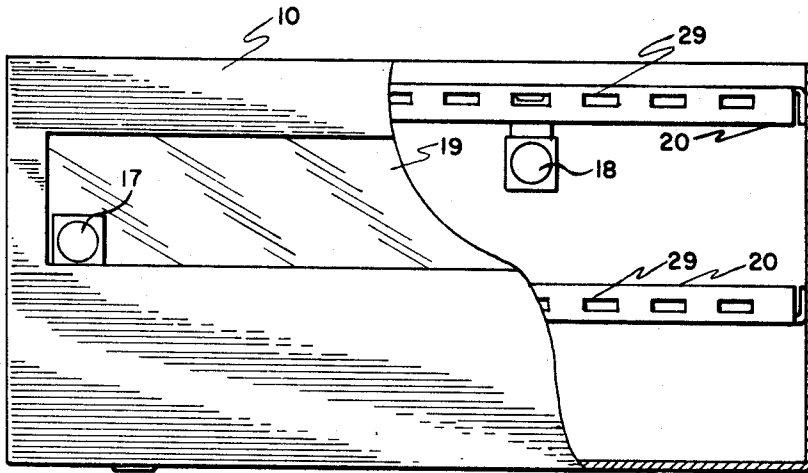


Fig. 2

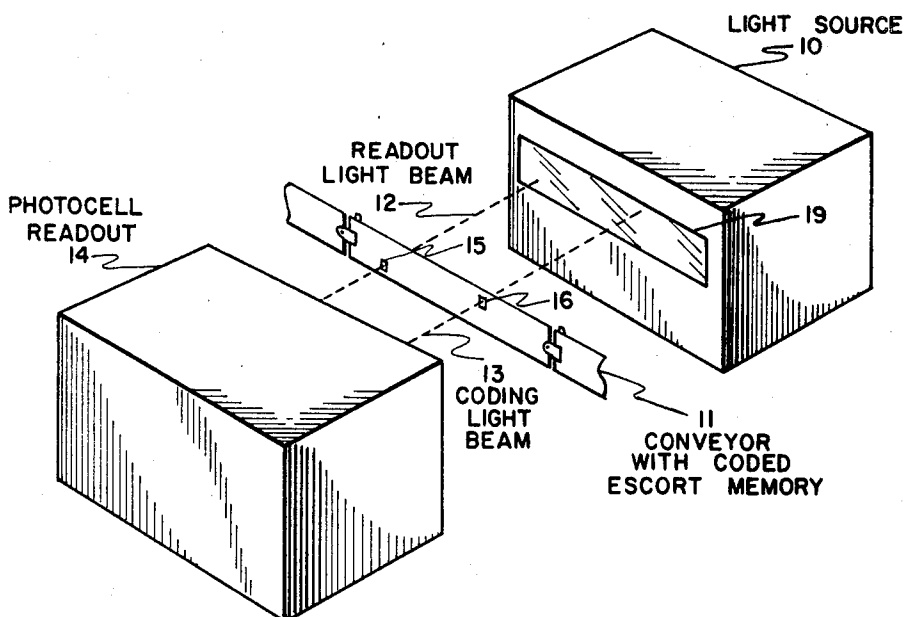


Fig. 1

INVENTOR.
STANLEY S. KINTIGH
BY *Francis A. Lin*
ATTORNEY

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S. S. KINTIGH

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4 Sheets-Sheet 2

