

Short title: Traffic element with illumination and
transparent plastic component therefor with
illumination means

The present invention relates to a traffic element with illumination, at least comprising an element body having a transparent plastic component which comprises illumination means encapsulated by the plastic of the component.

Such a traffic element is disclosed by EP-A-0 658 655. The said traffic element for example comprises a kerb in which a transparent plastic component is accommodated in a recess. The said transparent plastic component comprises a tray-shaped container of aluminium sheet material in which a bottom slightly ascending from the walls of the container is present. Fitted in said bottom are illuminating elements in the form of LEDs (light-emitting diodes), and the container is filled with a plastic which contains light-refracting particles. Optionally, the space underneath the bottom can likewise be filled.

An important drawback of such a plastic component is, firstly, that the shape of the component is very limited. The component can be fabricated by the plastic provided with particles being cast into the container on top of the LEDs. This means that the illuminating surface thereof which is in contact with the environment is always flat. In practice there are many traffic elements having highly diverse shapes, which therefore cannot be provided with such illumination in the form of transparent plastic component with illumination means, or only with a number of smaller ones. Secondly, casting plastic in an open container of this type is an unreliable and nonreproducible technique, since air bubbles and irregularities can easily be cast within the container. The prior art therefore does not permit reliable and reproducible fabrication of light-emitting, transparent plastic components of diverse shapes and design to be incorporated in traffic elements.

It is an object of the present invention to provide a solution to the abovementioned drawbacks and also to provide a generally improved traffic element, the invention therefore being characterized in that the transparent plastic component is

fabricated by casting a multicomponent plastic in a closed mould.

For the purpose of the present invention casting can suitably include both standard injection moulding and transfer
5 moulding (forcing a charge of encapsulating material into mould cavities with the aid of a displacement chamber). Preferentially, a vacuum multicomponent casting technique is used. The multicomponent casting technique has the advantage, owing to the low processing temperature, that the transparent
10 plastic components fabricated by this technique can comprise elements which are sensitive to high temperatures, such as LEDs, and light-conducting plastic cables.

The traffic element, and therefore also the transparent plastic component thereof, are often exposed to the ageing and,
15 in particular, yellowing effect of solar radiation, in particular ultraviolet solar radiation. The multicomponent casting compound is therefore advantageously chosen from polyurethane or bioresin systems, thus ensuring permanent transparency, since these materials substantially will not
20 yellow or otherwise opacify.

The traffic elements must be able to withstand frequent loading and deformation by traffic, for example cars being driven across them. The multicomponent plastic used should therefore be permanently resilient and tough. The customary
25 clear multicomponent plastics are usually either hard and brittle, or resilient by having plasticizers incorporated therein, which decompose, however, under the influence of sunlight, the resilience being lost as a result. The clear multicomponent plastic is therefore advantageously a resilient
30 multicomponent plastic.

By using casting techniques in a closed mould it is possible, reliably and reproducibly, to give the transparent plastic component virtually any arbitrary shape, without this being subject to any limitation. The traffic element according
35 to the invention can therefore likewise have any arbitrary shape.

Advantageously, the transparent plastic component comprises a reinforcement, for the purpose of increasing the

strength and the loadability. Particularly advantageously, said reinforcement comprises one or more nonwoven webs of polyester.

In particular, the element body comprises a recess in which the transparent plastic component is accommodated at least
5 in part. It is also possible for the transparent plastic component to be disposed on the element body.

Preferably, the outer surface of the transparent plastic component substantially matches the external shape of the element body.

10 In present-day traffic, use is often made of passive traffic channelling in the form of, for example, white lines on the road surface to indicate the various lanes, but instructions are also displayed in the lane. Possible applications are lane indication, get-in-lane boxes and speed instructions. Equally,
15 there are various types of approach indicators such as lines and ridges on the road surface. Obstacles in traffic such as kerbs, traffic islands and the like comprise either passive warning indicators in the form of coloured lines and warning signs or large illumination means such as light boxes and the like.

20 An important drawback of passive traffic channelling is that these always need to be illuminated by external sources of illumination. This can lead to poor visibility. Even during the day it is possible, in the event of bad weather conditions, the sun being low, rain, approaching dusk, snow and falling snow,
25 fog and the like, for visibility to be very considerably restricted.

