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(71) Applicant: **Elettromeccanica CM S.r.l.**
51034 Serravalle Pistoiese (PT) (IT)

(72) Inventors:
- **Cappellini, Mario**
  51100 Pistoia (IT)
- **Cappellini, Roberto**
  51016 Montecatini Terme (Pistoia) (IT)

(74) Representative: **Martini, Lazzaro**
Studio Brevetti Ing. Dr. Lazzaro Martini s.r.l.
Via dei Rustici 5
50122 Firenze (IT)

(54) Light signal apparatus, especially for railroads

(57) The invention relates to an apparatus for light signal, comprising more light units (L1, L2, L3) associated with a power source unit (2), characterized in that each of said light units is made up of a matrix of light sources (3) comprising a preset number of luminous groups or sectors connected in parallel to each other; each luminous sector including a preset number of light sources (3) connected in series to each other

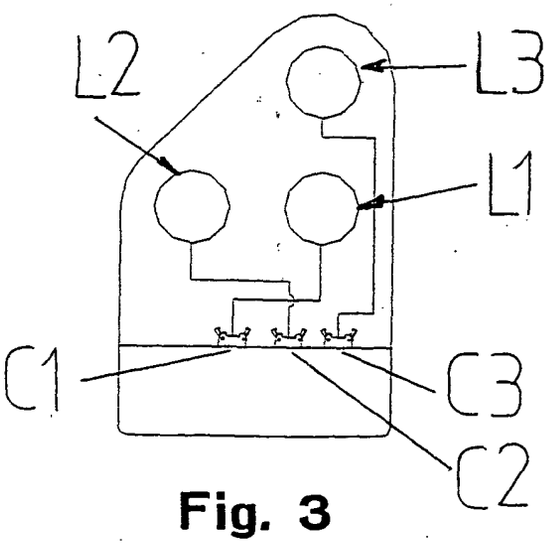

Fig. 3

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Description

[0001] The present invention refers to a light signal, especially for use in the railroad field.

[0002] In the railroad field, maneuver low light signals are known to control the maneuver movements (routings) by switching-on two white lamps vertically superimposed to indicate all-clear way, and two white lamps horizontally lined up to indicate no admittance. These signals comprise three optical groups and three electric power transformers disposed in a container of plastic material. The optical groups make use of incandescent lamps or halogen lamps, with one lamp of each group.

[0003] The light signals of this type have many drawbacks among which the fact that in case of a burnt-out lamp, the relevant useful signal cannot be generated, the fact that overheating, and thus integrity, problems may arise due to the excess of heat generated by the lamps, besides the fact that they may often be affected by the so-called "ghost effect". The latter being a phenomenon of essentially optical nature by which the optical unit - intended to emit the light signal by projecting white or otherwise coloured light - although switched off, is able all the same to project a beam of light following the input and subsequent reflection of foreign radiations (for example, coming from artificial sources like railroad or road lamps and lights, signs, natural sources like sun rays) in the signal-projecting direction. Obviously, an event of such nature would dangerously prejudice the recognition and interpretation of the signals by the train's staff.

[0004] The main object of the present invention is to eliminate or at least greatly reduce the above said drawbacks.

[0005] This result has been achieved, according to the invention, by adopting the idea of making an apparatus having the features disclosed in the claim 1. Further characteristics being set forth in the dependent claims.

[0006] The present invention makes it possible to greatly increase the reliability and thus the operation safety of this type of signal apparatus; to avoid the onset of the "ghost effect"; to reduce the costs related to the inspection and maintenance of the signal apparatus; to limit at a minimum or at least to more acceptable levels the detrimental thermal effects due to the electrical supply of the light sources.

Moreover, an apparatus according to the present invention is relatively simple to make and cost-effective in relation to the its performance.

[0007] These and other advantages and characteristics of the invention will be best understood by anyone skilled in the art from a reading of the following description in conjunction with the attached drawings given as a practical exemplification of the invention, but not to be considered in a limitative sense, wherein:

- Fig. 1 is an exploded perspective rear view of a light signal apparatus according to the invention, relating to the assembly of the power supply;
- Fig. 2 ia a view similar to the preceding one, relating to the assembly of a luminous matrix;
- Fig. 3 is a simplified wiring diagram for connection between the supply and the luminous matrixes;
- Fig. 4 shows schematically a luminous matrix; and
- Fig. 5 is an electric diagram relating to one embodiment of the luminous matrix.