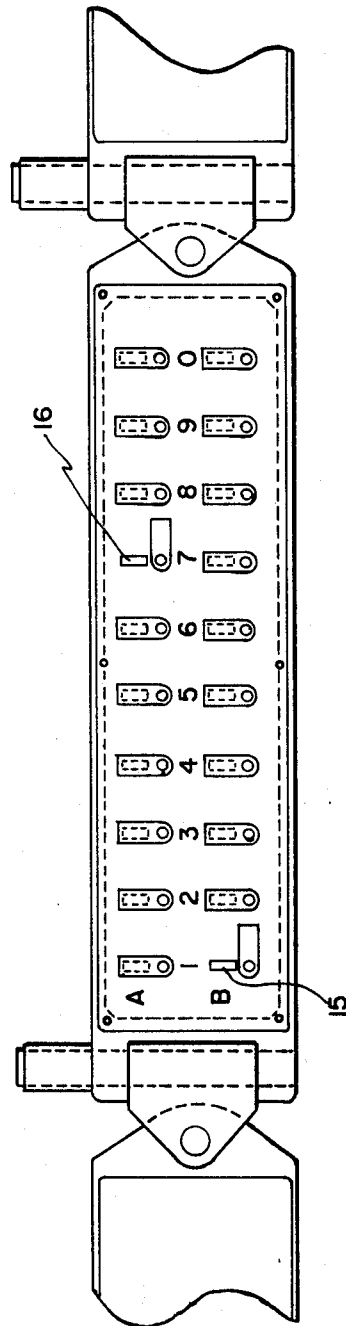


Fig. 3

INVENTOR
STANLEY S. KINTIGH
BY *Francis A. Lin*
ATTORNEY

July 23, 1968

S. S. KINTIGH

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4 Sheets-Sheet 3

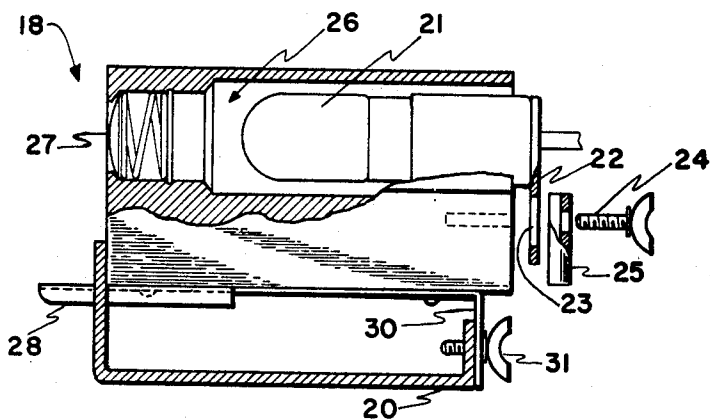


Fig. 5

