

Description

[0001] The present invention relates to a vehicle light fitted with at least one front sidelight and at least one lateral sidelight, wherein the term vehicle light is understood to mean indifferently a rear vehicle light or a front vehicle light, the latter also known as a headlight.

[0002] In the same way, the front sidelight is understood to mean a sidelight directed along the longitudinal axis of the vehicle, that is to say, rearwards in the case of a tail light or forwards in the case of a front light or headlight.

[0003] As is known, a vehicle light is a lighting and/or signalling device of a vehicle comprising at least one outer light of the vehicle having a lighting or signalling function outwards of the vehicle.

[0004] The vehicle light, in its simplest form comprises a container body, a lenticular body and at least one light source.

[0005] The lenticular body is placed so as to close a mouth of the container body so as to form a housing chamber. The light source is arranged inside the housing chamber, which may be directed so as to emit light towards the lenticular body, when powered with electricity.

[0006] Vehicle lights are provided with at least one rear or front sidelight and, in some cases, may be provided with at least one lateral rear or front sidelight.

[0007] The sidelight, whether front or rear, is generally used to signal the presence of the vehicle to which it is applied.

[0008] The rear or front lateral sidelight is used for example to indicate to others the lateral dimensions of the vehicle.

[0009] The co-presence of rear/front and lateral sidelights in the same rear/front vehicle light entails some construction complications of the vehicle light. In fact, the longitudinal and transversal luminous beams (whether rear or front) must comply with legal specifications both in terms of luminous power and of geometrics, that is to say the aperture of the luminous beam produced.

[0010] The solutions of the prior art envisage the use of specific and separate light sources for performing the longitudinal and lateral sidelight functions: in other words, the light sources used for the rear/front sidelights are different from those used for the transversal sidelights.

[0011] Such solutions of the prior art are therefore expensive to manufacture in that they envisage a large number of components, increasing the production and assembly costs of the lights.

[0012] The purpose of the present invention is to make a vehicle light provided with at least one rear/front sidelight and at least one lateral sidelight, which has reduced manufacturing and functioning costs.

[0013] Such purpose is achieved by a vehicle light according to claim 1.

[0014] Other embodiments of the vehicle light according to the invention are described in the subsequent claims.

[0015] Further characteristics and advantages of the present invention will be more clearly comprehensible from the description given below of its preferred and non-limiting embodiments, wherein:

5 **[0016]** -figure 1 shows a perspective view, in an assembled configuration, of a vehicle light according to the present invention;

[0017] -figure 2 shows a perspective view in separate parts of the light in figure 1;

10 **[0018]** -figure 3 shows a perspective view of several components of the light in figure 1;

[0019] -figures 4-5 show cross-section views of the light in figure 1.

15 **[0020]** The elements or parts of elements common to the embodiments described below will be indicated using the same reference numerals.

[0021] With reference to the aforementioned figures, reference numeral 4 globally denotes a vehicle light; the definition of vehicle light should be understood in its widest sense, comprising a light suitable for being used on any type of locomotive vehicle. The term vehicle light is understood to mean indifferently a rear vehicle light or a front vehicle light, the latter also known as a headlight.

20 **[0022]** The vehicle light 4 comprises a container body 8 and a lenticular body 12 which at least partially define a housing chamber 16 hosting at least one light source 20.

[0023] The light source 20 is electrically connected to electrical connection means to power the same.

30 **[0024]** Preferably, said light source 20 is a light emission diode light source. Said light emission diode light source 20 comprises an electric support and connection component 24 and at least one light emission diode 28 connected to said electric support and connection component 24.

35 **[0025]** The container body 8 comprises a mouth 32 through which it usually receives and contains the various components of the light 4; the container body 8 further permits the attachment of the light 4 to the relative vehicle.

40 **[0026]** The lenticular body is made from at least partially transparent, or semi-transparent or translucent material, and may also comprise an opaque portion.

[0027] The lenticular body 12 is placed so as to close the mouth 32 of the container body 8, so as to enclose said housing chamber 16.

[0028] Further components of the vehicle light 4 are placed inside the housing chamber 16, such as a reflector body 36, further light sources not shown, and at least one light guide 40.

50 **[0029]** The reflector body 36 is usually made from an opaque material and has a substantially concave shape with its inner surface mirror-treated, that is to say metalised. The reflector body 36 is, moreover, divided into a first portion 36a and a second portion 36b. The first portion 36a of the reflector body 36 extends in a series of shell-shaped reflecting elements 37 and is coupled to a further light source, not shown, comprising a plurality of

light emission diode light sources. More specifically, each light emission diode light source is paired with a respective shell-shaped reflecting element 37, so that the beam of light emitted by the light emission diode light source is reflected on the inner metallised surface of the respective shell-shaped reflecting element and projected at a distance after traversing the lenticular body 12. A light of the vehicle light, such as a brake light, is thereby realised. Similarly the second portion 36b of the reflector body is coupled to a light source, not shown, to make a light of the vehicle light, for example an indicator light.