An important advantage of the traffic element according to the invention is that it is perceived as light-emitting by an observer in the traffic and therefore always remains well
30 visible.

Advantageously, that part of the outer surface of the transparent plastic component which is in contact with the element body, and/or that part of the surface of the element body which is in contact with the transparent plastic component,
35 comprises a light-absorbing material. For example, a layer of adhesive or some other adhesive layer can be used, to which light-absorbing material has been added. The presence of a light-absorbing material has the advantage that if the illumination means have been switched off the traffic element

becomes substantially invisible. In other words, the transparent plastic component, when switched off, will assume the colour of the light-absorbing material, in particular a black material. This embodiment is particularly important if the traffic element is a road surface. If the road surface comprises various transparent plastic components, which serve to indicate the demarcation on the road surface for both a two-lane and a three-lane road, for example, it is important for the transparent plastic components not in use to be invisible to the road user.

Advantageously, that part of the outer surface of the transparent plastic component which is in contact with the element body, and/or that part of the surface of the element body which is in contact with the transparent plastic component, comprises a light-reflecting material which is optionally coloured, one or more of the illumination means facing said reflective material. For example, in this case too a layer of adhesive or some other adhesive layer can be used which is provided with colourants or with optionally coloured light-reflecting substances.

In this way, which will be explained hereinafter in more detail in the figures, the option is provided, for example, for a particular colour impression to be conferred onto the transparent plastic component, giving the impression of there being no question of point-by-point illumination by, for example, LEDs or the like, since the whole component is uniformly illuminated thereby.

Of course, the transparent plastic component can also be given particular colour by a suitable plastic being selected or the latter being coloured in a suitable manner. Apart from coloured plastic or the use of light-reflecting material it is also possible to make use of luminescent, phosphorescent or fluorescent materials or components.

It goes without saying that the transparent plastic component should have connection means for connecting the illumination means to an energy source for energizing the illumination means. The term energy source refers both to an electrical supply and to a light source, in the case of light-conducting cables.

Connecting means for an electrical supply can, for example, comprise suitable connection terminals.

5 An electrical supply of this type can also be co-moulded in the plastic component, for example if use is made of solar cells with a storage battery. This storage battery can be charged by sunlight during the day and in the evening energize the illumination means.

Also possible is a combination of electrically energized illumination means with light-conducting cables.

10 Advantageously, the element body is provided with continuous grooves designed to accommodate lines for connecting the illumination means to an energy source. Possible options for an electrical supply include, for example, generally used connection terminals which can be connected to a supply.

15 In a particular embodiment, the element body is provided with coupling means designed to couple the one element body to the coupling means of another element body. These coupling means can take the form, for example, of a tongue-and-groove joint or a dovetail joint and the like.

20 Preferably, the coupling means also comprise connecting means for the connections of the illumination means, so that the illumination means of element bodies coupled together can be supplied (illuminated) by the energy source via only one connection.

25 The traffic element according to the invention is in no sense limited and can, for example, be selected from a kerb, traffic island, roundabout element, bend marker block, right-of-way triangle etc. In particular, the traffic element is a road surface or part thereof. The traffic element according to the invention offers particular advantages when used as a road surface, for example for the demarcation thereof, direction indication, or speed indication and the like.

30 In the case of a road surface it is preferable for the element body (the road surface) to contain one or more electrical supply leads and for the transparent plastic component to comprise connection terminals which can cooperate with the leads. This type of connection will be explained in more detail in the description for the figures. Thus it is possible for the electrical supply leads to be laid down first

of all in the road surface, and for the plastic component subsequently to be electrically connected thereto in a simple manner.

In particular, in this embodiment, the electrical supply leads are electricity cables insulated by means of an insulation sheath, and the connection terminals comprise sharp connection terminals of electrically conducting material which pierce the insulating sheath of the electricity cables to effect electrical contact. This embodiment will likewise be explained hereinafter in more detail with reference to the figure.

In particular, the illumination means in the traffic element according to the invention comprise one or more substantially flat illuminating elements. Flat illuminating elements have the advantage that the transparent plastic component according to the invention can be made very thin. These can readily be encapsulated during the casting process in the mould. Prior to the casting process, the illumination means can be introduced into the suitably shaped mould cavity in question.

