LIGHT REFERENCE SYSTEM FOR RAILROAD TRACK SURVEYING

Inventors: Odon Steven Bencsics, 4917 Coronation Ave., Montreal, Quebec, Canada; Helmut Rolf Erich Von Beckmann, 189 Castle Road, Columbia, S.C. 29210

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ABSTRACT
This invention relates to reference systems of the type used for surveying railroad track in which a light beam transmitter, a beam receiver spaced therefrom and a railroad condition sensor having a single edged shadow board is located therebetween. The invention contemplates positioning at least two photo-cells in the receiver physically closely spaced apart in the direction of shadow board motion. The outputs from the photo-electric cells are electrically connected in a differential configuration so that a command signal is generated to stop shadow board movement into the transmitted beam when the shadow board reaches a datum position at which point the distribution of the transmitted light on the photo-cells will have achieved a predetermined difference. In one aspect of the invention a deadband producing photo-cell is provided in the receiver and located physically closely spaced apart from the other two photo-cells in the direction of the shadow board motion and inwardly of the edge thereof when it is in datum position. The deadband producing photo-cell is electrically connected to generate a command signal to commence shadow board movement into the beam when the deadband producing photo-electric cell is exposed by a predetermined amount to the transmitted beam.

5 Claims, 2 Drawing Figures
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BACKGROUND OF INVENTION

This invention relates to reference systems of the type which use a beam transmitter, usually a light beam projector which transmits a reference beam towards a receiver and in which a single edged shadow board is mounted on a road condition sensor between the transmitter and the receiver.

In the past systems of this nature, particularly when used for railroad surfacing work, have used a single edged shadow board positioned closer to the receiver than to the transmitter. In the conditions where fog, or dust-laden air, was encountered during a surveying operation, a good deal of scatter of the transmitted reference light beam took place and consequently the cut-off point of the shadow board in the transmitted beam was affected. Thus, surveying or track correction operations were hampered by the receiver being able to receive quantities of energy from the scattered light beyond the shadow board single edge and whereas in clear air conditions a positive repeatable cut-off datum point for the shadow board was readily established, in fog and like conditions the datum cut-off point of the shadow board was not readily ascertainable or repeatable.

SUMMARY OF INVENTION

It is an object of the present invention to provide a receiver for use with a single edged shadow board which is less affected by light scatter under adverse surveying conditions than receivers hereetofore used.

Accordingly, the present invention provides in a reference system of the type described, the improvement wherein the receiver includes at least two light sensitive transducers physically closely spaced apart in the direction of shadow board motion; and means for electrically connecting the outputs from the transducers in a differential configurational whereby to produce a command signal to stop shadow board motion when the shadow board is positioned at a datum position in the transmitted beam so as to distribute the transmitted light on the transducers with a predetermined difference.

According to a feature of the present invention a deadband producing transducer is provided for the system and is physically closely spaced apart from the first mentioned transducers in the direction of the shadow board motion and inwardly of the shadow board edge when it is in datum position; and means electrically connecting the output from the deadband transducer to the output from the transducer close to the shadow board edge, when it is in datum position, to provide a command signal to commence shadow board movement into the beam when said deadband producing transducer is exposed by a predetermined amount to the transmitted beam.

BRIEF DESCRIPTION OF THE DRAWINGS

The following is a description by way of example, of two embodiments of the invention, reference being had to the accompanying drawings in which:

FIG. 1 which is a schematic representation of the device; and

FIG. 2 is a diagrammatic representation of the device according to FIG. 1, further modified by the inclusion of a deadband transducer.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In the drawings there is schematically shown a surveying system of the type generally in use on railroads where a projector 10, of infra-red light, is mounted on a satellite car which precedes a track surveying or correcting car along the track. A receiver 12 is mounted on the surveying or correcting car and a track condition sensor having a shadow board 13 is mounted between the projector and receiver. The arrangement may be for a track surveying or alignment operation, or for a track horizontal condition surveying or alignment operation. How-
If desired, a second receiver 12a may be mounted outwardly of the receiver 12 and be connected to an alarm circuit 25 such that if an operator inadvertently stands into the path of the transmitted beam, such that the receiver 12 will be obscured from the transmitter, an alarm will be sounded.

What we claim as our invention is:

1. In a reference system comprising a light beam projector, a beam receiver spaced therefrom, a road condition sensor including a single edged shadow board therebetween, the improvement wherein the receiver includes at least two photo-electric cells physically closely spaced apart in the direction of shadow board motion; and means for electrically connecting the outputs from the cells whereby to produce a command signal to stop shadow board movement when the shadow board is positioned at a datum position in the transmitted beam so as to distribute the transmitted light on the cells with a predetermined difference and in which a deadband producing transducer is provided physically closely spaced apart from the said two cells in the direction of the shadow board motion and inwardly of the shadow board edge when it is in datum position; means electrically connecting the output from the deadband producing transducer to the output from the cell close to the shadow board edge, when it is in datum position, to provide a command signal to commence shadow board movement into the beam when said deadband producing transducer is exposed by a predetermined amount to the transmitted beam, which means electrically connecting the output from the deadband producing transducer to the output from the cell close to the shadow board edge, include amplifying means for that cell and for said transducer and a summing and weighing network electrically connected to receive the output signals from each of the amplifying means and adapted to produce an operating signal when the output signals from the amplifying means are in a predetermined ratio to one another; and a trigger circuit activated by said operating signal and providing the command signal to commence shadow board movement into the beam.

2. A system as claimed in claim 1 wherein said summing and weighing network is adjustable.

3. A system as claimed in claim 1 wherein said summing and weighing network is adjustable by potentiometer setting whereby to produce a controllable deadband.

4. A system as claimed in claim 3 wherein the output from the photo-electric cell remote from the shadow board edge is amplified in an amplifying means and wherein a second summing weighing network is electrically connected to receive the output signals from the amplifying means for said outermost photo cell and from the amplifier for said inner photo cell which second summing and weighing network produces an operating signal when the output signals from the two amplifying means connected thereto are in a predetermined ratio to one another; and a second trigger circuit activated by said operating signal from said second summing and weighing circuit and providing a control signal to retract the shadow board out of the transmitted beam.

5. A device as claimed in claim 4 in which a second receiver is provided outwardly of the first receiver and is electrically connected to an alarm system operable if the transmitted beam is inadvertently interrupted.  

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