

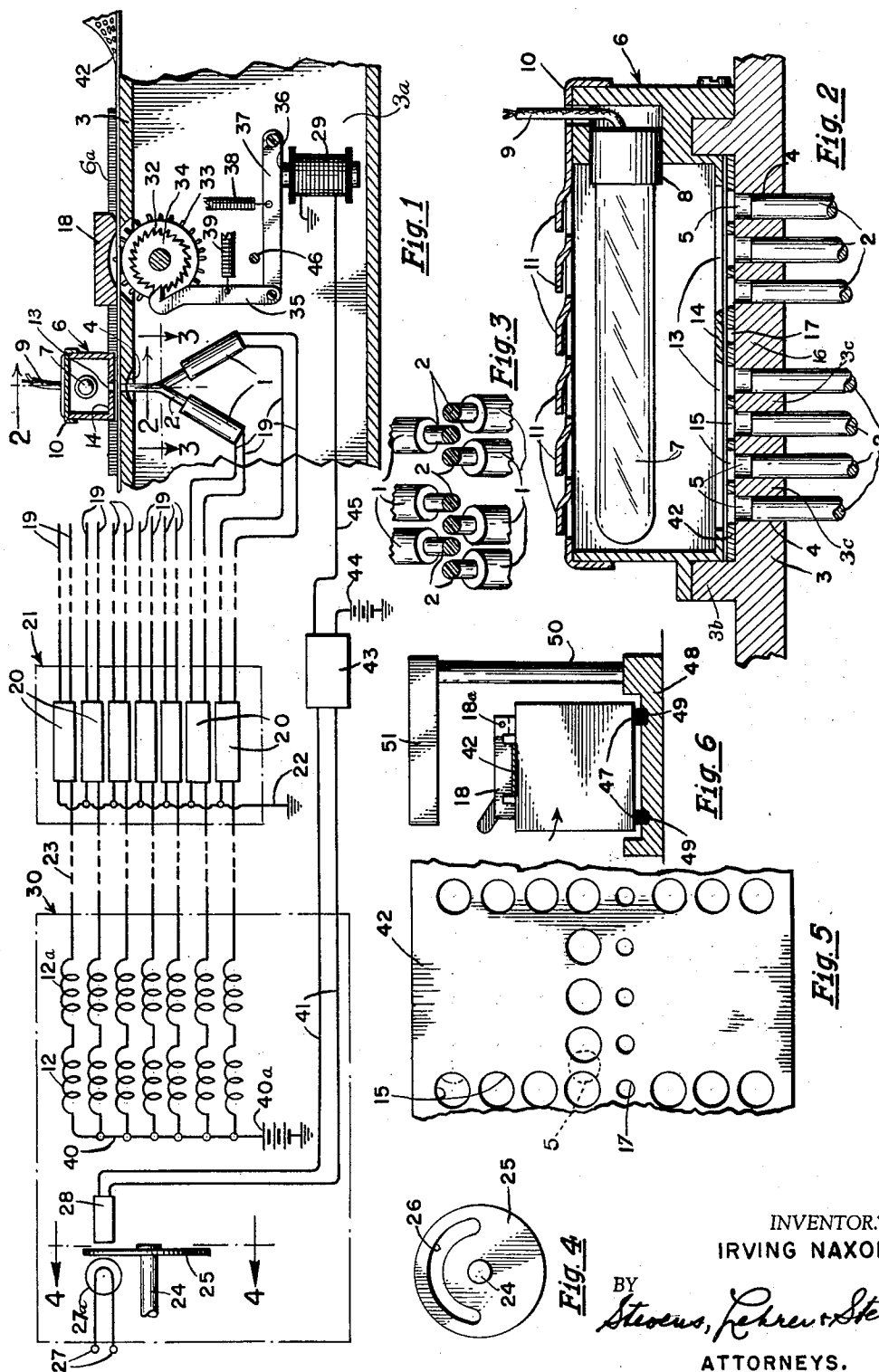
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I. NAXON

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CHARACTER-TRANSMISSION MEANS FOR TRAVELING MESSAGE SIGNS

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INVENTOR:
IRVING NAXON

BY
Stevens, Lehrer & Stevens
ATTORNEYS.