For example, the illuminating elements are selected from LEDs, electrically energized light-emitting foil sections, and preferably from light-conducting cables or components illuminated by light-conducting cables. According to the invention, the illumination means can therefore be illumination means which can be electrically energized from outside the transparent plastic component, although the illumination means can also be in the form of means which are irradiated with the aid of an external light source. The latter case relates, for example, to light-conducting cables. Also possible is a combination of both systems, i.e. illumination means in the transparent plastic component being energized by an electrical supply located outside the transparent plastic component, the illumination means in turn forming a light source for light-conducting cables or the like present in the transparent plastic component.

The term light-conducting cables refers inter alia to fibre-optics quartz cables or glass fibre cables. Advantageously, however, plastic light-conducting cables are used which combine a high light output ratio and low light

absorption with a low price. These plastic light-conducting cables can be chosen, for example, from PMMA or polyamide cables.

Advantageously, the illumination means comprise light-conducting cables which can be illuminated, the light exit ends of the light-conducting cables, in particular, being located within the outer confines of the transparent plastic component. This embodiment is particularly advantageous in the case of a road surface and will be explained hereinafter in more detail in the description of the figures.

In this context, reference is made to FR-A-2 686 104, which discloses a traffic element comprising light-conducting cables. This, however, does not relate to a transparent traffic element and, moreover, the exit ends of the light-conducting cables project beyond the surface of the plastic component, which means that these can readily become damaged and/or dirty. This has major adverse effects on the light output ratio of the light-conducting cables.

Preferably, the transparent plastic component has a substantially T-shaped cross-section. Thus the transparent plastic component can be fastened simply by a groove being introduced into the traffic element, for example a road surface, and the vertical leg of the T-shaped cross section being positioned in the groove. The top, which in that case lies on the traffic element in this arrangement is advantageously chamfered at its circumference towards the element. In particular, the groove in the traffic element is of such design that the load which is applied to the traffic element, for example by a vehicle, substantially does not propagate within the said groove, thus allowing the sensitive electronics for the illumination means, such as an electrical supply or a light source, to be accommodated therein.

The T-shaped cross-section ensures that the transparent plastic component cannot be displaced within the traffic element in the transverse direction. Longitudinal displacement can suitably and reliably be eliminated by the transparent plastic element being locally provided with wing ribs. Such wing ribs, in particular, are partially located within the transparent plastic component and partially outside it. To fasten such a

plastic component within a traffic element it is advisable to arrange not only an elongate groove but also a number of transverse grips to accommodate the said wing ribs. This embodiment will likewise be explained hereinafter in more detail in the description of the figures.

The traffic element preferably has positioning means for the light-conducting cables near the exit end of the light-conducting cables. This thus provides the advantage that when the transparent plastic component is being fabricated by casting in a closed mould, the positioning means can retain the light-conducting cables in position. For example, these positioning means of the wing ribs are projecting lugs with holes in which the ends of the light-conducting cables can be fastened. It will be obvious that it is thus possible, in the case of casting in a closed mould, for the light-conducting cables to be positioned in a suitable manner.

In a preferred embodiment of the traffic element according to the invention, the transparent plastic component contains one or more optical elements near the exit end of the light-conducting cables, said optical elements advantageously being made of the same material as the transparent plastic component. These optical elements are not subject to any particular limitation, but can be selected from lenses, prisms, scattering components etc.

In a particular embodiment, a plurality of LEDs are incorporated in an LED assembly in the transparent plastic component to illuminate the light-conducting cables. This is made possible by the light-conducting cables of the traffic element all being guided towards the said assembly. This offers the advantage that such a LED assembly after fabrication of the transparent plastic component can be accommodated replaceably therein and can likewise easily be replaced in the event of damage or other faults.

The illumination of the light-conducting cables can also be effected in some other way rather than by means of a LED assembly in the transparent plastic component. In particular, the light-conducting cables can be illuminated by a light source situated outside the traffic element. In the case of inexpensive plastic light-conducting cables this has the advantage that the

transparent component can be replaced simply and inexpensively, without the much more expensive light sources having to be replaced.

Advantageously, the light-conducting cables for this purpose are connected to a first connector for coupling to a light source. The light source can be selected from many different light sources. Preferably, however, the light source comprises a LED assembly which is present in a second connector which is suitable for coupling with the first connector.