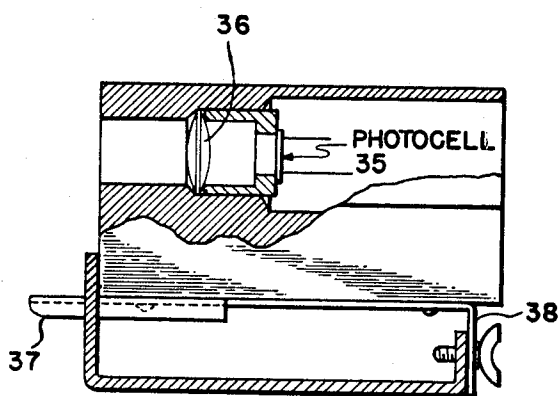


Fig. 6

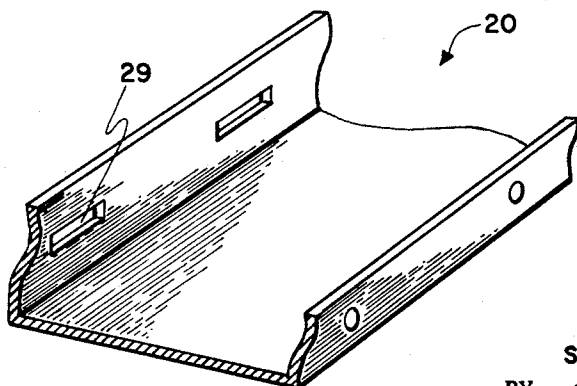


Fig. 4

INVENTOR.
STANLEY S. KINTIGH
BY *Francis A. Seir*
ATTORNEY

July 23, 1968

S. S. KINTIGH

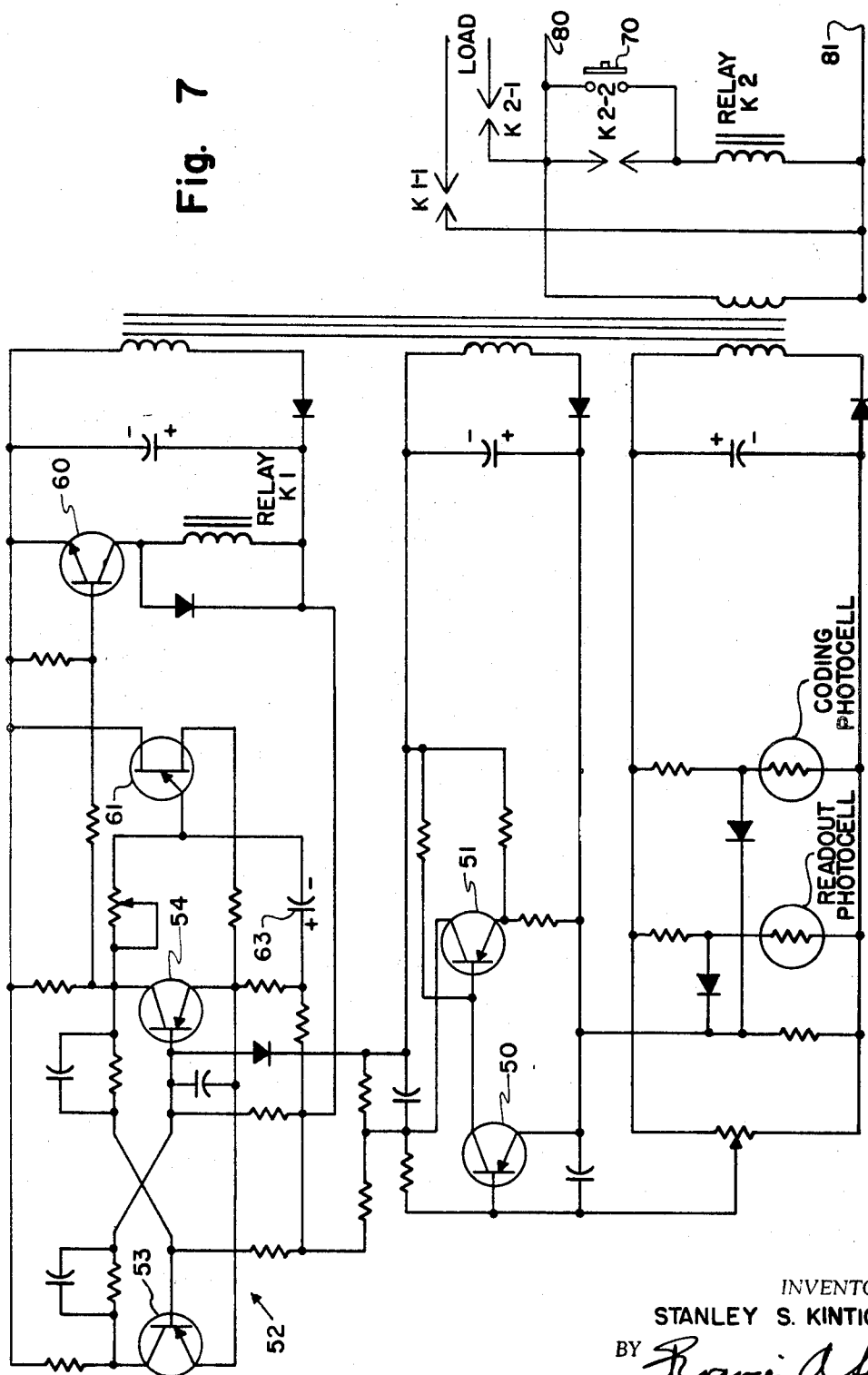
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Fig. 7