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CHARACTER-TRANSMISSION MEANS FOR TRAVELING MESSAGE SIGNS

Irving Naxon, 3600 W. Touhy Ave., Chicago 45, Ill.

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The present invention deals with means for interpreting character formations in the tapes of traveling message signs in a manner to portray such formations in the sign, this subject being treated in the Nachumsohn Patent No. 2,006,999 and the Naxon Patent No. 2,817,703. The message tapes are formed with perforations arranged in character-forming relation. Fundamentally, perforations occur in tape readers or transmitters employed in printing telegraphy and related arts, where the tape perforations occur in Baudot or other coded forms. In these forms each transverse row of perforations comprises a complete character or signal. On the other hand, in the patents referred to the message tape departs from codes unfamiliar to and unreadable by the average person, and employs known letters and symbols familiar to any typist or sign electrician and of a character to be duplicated exactly in the traveling message sign. A step-by-step feed of the message tape produces successive cross-rows of perforations which combine in groups to form the message letters, with the exception of the letter "I" which is of course contained in a single cross-row. The electric sign letters are therefore reproduced in the character formation of the message tape.

The technique illustrated in the second-named patent for reading the tape perforations comprises a series of fingers arranged transversely of the tape, so that the cross-rows of perforations register in single order with the finger series as the tape is fed intermittently in longitudinal direction. While this type of transmission is efficient in principle, it is unsuited for rapid operation. Functional problems and disadvantages arise in such event as a result of inertia and wear incident to the mechanical fingers, since the longitudinal separation of the tape perforations creates solid material between them and a corresponding interruption of electric current as such material passes each cross-row of perforations. To illustrate, five successive tape impulses are required to produce the top bar of the letter "T" during the step-by-step feed of the tape and the corresponding action of the electromagnets 12 and 12a illustrated in the second-named patent. As translated in the operation of the traveling message sign, the action at a rapid rate develops mechanical errors and electrical reactances productive of inertial sluggishness in the operation of the message sign.

Accordingly, it is one object of the present invention to provide means in the transmission apparatus for causing an elongation of the signal occasioned by a group of successive impulses, so that a series of short signals is replaced by one longer signal. The top bar of the letter "T" may be formed by one long signal in the magnets 12 and 12a of the second-mentioned patent instead of five shorter ones.

Another object is to so arrange the light-passing perforations in the message tape, or otherwise control the light beams, to effect the desirable combining and overlapping of signals occasioned by longitudinally adjacent perforations, so that light beams occurring between any two transversely adjacent tape perforations are concentrated or shrunk to create a comparatively wide gap or underlapping between transversely adjacent light beams.

A still further object is to effect an improvement in traveling message signs by using a tape having uncoded and directly readable characters perforated thereon in combination with photo-optical reading means, and with a different spacing of the perforations in the tape to effect

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a faster response and better functioning of the receiving apparatus. As will be noted in the first-named patent, the spaces between longitudinally adjacent perforations is much greater than between transversely adjacent ones. By spacing adjacent perforations uniformly in both directions, or even favoring by a slightly closer distance the space between any pair of perforations in a longitudinal row, and further combining this feature with a photo-optical readout system which still further tends to exaggerate this difference—as if the transversely adjacent perforations were still further apart, while the longitudinally adjacent perforations read as if they were virtually run together—the functional response of the message-storing and lamp-flashing apparatus will be greatly improved.

Unlike the conventional light-slit between a lamp and photo-cell in a motion picture sound projector where the light aperture is a slit made very narrow in relation to the direction of travel of the film while maintaining a comparatively large dimension in relation to the width of the film, I have found in applying photo-cell reading apparatus to the mechanisms employed in flashing the lamps of traveling message signs that an important improvement is effected in the performance of the entire impulse receiving, storing and lamp-flashing apparatus. This improved performance and result are especially noticeable when telephone lines are employed between the transmitter and the electric selective apparatus located at the sign. Moreover, with my improvements the number of transmission errors is greatly reduced, especially when the lines employed have an abnormally high capacitive reactance.