The connectors used can take the form, for example, of suitably designed plugs, the light-conducting cables ending in the one plug, and a light source being present in the other plug or the plug being connected to said light source. The plug in which the light-conducting cables end can optionally be integrated in the plastic component.

It will be evident that positioning of the light-conducting cables can be effected in many ways; preferably, however, the light-conducting cables are in such positions that light leaving them during use forms an angle of about 20° with the road surface in question at that point. This is particularly advantageous, since at such an angle the illumination and therefore the transparent plastic component can be very readily perceived by road users.

The invention further provides a transparent plastic component which comprises illumination means encapsulated by the plastic and is fabricated by casting a multicomponent plastic in a closed mould, obviously designed for use in a traffic element according to the invention.

A transparent plastic component according to the invention can be accommodated in a recess in an element body, but can likewise be disposed on an element body, for example by gluing or the like.

Finally, the invention provides a wing rib obviously designed for use in a transparent plastic component according to the invention.

Hereinafter, the invention will be explained in more detail with reference to the accompanying drawing in which: Figures 1a, b and c show a number of possible traffic elements according to the invention;

- Figure 2 shows a section on II/II in Figure 1a;
Figure 3 shows a section of a kerb comprising a transparent plastic component according to the invention;
- 5 Figure 4a, b, c shows various steps during the fabrication of a road surface comprising a transparent plastic component according to the invention;
- 10 Figure 5 shows a section of a road surface as a traffic element comprising a transparent plastic component;
- Figure 6 shows a perspective view of the transparent plastic component according to Figure 5;
- Figure 7 shows a partial section of the transparent plastic component according to Figure 6;
- 15 Figure 8 shows an enlarged detail of the section according to Figure 5;
- Figure 9 shows a wing rib according to the invention;
- Figure 10 shows a schematic side view of the transparent plastic component according to Figure 6;
- 20 Figure 11 shows a perspective view of a traffic element according to the invention comprising light-conducting cables and a light source outside the traffic element; and
- 25 Figure 12 shows an example of a plug combination for connecting light-conducting cables with a light source.

Figure 1a shows a perspective view of a roundabout element, Figure 1b showing a perspective view of a verge marker block, and Figure 1c showing a perspective view of a traffic island block. The traffic elements are generally denoted by 1 and comprise a recess 2 which accommodates a transparent plastic component 3 which comprises illumination means in the form of LEDs 4. As is evident from these figures, the outer surface of the transparent plastic component substantially matches the external shape of the traffic element body 5. Figure 1a clearly shows coupling means in the form of a projection 6 at one side and a correspondingly shaped recess 7 on the other side. These coupling means can likewise be provided with suitable connecting

means for electrically coupling the LEDs in the one element 1 to the other element.

The transparent plastic components are preferably fabricated by a vacuum casting technique from a multicomponent plastic, in particular a resilient multicomponent plastic.

Figure 2 shows a section of the traffic element from Figure 1a on II/II. Here the various components are clearly visible, and a channel 8 is visible which serves to accommodate a line 9 to connect the LEDs 4 to an external current source.

Figure 3 shows a section of a kerb wherein it clearly can be seen that the transparent plastic component containing the LEDs has a curved shape.

In the preceding figures, the transparent plastic component is accommodated in each case in a recess in the element body. Whilst being preferable, this is not necessary. The plastic component can equally be attached to an element body.

Figure 4a shows a first step of fabricating a road surface using VOAC (very open asphalt concrete). On top of a foundation 10, which will form the bottom of the recess, insulated electricity cables 11 are laid which serve for the electrical connection by means of connection terminals 12 in the transparent plastic component 13 to energize LEDs 14 present in the plastic component 13.

The connection terminals 12 comprise sharp edges 15 of electrically conducting material, for example metal, which serve to pierce the insulating material of the insulated electricity cables 11 and make contact with the conductor therein.

The reference numeral 16 denotes a layer of adhesive which serves for fastening the light-emitting plastic component 13 to the foundation 10. Disposed on the plastic component 13 is a temporary protective film 17 which can be removed after the VOAC has been applied and rolled.

Figure 4b shows a condition in which VOAC 18 has been applied and the sharp connector 15 is electrically connected to the conductor in the electricity cable 11. The longitudinal recesses 19 serve for good and durable accommodation in the VOAC concrete.