INVENTOR.
STANLEY S. KINTIGH
BY *Francis A. Lin*
ATTORNEY

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3,394,262

CODE ESCORT HAVING SELECTIVELY OPENABLE APERTURES AND SELECTIVELY PLACEABLE PHOTOCELLS

Stanley S. Kintigh, Hopkins, Minn., assignor to Honeywell Inc., Minneapolis, Minn., a corporation of Delaware

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9 Claims. (Cl. 250—219)

ABSTRACT OF THE DISCLOSURE

A conveyor control apparatus with a light source on one side of the conveyor to shine light through a plurality of openings carried by the conveyor, the pattern of the resulting light beam constituting a code, and a photocell code readout structure on the other side of the conveyor having a plurality of photocells which may be selectively positioned in a large variety of patterns to selectively code the readout structure.

My invention is concerned with an improved control apparatus and particularly with a control apparatus utilizing a coded photocell readout structure to read out coded escort memory carried by a member.

My invention finds particular utility as a conveyor control apparatus, wherein a movable conveyor incorporates coded escort memory. Escort memory can be defined as a coding which is provided on the individual conveyor section or links and which is carried by the sections of the conveyor as the conveyor moves along a predetermined route of travel. While it forms no portion of my invention, I disclose a conveyor link which may be an endless chain of links to form a continuous conveyor belt moving over the predetermined route of travel. Each of the links of the conveyor is provided with a plurality of spaced apertures which may be uncovered in a selected pattern to thereby provide escort memory for each particular link.

The operator of the conveyor loads a link of the conveyor and codes the link to indicate the unloading station at which this particular link of the conveyor is to be automatically unloaded. My invention does not relate to the manner of coding the link, nor to the matter of unloading the conveyor. My invention relates to the means of reading out the escort memory code and to a means providing a single readout structure which may be selectively adjusted to provide readout of any particular code, thus allowing identically manufactured structures to be utilized, one at each of the unloading stations of the conveyor, and each of the structures being coded to its particular unloading station by the selective positioning of photocell elements.

The readout structure of my invention provides a stationary readout photocell which determines when the conveyed link is in a position to attempt a code readout. If a code readout is accomplished, an output load is actuated and a timer holds this actuation for a short time period to accommodate movement of the link beyond the readout position. If the code is not read out by the photocell readout structure, the conveyor link moves on until a station is reached where a readout is accomplished.

My invention will be apparent to those skilled in the art upon reference to the following specifications, claims and drawing, of which

FIGURE 1 is a diagrammatic representation of a portion of the conveyor, having a coded escort memory, shown with a light source positioned on one side of the conveyor and a photocell readout structure located at the other side of the conveyor,

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FIGURE 2 is a view of the light source structure of FIGURE 1, showing two lights in position, one of them being effective to establish a readout light beam, and the other being selectively adjustable to form the coding light beam,

FIGURE 3 is a showing of one form of conveyor link, showing two rows of apertures with ten apertures in each row,

FIGURE 4 shows a portion of the mounting bracket for the light sources of FIGURE 2, this particular mounting bracket also being utilized in the photocell readout structure to mount the photocells,

FIGURE 5 is a showing of a light source structure, partially broken away, mounted on the mounting bracket of FIGURE 4,

FIGURE 6 is a showing of a photocell structure, partially broken away, mounted on the mounting bracket of FIGURE 4, and

FIGURE 7 is a schematic diagram of the electronic network to accomplish readout of a particular code carried by the conveyor link.

Referring to FIGURE 1, reference numeral 10 designates a light source adapted to generate light to be projected toward a conveyor 11 to thus form a readout light beam 12 and a coding light beam 13 which is intercepted by a photocell readout structure 14. For purposes of simplicity I have not shown the details of the conveyor nor the manner in which the conveyor is constructed and arranged to convey articles along the route traveled by the conveyor. The portion of the conveyor which I have shown provides a readout aperture 15 and a coding aperture 16. While I have elected to show a single coding aperture 16, a number of coding apertures may be provided. The function of readout aperture 15, as will be apparent, is to facilitate the sensing of the readout position of the conveyor at which readout of the code should be attempted by the photocell readout structure 14.