The high capacitive reactance of modern metallic telephone circuits, due to the large number of conductors in and compactness of underground cables, becomes an objectionable factor in remote-control sign operation, especially at higher transmission speeds. In this area of operation objectionable "cross-talk" or interference from and into adjacent cable conductors must also be considered. It should be noted, therefore, from the very make-up of the alphabet block letters that the transverse rows of perforations—such as for example the two vertical sides or the complete transverse row in the letters I, T, H, M, L, N, etc. are spaced a few intervals away from a similar partial or complete transverse row. In order to create a simple block-letter type of alphabet for a traveling message sign, it should be observed that apart from an occasional diagonal line or connecting symbol the alphabet in the main comprises longitudinal and transverse lines or bars made up of groups of illuminated lamps on the sign and corresponding groups of perforations in the tape. However, the longitudinal rows, such as the top, middle or bottom bars of letters T, E, L, H, etc. are transmitted by signals in immediate and rapid succession. Therefore, the cross-talk or noise induced into adjacent lines would be much more objectionable if a single longitudinal bar were produced by five short on-off impulses, as against a single on-off signal having one-fifth its frequency.

In accordance with the foregoing, a better understanding of the invention may be had by reference to the accompanying drawing, in which—

FIG. 1 is a schematic view of the transmitter incorporating an electric circuit;

FIGS. 2 and 3 are enlarged sections on the lines 2—2 and 3—3 of FIG. 1, respectively;

FIG. 4 is a section on the line 4—4 of FIG. 1;

FIG. 5 is a magnified fragmental top plan view of the message tape; and

FIG. 6 is a sectional view on a reduced scale and similar to FIG. 2, showing a modification.

Specific reference to the drawing shows that FIG. 1 follows the arrangement of FIG. 7 in the second-named

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patent; and similar parts have identical reference numerals. Thus, the magnet is shown at 29, its armature at 37, the pawl at 35, the armature draw-spring at 38, the pawl draw-spring at 39, the ratchet wheel at 34, its teeth at 32, and the feed pins for the message tape 42 at 33. These parts are now contained in a housing 3a having a top 3 over which the message tape 42 is slidable. The top 3 has upward supports 3b (see FIG. 2) for a transversely-positioned casing 6 having a bottom 14 spaced from the top 3 for the passage of the tape 42. The bottom 14 is extended forwardly and rearwardly with a shield 6a for the tape, such shield having an intermediate arch 18 to clear the feed pins 33 of the ratchet wheel 34.

FIGS. 1 and 2 show that the casing 6 contains a transversely-positioned electric lamp 7, and receives a cover 10 formed with ventilating louvers 11. The bottom 14 of the casing has a pair of narrow slots 13, these being in transverse alinement as shown in FIG. 2. This figure also shows that the tape 42 has a transverse row of character-forming apertures 15 directly under the slots 13. Such row has four perforations under one of the slots, and three perforations under the other slot. The perforation rows represent the vertical bars of alphabet letters, numerals or other characters; and FIG. 5 shows the apertures arranged to form the letter "H." A longitudinal series of small perforations 17 is made in the center region of the tape 42 to receive the tape feed pins 33.

The translation of the character formations in the tape 42 into electrical impulses is now accomplished by photo-electric means. Thus, the housing top 3 has a series of vertical bores 5 in registration with the tape perforations 15, such bores being of less diameter than those of the perforations. The bores 5 receive light-rods 2 of transparent plastic substance from below and to a partial extent; and each rod carries a photo-cell 1 at its lower end. As the bores 5 are rather close to each other, there may be insufficient room to position the cells 1 vertically in a transverse row. They are therefore grouped in closely-staggered formation by being deflected outwardly, as seen in FIGS. 1 and 3. The light-rods, bores and adjoining metal surfaces have a dull black coating to prevent leakage or reflected light from causing undesirable stray light-rays. A suitable lens system (not shown) may be employed between the light sources shown and the photo-responsive device.