In Figure 4b, the protective film 17 has been removed. For the sake of clarity, the connection between the LEDs 14 and the connection terminal 12 is not shown in any detail.

Figure 4c shows a transparent plastic component 13 which has been arranged in a milled recess 20 in an existing VOAC road surface 21 and is fastened therein by a layer of adhesive 22. The electrical supply leads are here indicated by 23, and can be electrically connected to the illumination means in the same manner as described above with the aid of suitable sharp connectors (not shown).

The reference numeral 24 denotes an anti-skid surface pattern. This prevents the transparent plastic component from becoming slippery in the event of wet weather.

Both in Figure 4a and 4b and also in Figure 4c, the adhesive can be a black adhesive or on the other hand a coloured adhesive. As discussed earlier, a black adhesive provides the advantage that the element body is experienced as being invisible, if the illumination means are not energized.

Figure 5 again shows a road surface 21 with a transparent plastic component 25 having a substantially T-shaped cross section disposed therein. The transparent plastic component 25 is disposed in a groove 26 in a road surface 21 and again fastened with the aid of an adhesive 16. The reference numeral 27 denotes a wing rib which extends in the transverse direction of the transparent plastic component 25 and will be explained below in more detail with reference to Figure 9.

The transparent plastic component 25 comprises a plurality of rows of bosses 28 which are provided with lenticular components 29 at the ends of light-conducting cables 30. These are shown more clearly in the enlarged detail in Figure 5. Such bosses with lenticular components can be directly co-moulded during fabrication of the transparent plastic component in the closed mould.

Figure 6 shows the transparent plastic component 25 according to Figure 5 in a perspective view. It is evident that a plurality of rows of bosses 28 are present which each comprise lenticular components 29 which are connected to light-conducting cables 30.

In Figure 7, a partial longitudinal section of the plastic component 25 of a boss 28 is shown, in which the light-conducting cable 30 is indicated which ends near the lenticular component 29. Also clearly visible here is that the wing rib 27 serves to position the light-conducting cable during fabrication of the transparent plastic component 25. The wing ribs can, of course, have any desired shape and in this first instance serve to position the light-conducting cables 30 in the mould when the transparent plastic component is being cast in a mould.

Preferably, the light-conducting cables 30 end at a short distance from the outer surface of the transparent plastic component 25. In between the exit end of the light-conducting cables and the outer surface an optical element can be present which advantageously consists of the same material as the transparent plastic component.

The angle α is preferably about 20° in the case of a transparent plastic component for a road surface.

Figure 8 shows an enlarged detail of a section of Figure 5, in which the groove 26 is visible into which the vertical leg of the T-shaped transparent plastic component 25 has been introduced. Also visible here are the light-conductive cables 30 which are connected to schematically depicted LEDs 31. With the aid of electrical supply leads 32, the LEDs 31 can be connected, in the same way as described earlier with reference to Figure 4, with the aid of connection terminals 12 having sharp edges, to electricity cables 11 which may have been laid into the groove 26 beforehand.

The transparent plastic component which has been shown in the previous figures and is designed for use in a road surface therefore comprises light-conducting cables as illumination means, said light-conducting cables being capable of being illuminated with the aid of LEDs in the transparent plastic component. Alternatively, however, it is possible to illuminate the light-conducting cables with the aid of a light source situated outside the transparent plastic component. For example, the light-conducting cables can be run to a plug which can be coupled to a second plug, whilst the second plug comprises a light source.

Figure 9 shows an embodiment of a wing rib 27 having lugs 33 thereon with positioning openings 34 for positioning the light-conducting cables 30 when the transparent plastic component is being fabricated in a mould by casting. The advantage of using such wing ribs 27 is not only the positioning accuracy of the light-conducting cables 30 during fabrication of the transparent plastic component 25, but also the positioning accuracy when a transparent plastic component 25 as described with reference to the preceding figures is positioned in a road surface or some other traffic element.

The vertical leg of the T-shaped cross section of the transparent plastic component 25 provides very good stability against possible transverse stress the transparent plastic component may be subjected to. Longitudinal stress is completely eliminated by the presence of the wing ribs 27 which partially project from the material of the transparent plastic component 25. Thus it is advisable, before a transparent plastic component is positioned in e.g. a road surface, not only to provide a longitudinal groove for the vertical leg of the T-shaped cross section, but also various transverse grooves for the wing ribs 27.