In the preferred embodiment of my invention, I provide a separate light source for each of the light beams 12 and 13. These light sources are provided by the structures 17 and 18, as shown in FIGURE 2. The front of light source 10 includes a glass window 19 which faces the conveyor to project light toward the conveyor on one side of the conveyor link.

In FIGURE 2 reference numeral 20 designates mounting brackets adapted to selectively position the coding light source 18, readout light source 17 being mounted in a similar fashion.

Referring to FIGURE 5, structure 18 is shown partially broken away to disclose a bulb 21 having a mounting tab 22 with a relatively large aperture 23 adapted to receive a thumbscrew 24 and to be imprisoned by a member 25. The opening 23 is large compared to the size of thumbscrew 24 and thus bulb 21 may be positioned within cavity 26 to provide optimum alignment of the bulb filament and spring biased lens 27 to form a light beam which is projected toward the conveyor link.

As can be seen in FIGURE 5, a tongue 28 is provided to extend through an opening 29 in mounting bracket 20 (see FIGURES 2 and 4) and is provided with a mounting tab 30 adapted to receive a thumbscrew 31 to physically hold structure 18 on mounting bracket 20.

FIGURE 6 discloses a structure, including a photocell 35 which is mounted in a cavity and receives light through a lens 36. Here again the structure including photocell 35 is provided with a tongue 37 and a tab 38 such that the photocell may be mounted in alignment with the readout light beam 12 and the coding light beam 13, on a bracket 20 identical to that utilized to mount the light sources 17 and 18.

The photocell readout structure 14 of my invention is provided with two photocells, in the preferred embodi-

ment disclosed and these photocells are a readout photocell mounted at a fixed physical position in axial alignment with the readout light beam 12 to establish the readout position for each and every link of the conveyor. When each link is at this position, the readout photocell is illuminated and an attempt is made to readout the code carried by the link. If the correct link is in position, as determined by the position of the coding photocell for the particular photocell readout structure, then the circuitry of FIGURE 7 is actuated, as will be described. Thus with the structure of my invention it is possible for a number of identically manufactured photocell readout structures to be provided along the conveyor to establish different stations for the conveyor. By selectively positioning the coding photocell for each of these different stations, a code will be established at each station and the escort memory carried by the conveyor links will be interrogated at each station as the links move along the conveyor route.

In FIGURE 3 I disclose a method by which a conveyor link may be coded. Reference numeral 15 designates the aperture B-1 which is open to establish the readout light beam 12. Reference numeral 16 designates the open aperture A-7 which has been opened to establish the coding light beam 13. Thus, the structure of the link of FIGURE 3 establishes a physical position between the two light beams B-1 and A-7. At each station of the conveyor, the beam B-1 will activate the readout photocell. If the coding photocell is located in the correct physical position, that is the A-7 position, then a readout will be effective and the structure of FIGURE 7 will actuate an output load, for example mechanism to automatically unload this link of the conveyor. However, should the coding photocell be located at some different position, then this readout will not be effective even though readout photocell B-1 is illuminated, and the conveyor link will move on seeking a station where readout can be affected. In the showing of FIGURE 3 apertures A-1 and B-1 are readout apertures and one of the apertures will always be open to establish the readout position as the one position of either row.

Referring to FIGURE 7, this figure discloses a schematic diagram including the readout photocell and the coding photocell. Insofar as the electrical circuitry is concerned, these two photocells are "And" gates which feed forward biasing current to a normally conducting transistor 50. While I have shown the use of two photocells, my invention may be utilized with more than two photocells, depending upon the structure of the coded member and the type of code to be read. In other words, if a large number of readout stations are necessary, more photocells may be utilized.

When both of these photocells are illuminated, transistor 50 becomes nonconductive. When either or both of the photocells remain in a dark state, transistor 50 remains conductive.