It follows from the above description that light in the casing 6 will pass through the slots 13 and such perforations in the message tape as come into registration with the slots, and thence into the rods, where it will be "bent" owing to the angularity thereof, to enter the photo-cells 1. These will close and open circuits in the manner of the switches 41 in the second-named patent to operate an electric unit 21 and a transmitter 30. It is noted in the latter that the cam 26 and switch 27 of the second-named patent are replaced by a lamp 27a, fed from a current source 27, whose light is cast through a slot 26 in a rotary disc 25 to energize a separate photo-cell 28 which controls the circuit of a relay device 43.

It is proper to observe at this time that the message tape 42 is of an opaque material, in order that it may only pass light in the region of its character forming perforations. Since light from the casing 6 can only pass to the tape by way of the transversely-spaced slots 13, the intermediate casing bottom portion 14 will bar light from passing through the feed perforations 17, as seen in FIG. 2. Also, light will be concentrated in the bores 5 before it enters the rods 2, while the solid walls in the top 3 between the rods will prevent light received in selected rods from spreading to others. Further, a cut-out 4 is noted in the under side of the top 3 in the region of each of rods 2. These cut-outs are arcuate, as indicated in FIG. 1, with the width of each cut-out corresponding to the diameter of the light-rod, the latter, being pressed and cemented into each cut-out with the upper end of the rod located in registration with the bore.

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The parallel walls 3c remaining between the light-rods further serve as light shields between the rods. With partial reference to FIG. 3, where one feed perforation 17 is shown, it is to be noted that the center portion 16 of the top 3 and the center portion 14 of the casing bottom serve the important function of preventing either direct or reflected light rays, which might pass through the feed perforations or cracks in the tape from straying onto the adjacent light-rods. In traveling message signs it is often desirable to re-run endless loops of tape over prolonged periods of time with resultant wear of the tape occasioned particularly because the metal feed pins fray the feed perforations and enlarge them. Likewise, the body of the tape, particularly if of a paper base, may develop cracks or injuries which might further permit light to stray into the area around the feed perforations. Thus, the upper light shield 14 prevents the vertical rays from entering this area, while the lower solid body 16 further prevents lateral or diagonal rays from reaching the adjacent light rods.

The action of the light in the casing 6 in respect to the traveling message tape and the rods 2, in order to attain the anticipated result, will now be explained. First, the narrow dimension of the cross-slots 13 must be stressed as confining the light to narrow bars as it passes into a cross-row of tape perforations. These will register with their trailing portions in a given cross-row of bores 5 and with their leading portions in the next cross-row as the tape moves a step, as noted in the center portion of FIG. 5. This means that light will be received continuously in any set of longitudinally-grouped tape perforations, such as would make up the top bar of a "T" or the middle bar of an "H." In consequence, a single long impulse, instead of five successive ones, would accomplish the slated result, permitting fast transmission without prejudice to articulation in the sign characters. On the other hand, the light elongation would not affect single perforation characters, as no overlap of perforations would occur.

The modification of FIG. 6 illustrates a similar tape-reader unit mounted independently of the light source. Such unit is shown at 31, the tape at 42, and the shield with the row of bores 5 for the same at 18. The unit is mounted by means of feet 49 on a base 48; and the lamp (not shown) is carried in the headpiece 51 of a standard 50. In this modification the tape reader may be lifted out of position into respect to the base 49 which contains cavities adopted to receive the feet 49 to assure accurate registration and placement of the entire unit on the base with the overhead source of light. By spacing the latter rather far above the entire unit any objectionable heat from the latter is far removed from the photocells; at the same time the spread of light serves as a source of general illumination, enable the operator to start the tape accurately with the feed perforations thereof in perfect registration with the feed wheel. The arch 18 is hinged at 18a to facilitate this operation.