[0008] Reduced to its basic structure, and reference being made to the figures of the attached drawings, a signal apparatus according to the invention comprises three light units L1, L2, L3 disposed according the vertexes of a right-angled triangle within a box-like container 1 of thermoplastic material which is provided with three corresponding front apertures 10, preferably of circular shape. The said units L1, L2, L3 are intended for operating in pairs: for example, in order to signal "all clear" there are activated the units L1 and L2, whereas to signal "no admittance" the units L1 and L2 are activated. For the sake of simplification, the rear lid of the container 1 is not shown in the drawings. The said container 1 has an inner base 11 on which a power supply 2 is fixed for supplying power to the light units L1, L2, L3 via corresponding connectors C1, C2, C3.

[0009] Advantageously, each light unit L1, L2, L3 is made up of a matrix of light sources 3 comprising a preset number of luminous groups or sectors which are connected in parallel to each other: each luminous sector comprising a preset number of light sources 3 connected in series to each other.

[0010] Shown in Fig. 5 is and electric diagram of a matrix with m sectors in parallel, each of which consists of n LEDs in series. Provided on each sector is a relevant limiting resistance (R_1, ..., R_m) and n LEDs ($D_{1,1}$ ..., $D_{m,n}$).

[0011] For example, each unit L1, L2, L3 may comprise eight sectors or groups of thirteen light sources 3, the light sources 3 of each sector being, as above indicated, connected in series to each other, and the sectors being connected in parallel, thereby resulting electrically independent from each other. According to this example, therefore, there will be one hundred and four light sources 3 for each unit L1, L2, L3.

[0012] Each light source 3 may consist of LEDs of lunar white light with a typical light intensity of 1.6 cd at 20 mA, and angle of emission of $\pm 25°$ with respect to its optical axis.

[0013] The light sources 3 of each unit L1, L2, L3 may be mounted on a plate 30 provided with a finned heat sink 31 and mounted on a metal support 32 which allows the same plate to be fixed to the container 1 by screw means.

[0014] The said support 32 may be fixed to the container 1 so as to orient the plate 30 of about 9° upwardly, and about 6° towards the rail under control, so as to make the signal visible to the train's staff also from a

very close distance.

[0015] Between the light units L1, L2, L3 and the respective aperture 10 of container 1, a piano-lens 4 may be positioned by means of a fixing ring nut commonly used for this type of apparatus.

[0016] A light signal apparatus according to the invention is characterized, as above mentioned, by a high reliability.

[0017] As for the reliability of a signal apparatus according to the invention, comprising a matrix of LEDs arranged in sectors in parallel, each sector including one or more LEDs in series, experimental tests have shown that this arrangement allows a significant increase of the reliability and availability of each of the three optical groups (equal to each other) that form the light signal apparatus. The particular embodiment and technology being used actually bring about a very long average life; by way of non-limiting example, such length can be expected of over 20 years.

[0018] It should be apparent that the maintenance signal systems result therefore economical as far as the costs and organization of the maintenance activity are concerned.

[0019] For example, the service interventions can be limited to a simple yearly visual inspection, in order to check the physical integrity and the efficiency of the luminous sectors and to provide for cleaning the lenses 4, by deferring the replacement of the whole matrix at the end of the second year.

[0020] The present apparatus is not provided with optical components like mirrors, prisms, colour filters so that the risk of the occurrence of the so-called "ghost effect" results practically suppressed.

[0021] The container 1 may be provided, in correspondence of the side facing the rail under control, with a screen or shield which further contributes to reduce the probability of the occurrence of the above said phenomenon.

[0022] In place of LEDs, equivalent light sources may be used, organized according to a matrix scheme as above described.

[0023] Particularly positive results, from the constructional and functional point of view have been obtained with matrixes of 8 sectors connected in parallel and consisting of 13 LEDs in series, for a total of 104 LEDs.

Claims

1. Apparatus for light signal, comprising more light units (L1, L2, L3) associated with a power source unit (2), **characterized in that** each of said light units is made up of a matrix of light sources (3) comprising a preset number of luminous groups or sectors connected in parallel to each other; each luminous sector including a preset number of light sources (3) connected in series to each other.

2. Light signal apparatus according to claim 1, **characterized in that** it comprises eight sectors or groups of thirteen light sources (3).

3. Light signal apparatus according to claims 1 and 2, **characterized in that** the said light sources (3) are made up of LEDs of lunar white-coloured light with typical light intensity of 2.6 cd at 20 mA.

4. Light signal apparatus according to one or more preceding claims, **characterized in that** the said light sources (3) of each unit (L1, L2, L3) are mounted on a plate (30) provided with heat sink (31).