So long as transistor 50 is conductive, a further transistor 51 is nonconductive. Reference numeral 52 generally designates a one-shot multivibrator including a normally conducting transistor 53 and a normally nonconducting transistor 54. Conduction of transistor 51 is effective to switch multivibrator 52 to its alternate state where transistor 53 is nonconductive and transistor 54 is conductive.

Conduction of transistor 54 is effective to trigger a normally nonconducting transistor 60 to a state of conduction to energize the coil of a relay K1.

A unijunction transistor 61 is normally nonconductive and is provided to maintain multivibrator 52 in its triggered state during the discharge time of a capacitor 63, it being remembered that the conveyor link is in a readout position for only a short period of time. It is thus necessary to provide a timer to hold relay K1 in an energized position and this is accomplished by the structure including capacitor 63. Specifically, this is accomplished

by capacitor 63 discharging through the new conducting transistor 54 to maintain it conductive so long as the capacitor continues discharging. Capacitor 63 discharges until the intrinsic standoff ratio of unijunction 61 is reached. The capacitor then recharges through unijunction 61 during which time the emitter voltage of transistor 54 equals the collector voltage to turn on transistor 53 and reset multivibrator 52. The time of discharge is related to the speed of movement of the conveyor in that the multivibrator 52 is reset by the time the next link moves into the readout position.

Relay K1 is provided with a normally open switch K1-1 which is connected in series with a switch K2-1 of a further relay K2 to provide energization to a load when the switches K1-1 and K2-1 are closed. This load may, for example, be mechanism to automatically unload the conveyor.

Relay K2 disclosed is a relay to be latched in the energized position by way of a manual switch 70. Until relay K2 has been energized and latched in this position by switch K2-2, it is not possible for relay K1 to energize the load. Multivibrator trigger 52 is capable of initially assuming a state where transistor 54 is conductive, upon initial application of power to the power supply leads 80 and 81. Were it not for switch K2-1 the load would be falsely actuated at this time. If trigger 52 initially assumes such a state, relay K1 is energized and is maintained energized only for a short period of time, whereupon the multivibrator 52 reverts to its normal state wherein transistor 53 is conductive and transistor 54 is nonconductive. After this relatively short period of time, manual switch 70 is closed to latch relay K2 in the energized condition and thereafter energization of relay K1 is effective to actuate the load.

From the above description it can be seen that I have provided a unique control apparatus which is particularly novel in the selective positioning of the lights of the source structure and the photocells of the photocell readout structure, so that each station along the conveyor may be of a similar construction and yet may be coded differently by the simple expedient of positioning of the light sources and the photocells. Other modifications of my invention will be apparent to those skilled in the art and it is thus intended that the scope of my invention be limited solely by the scope of the appended claims.

I claim as my invention:

1. Control apparatus for use with a member which is adapted to be coded with code memory by way of a plurality of physically spaced apertures which are selectively uncovered to code the member by allowing radiation to pass therethrough in a predetermined physically spaced code pattern, the apparatus comprising;

a source of radiation adapted to be positioned on one side of the member,

and radiation sensitive means adapted to be positioned on the other side of the member so that the member interrupts the radiation between said source of radiation and said radiation sensitive means, said radiation sensitive means including mounting means and a plurality of physically spaced photocells mounted thereon, said photocells being selectively positioned in a selected pattern to correspond to a predetermined physically spaced code pattern.

2. Control apparatus for use with a movable member having coded escort memory consisting of a plurality of apertures adapted to allow light to pass through from one side of the member to the other, as a coded pattern of spaced light beams, the apparatus comprising;

photocell readout means adapted to be positioned on the other side of the member, said photocell readout structure including a plurality of spaced photocells and supporting means therefore, said photocells being positioned in a selected pattern to facilitate the selective coding of the photocell readout means to

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readout a desired coded pattern of spaced light beams.