With reference to the light-responsive cells 1 and 28, these may be of the photo-electric or photo-voltaic types. If the former, then a suitable source of current and circuitry (not shown) may be employed; but if the latter type of cell is employed and the values of the light sources are sufficient sensitive relays 20 and 28 may be employed and operated directly by the energy developed by the light source. In place of relays 20 and 43 vacuum tube or transmitter amplifiers may be employed as alternatives. But in the preferred form relays are suggested by outline. Where relays are employed the wires 19 connect with the coils thereof while the wires 23 emanate from the contact points of the relay. It will be noted that ground conductor 22 is connected in common to one side of the seven relay contacts so that when the latter points are closed current from a battery 40a, one side of which is grounded, will energize the selected electromagnets 12—

12a as the contact electromagnets points are closed through the operation of the relays.

Assuming the photo-cell 23 to be photo-voltaic in principle, operation of the cell intermittently during the rotation of the shaft 24 will send a pulsating current into the coil of a relay represented by the outline 43, and the corresponding opening and closing of the relay contacts will pulsate current from the battery 44 through the relay points and the coil 29 through the medium of the conductor 45, the battery and coil being accommodated by a return ground-circuit. In FIG. 1 the dotted-line portions of the horizontal conductors 23 and 19 depict distance, and it will be noted that the relay or amplifier group 21 may be located adjacent to the transmitter, receiver or at an intermediate point. Where the relay-group 21 is located remotely from the transmitter, the lines 19 may be seven pairs of telegraph wires or in lieu of pairs, seven individual wires all having a common metallic or earth-return circuit. While the units 20—whether they be relays or amplifiers—are shown as input circuits, it should be noted that the output circuits may be designed to operate when the input circuits are energized, or on the other hand, when the input circuits are de-energized. In other words, if conventional mechanical relays are employed, the armatures—when magnetically energized—may be made to open their electric contacts rather than close them. This choice is arbitrary. In reference to the magnets 12—12a in the second-named patent these are depicted therein as normally energized, in which case the points of the relays 20 would normally be closed, and the presence of perforations in the tape would then act, through the medium of the photo-cells, to open the relay contacts for the release of one or more steel balls as described in the patent.

I claim:

1. In an electric sign system comprising a rectangular field of lamps and utilizing an opaque message tape provided with perforations selectively arranged in uniform transverse and longitudinal rows in letter formations, an uninterrupted row of feed-holes extending substantially longitudinally of the tape adjacent some of said message perforations, a feed member associated with said feed-holes for moving the tape longitudinally in steps each of which corresponds to a fraction of a known letter and which fractions, when successively grouped together form known letters visibly readable directly from the tape, a plurality of light-responsive elements adjacent said feed-holes and feed member and on one side of the tape, a light-producing means on the opposite side of said tape adapted to feed light through the letter perforations therein to selectively operate the light-responsive elements, additional means adjacent to and associated with said light-producing means for preventing light passing through said feed holes from affecting the light-responsive elements adjacent the feed holes, a rotatable shaft, means driven thereby for selectively operating a plurality of switches connected with said lamps and adapted for receiving the signals from said light-responsive elements in fractions of a letter at a time and for storing the same to combine said fractions into complete letters, and a signal-impulse device operable by the rotation of said shaft for transmitting impulses which control the movement of said feed member to move the tape past said light-responsive elements.

2. A device of the character described comprising a field of illuminable lamps arranged in uniform longitudinal rows, circuit control means connected with said lamps for establishing predetermined character permutations representing letters moving lengthwise of said field and comprising electromagnets and a rotatable storing device having lamp switches selectable by the selective operation of said electromagnets, one for each longitudinal row of lamps, in accordance with said permutations: an opaque message tape having characters thereon made up of a plurality of successive transverse rows of impressions, a