5. Light signal apparatus according to one or more preceding claims, located in correspondence of a rail to be guarded, **characterized in that** the said matrixes are oriented of about 9° upwards and about 6° towards the rail under control.

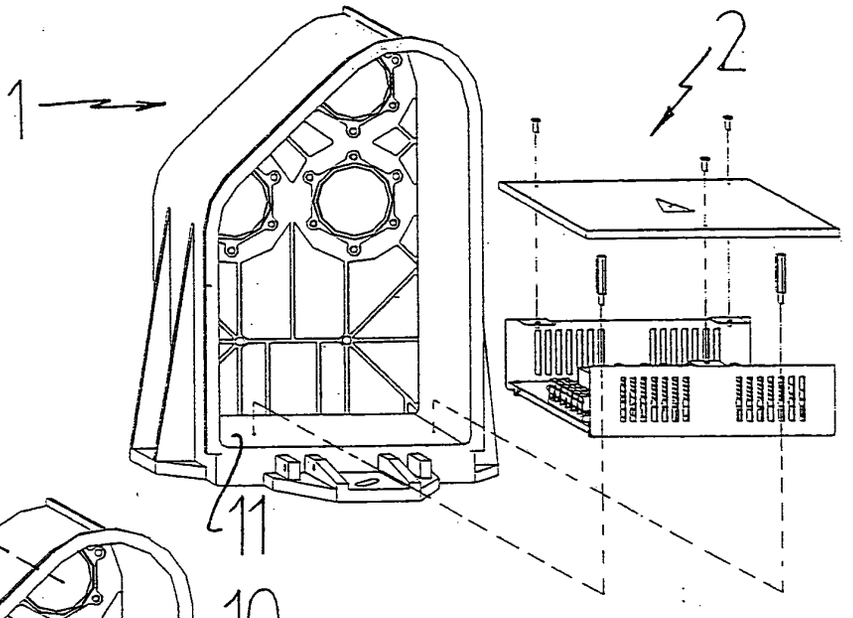

Fig. 1

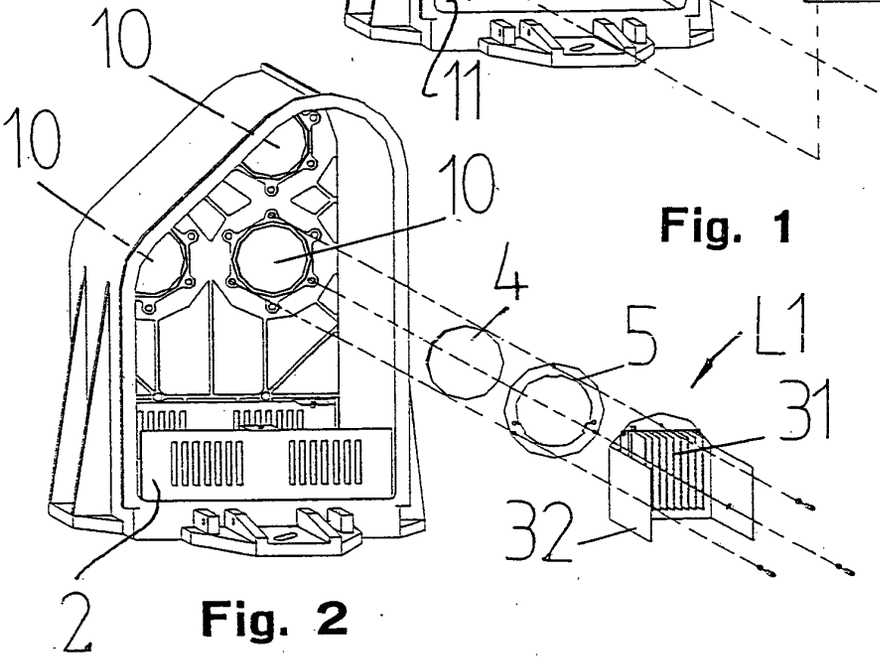

Fig. 2

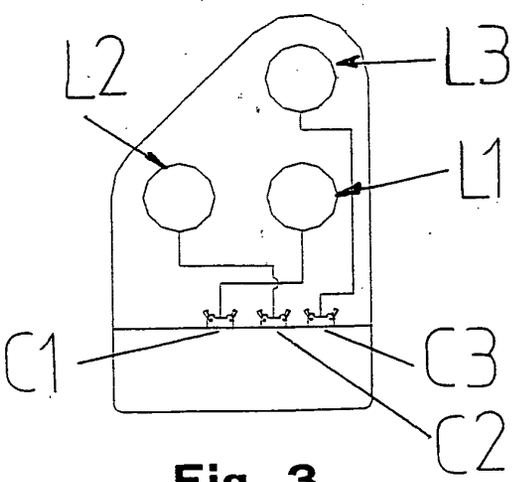

Fig. 3

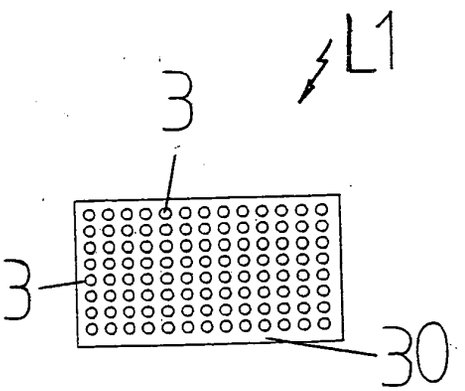

Fig. 4

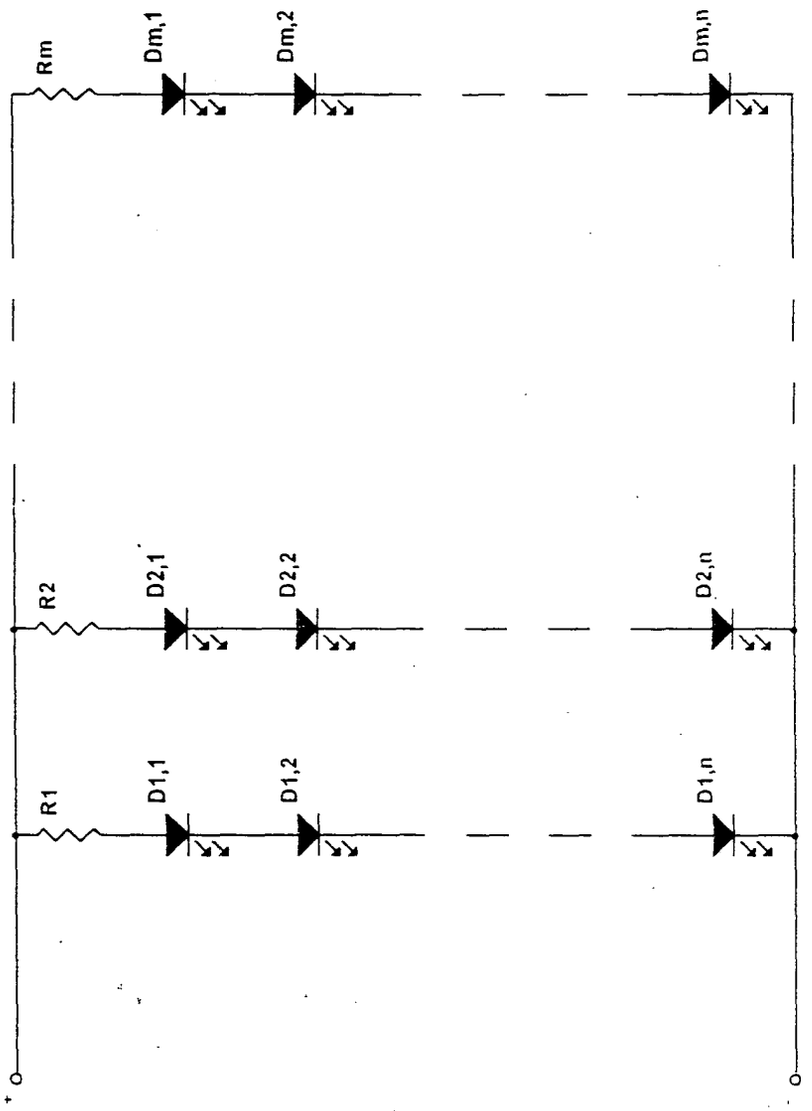

Fig. 5

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 04 42 5234

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	GB 2 329 011 A (HOWELLS RAILWAY PRODUCTS LIMIT) 10 March 1999 (1999-03-10) * page 12, line 33 - page 14, line 1; figure 4 *	1	B61L5/18
Y		4	

Y	US 4 729 076 A (MUNEHARU TOMINAGA ET AL) 1 March 1988 (1988-03-01) * column 2, line 15 - column 3, line 7; figure 4 *	4	

TECHNICAL FIELDS SEARCHED (Int.Cl.7)
B61L

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	14 July 2004	Janhsen, A

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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14-07-2004

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