3. Control apparatus for use in reading out a code which is established by the physical position of a plurality of apertures in a coded member, the physical position of the apertures allowing light to pass through the coded member as a predetermined pattern of individual light beams, the apparatus comprising;

a light source positioned on one side of the member to direct light toward the member and through the apertures to form light beams,

and a photocell readout structure positioned on the opposite side of the member in spaced alignment with said light source to intercept the light beams, said photocell readout structure having a plurality of individual photocells equal to the number of light beams, said photocells being movably mounted at preselected physical positions such that the positions selected for the photocells determines the code which will be read out by the photocell readout structure, such code being readily changed by movement of the individual photocells.

4. Photo sensing conveyor control apparatus for use with a movable conveyor having spaced individual portions thereof which are movable over a predetermined course of travel, each portion being provided with coded escort memory of the type including a normally uncovered readout aperture and a plurality of coding apertures at least one of which may be selectively uncovered to allow light on one side of the portion to pass through as spaced beams of light to the other side of the portion of the conveyor, the control apparatus comprising;

light source means adapted to provide light which passes through the apertures in the portions of the conveyor as the conveyor moves by said light source means, thus providing a readout beam of light and at least one coding beam of light on the other side of the conveyor, and

a photocell readout structure adapted to be positioned on the other side of the conveyor in spaced alignment with said light source means to intercept the beams of light, the photocell readout structure being provided with a readout photocell and with spaced mounting means adapted to mount at least one coding photocell, the coding of the photocell readout structure being achieved by the selective positioning of said coding photocell in a predetermined position such that the photocell readout structure will read out only a predetermined positioning of the coding beam as related to the readout beam only when the readout aperture is in position to illuminate said readout photocell.

5. The conveyor control apparatus as defined in claim 4 wherein said readout photocell and said coding photocell are connected to actuate an output load upon a coincidence of illumination of said photocells and wherein timer means are provided to maintain said load actuated for a time period thereafter to thus accommodate subsequent movement of the conveyor.

6. Photo sensing conveyor control apparatus for use with a conveyor having a series of end-to-end coupled links adapted to move over a route of travel, each of the

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links having read-out aperture means and a plurality of coding apertures which are selectively uncovered in a predetermined pattern to provide escort memory for the link, and in which a plurality of conveyor stations are provided along the route of travel, the control apparatus comprising;

means adapted to provide light to be projected toward the conveyor links and to pass through the uncovered apertures of the conveyor links to form a predetermined pattern of light beams on the other side of conveyor link, the pattern being indicative of a preselected escort memory,

and a photocell readout structure adapted to be positioned at a conveyor station and on the other side of the conveyor, said structure including a readout photocell mounted at a fixed position and a coding photocell adapted to be selectively positioned at one of a number of different physical locations to code the photocell readout structure in accordance with a particular code and to thus intercept the light beams and detect a predetermined code of escort memory established on the conveyor links.

7. Conveyor control apparatus for use with a movable conveyor having a plurality of sections each of which includes escort memory consisting of a normally open readout aperture and a plurality of spaced coding apertures, at least one of which may be selectively opened, the apparatus comprising;

a light source adapted to be positioned on one side of the conveyor and including a mounting rack having means adapted to mount a readout light at a fixed position and having a plurality of spaced means adapted to mount at least one coding light selectively positioned to code the light source,

and a photocell readout structure adapted to be positioned on the other side of the conveyor in spaced alignment with said light source and including a mounting rack having means adapted to mount a readout photocell at a fixed position and having a plurality of spaced means adapted to mount at least one coding photocell selectively positioned in spaced alignment with said coding light.

8. Conveyor control apparatus as defined in claim 7 wherein adjustable means are provided to mount said readout light and said coding light to facilitate initial adjustment of said spaced alignment of the lights and photocells.

9. Conveyor control apparatus as defined in claim 7 wherein said photocells are connected to actuate an output load upon a coincidence of light on said photocells and wherein timer means is provided to maintain said output load actuated for a time period thereafter.

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RALPH G. NILSON, *Primary Examiner*.

M. ABRAMSON, *Assistant Examiner*.