tape-reader positioned crosswise and adjacent said tape operable to photo-optically read the transverse rows one at a time each comprising a fraction of a character and having impulse-controlled feed hole means for feeding said tape, a row of light-responsive elements disposed transversely on one side of said tape, light-producing means on the other side thereof, additional means adjacent to and associated with said light-producing means for preventing stray light from affecting the light-responsive elements adjacent the feed holes, each of said light-responsive elements reading only a given longitudinal row of tape impressions and to control by the operation of a corresponding electromagnet only a predetermined single longitudinal row of lamps in said field, electrical impulse means operable in timed relation with the rotation of said storing device for controlling the speed of said impulse-controlled wires in synchronism therewith and to move the tape past said row of light-responsive elements in fractional letter steps, and a separate relay device in connection with each of said light-responsive means and having input and output circuits, the input circuit of each relay device being connected separately to a given light-responsive element, and the output circuit thereof being connected to a corresponding electromagnet, whereby each light-responsive element controls the illumination of a single longitudinal row of lamps in said field, a plurality of metallic telephone lines grouped together with any additional number of similar conductors which extend in a compact multiple-conductor cable, each of said first-named lines forming a remote-control connecting medium between the output circuit of each of said relay devices and each of said corresponding electromagnets and means, associated with said tape-reader and occasioned by the occurrence of longitudinally adjacent perforations in said tape, for reducing the susceptibility to interference due to electrical reactance among said first-named telephone lines or between any of them and said additional conductors in said cable.

3. The structure of claim 2, a shaft for said rotatable storing device, a separate light-responsive element and source of light associated with said storing device, a relay device therefor having an input circuit connected to said separate light-responsive element and an output circuit adapted to operate said impulse-controlled means, and a disc carried by said shaft, rotatable therewith and having a light opening therein for controlling the operation of said impulse-controlled means by controlling light interruptions between the last named source of light and the separate light-responsive element.

4. A photo-optical tape reader for traveling message signs, comprising a longitudinal field of lamps adapted to be flashed to give the appearance of a series of alphabet letters moving thereacross, a perforated message tape having similar alphabet letters directly readable thereon, a plurality of light-responsive elements arranged in a transverse row across said tape on one side thereof and adapted to read one transverse row of holes at a time which row corresponds to a fraction of each letter, electromagnetic means for moving the tape past the row of light-responsive elements, light-producing means for the latter adapted to permit the rays therefrom to pass through the letter perforations and operate the light-responsive elements, means for preventing light entering through a given perforation in said tape and intended to affect a corresponding light-responsive element from overlapping into a transversely adjacent light-responsive element while, at the same time, permitting light to overlap sufficiently into longitudinally adjacent holes during the advancement of said tape to reduce the tendency towards a complete light interruption due to the space between longitudinally adjacent holes in the tape.

5. In a tape-controlled traveling message sign made up of transverse and longitudinal rows of lamps and having a perforated message tape provided with transverse and longitudinal rows of holes arranged in readable alphabet

characters, the adjacent holes defining a character on said tape being separated substantially uniformly in both directions, a photo-optical tape-reader including a group of photocells and having additional means therein so disposed relative to the spacial relationship between the holes which define a character on the tape and to the coaction of the photocells in response to light passing through said holes to limit the spread of light passing through transversely adjacent holes while effectively extending such spread substantially as light is passed through longitudinally immediately adjacent holes to provide a condition leading to a continuous indicative output from said photocells.

6. The structure of claim 4, and a transversely-positioned casing containing light-producing means and having a bottom surmounting said tape, such bottom having a pair of aligned transverse slots with which said transverse rows of perforations are adapted to register in consecutive order, said means comprising the bottom portion between said slots.

7. The structure of claim 4, wherein the tape contains a longitudinal series of feed holes along a course between given pairs of said transverse perforations, a transversely-positioned casing containing light-producing means and having a bottom surmounting said tape, such bottom having a pair of aligned transverse slots with which said transverse rows of perforations are adapted to register in consecutive order, said means comprising the bottom

portion between said slots as positioned over said series of feed holes.

8. The apparatus of claim 5; said means adapted to provide an area of the light passing through the holes in excess of one-sixth the area thereof.

9. The apparatus of claim 5; said means adapted to provide an area of light passing through the holes sufficiently in excess of one-sixth the area of passage through said holes, to minimize objectionable sharp-cornered signals.

10. The apparatus of claim 5; said means adapted to provide an area of light passing through the holes sufficiently in excess of one-sixth the area of passage through said holes, to reduce interference occasioned by a plurality of objectionable wave forms occurring simultaneously, during the reading of said tape, from acting cumulatively to cause interference in the operation of said sign.

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