Figure 10 shows a schematic side view of the transparent plastic component 25 according to Figure 5. The reference numeral 35 denotes a replaceable LED assembly which comprises a large number of LEDs 31 which are all connected to one or more light-conducting cables 30. The advantage of using a LED assembly is that this assembly 35 can be fitted, for example, after fabrication of the transparent plastic component 25 and can easily be replaced in the event of damage or defects.

Figure 11 shows a perspective view of a traffic element as shown in Figure 1b, the illuminating elements, however, comprising light-conducting cables 30 which end near the surface of the transparent plastic component 3 and are there able to illuminate the traffic element by scattering. The light-conducting cables 30 all merge in a first connector, here indicated as a plug 36. This plug 36 can suitably be coupled to a socket which comprises a light source.

An example of such a plug assembly is shown in Figure 12. This plug assembly comprises a first connector 37 and a

second connector 38 of mating suitable design. The connector 37 is a plug which comprises a housing 39 into which the light-conducting cables 30 debouch. The second connector 38 comprises a plug having a housing 40 in which LEDs 41 are present which
5 can be supplied with the aid of an electric supply cable 42. The housing 40 fits into the housing 39. Thus the light-conducting cables 30 can be illuminated by the LEDs 41, resulting in illumination of the traffic element as shown in Figure 11. It will be evident that instead of LEDs it is also possible to use
10 other illumination means.



CLAIMS

1. Traffic element with illumination, at least comprising an element body having a transparent plastic component which
5 comprises illumination means encapsulated by the plastic of the component, characterized in that the transparent plastic component is fabricated by casting a multicomponent plastic in a closed mould.
2. Traffic element according to claim 1, characterized in
10 that the multicomponent plastic is selected from polyurethane systems or clear bioresin systems.
3. Traffic element according to claim 1 or 2, characterized in that the multicomponent plastic is a resilient multicomponent plastic.
- 15 4. Traffic element according to claims 1-3, characterized in that the plastic component comprises a reinforcement.
5. Traffic element according to claim 4, characterized in that the reinforcement comprises one or more nonwoven polyester webs.
- 20 6. Traffic element according to any one of the preceding claims, characterized in that the outer surface of the transparent plastic component substantially matches the external shape of the element body.
7. Traffic element according to any one of the preceding
25 claims, characterized in that the traffic element is a road surface (18, 21) or a part thereof.
8. Traffic element according to any one of the preceding claims, characterized in that the illumination means comprise light-conducting cables (30) which can be illuminated.
- 30 9. Traffic element according to claim 8, characterized in that the light-conducting cables comprise light-conducting plastic cables.
10. Traffic element according to claim 8 or 9, characterized in that the light exit ends of the light-
35 conducting cables (30) which are designed to emit light are located within the outer confines of the transparent plastic component (25).

This Sheet Has Been Replaced





11. Traffic element according to any one of the preceding claims, characterized in that the transparent plastic component (25) has a substantially T-shaped cross section.
12. Traffic element according to one or more of claims 8-11, characterized in that positioning means for the light-conducting cables are present near the exit end of the light-conducting cables.
13. Traffic element according to one or more of claims 8-12, characterized in that the transparent plastic component contains one or more optical elements for the exit end of the light-conducting cables.
14. Traffic element according to claim 13, characterized in that the optical elements which are present upstream of the exit end of the light-conducting cables are made of the same material as the transparent plastic component.
15. Traffic element according to one or more of claims 8-14, characterized in that a plurality of LEDs (31) are incorporated in a LED assembly (35) in the transparent plastic component (25) to illuminate the light-conducting cables.
16. Traffic element according to one or more of claims 8-15, characterized in that the light-conducting cables (30) can be illuminated by a light source (41) located outside the traffic element.
17. Traffic element according to one or more of claims 8-16, characterized in that in the case of the traffic element being a road surface or a part of a road surface the light-conducting cables (30) are in such positions that light leaving them in use forms an angle of about 20° with the road surface (25) in question.
18. Transparent plastic component which comprises illumination means encapsulated by the plastic of the component and is fabricated by casting a multicomponent plastic in a closed mould, obviously designed for use in a traffic element according to one or more of claims 1-17.
19. Wing rib obviously designed for use in a transparent plastic component according to claim 18.