[0030] The light guide 40 comprises a light guide body 44 suitable for receiving the beam of light emitted by the light source 20 so as to collect and propagate within itself the light emitted by the light source 20.

[0031] The light guide body is usually made from a transparent material and bases its functioning principle on the same physical principles which regulate the transmission of light inside optic fibres. The light guide body 44 is placed next to the light source 20 so as to collect and propagate within itself the light emitted by said light source. The light propagated inside the light guide body 44 is then extracted and distributed in the surrounding space as desired, as described better below.

[0032] The container body 8, the lenticular body 12, the reflector body 36 and the light guide body 44 are usually made respectively of one or more polymer materials, such as, for example, polycarbonate (PC), polymethyl methacrylate (PMMA) (plexiglass), acrylonitrile butadiene styrene (ABS), APEC, or polypropylene (PP).

[0033] The light guide 40 is fitted with a plurality of light deviation/extraction elements applied to the light guide body 44, suitable for deviating/extracting the light propagated inside the light guide body 44 outwards of the light guide 40.

[0034] The light guide body 40 extends from a lateral end 52 to a longitudinal end 56 so as to transmit the light between said ends 52, 56, wherein at the lateral end 52 the light guide 40 emits a transversal beam of light, directed in a transversal direction Y-Y, that is perpendicular to a longitudinal or advancement direction X-X of the associable vehicle to which the light 4 is attached. At the longitudinal end 56 the light guide 40 emits a longitudinal beam of light, directed substantially in the longitudinal direction X-X, perpendicular to said transversal direction Y-Y.

[0035] The emission of light in a transversal beam of light fulfils the lateral sidelight function while the emission of light in a longitudinal beam of light fulfils the longitudinal sidelight function (both front or rear).

[0036] The definition of the transversal Y-Y direction and longitudinal X-X direction should not be understood in a strict sense; in other words the transversal and longitudinal beams of light need not be considered perfectly perpendicular to each other, nor need they be considered perfectly parallel to the transversal and longitudinal directions of the associable vehicle.

[0037] The transversal beam of light must globally perform the lateral sidelight function of the vehicle light.

[0038] Despite this, the transversal rays of light T of the transversal beam of light are not necessarily all parallel to each other and to the transversal direction. For example, there may be, for design requirements, transversal rays of light T angled in relation to said transversal direction Y-Y according to angles of incidence α and

[0039] β even opposite to each other (figure 5).

[0040] The longitudinal beam of light is not necessarily parallel to the direction of driving, that is to say the longitudinal direction X-X but may comprise longitudinal rays of light L which are not necessarily parallel but which are also incident to said longitudinal direction X-X, identifying therewith an angle γ . In other words, the longitudinal beam of light must globally perform the longitudinal sidelight function.

[0041] Advantageously, the light source 20 is situated near said lateral end 52 of the light guide body 44 so as to emit a luminous beam which is propagated inside the light guide body 44 moving from the lateral end 52 towards the longitudinal end 56.

[0042] Advantageously, at said lateral end 52 the light guide 40 comprises moreover first light deviation/extraction elements 60 which extract the light from the light guide body 44 in a substantially transversal direction Y-Y and towards the lenticular body 12. Said first light deviation/extraction elements 60 thereby create the beam of transversal light directed along the transversal direction Y-Y.

[0043] In particular the first light deviation/extraction elements 60 are positioned on the light guide body 44 on the container body side so as to extract the light towards the lenticular body 12, that is outwards of the vehicle light 4.

[0044] Advantageously, at the longitudinal end 56 the light guide 40 further comprises second light deviation/extraction elements 64 which extract the light from the light guide body 44 in a substantially longitudinal direction X-X and in the direction of the lenticular body 12.

[0045] Said second light deviation/extraction elements 64 thereby create the beam of longitudinal light directed in the longitudinal direction X-X.

[0046] In particular the second light deviation/extraction elements 64 are positioned on the light guide body 44 on the container body side 8 so as to extract the light towards the lenticular body 12, that is outwards of the vehicle light 4.

[0047] Preferably, the first and second light deviation/extraction elements 60, 64 are direct prisms suitable for encouraging the extraction of the light from the light guide body 44 by means of a single reflection of said light on each single prism.

[0048] At the lateral end 52, the vehicle light 4 comprises a plurality of diffusion elements 68 of the luminous flow, said diffusion elements 68 being positioned between the light guide 40 and the lenticular body 12 so as to receive the transversal beam of light and to expand it

in said transversal direction Y-Y according to one or more predefined angles.

[0049] In particular the diffusion elements 68 are directly facing the light guide body 44 at a surface of the light guide body opposite that supporting the first light deviation/extraction element 60.

[0050] The diffusion elements 68 are directly facing the lateral end 52 of the light guide 40 and are supported by an intermediate lens 72 positioned between the lenticular body 12 and the light guide 40.

[0051] According to one embodiment, said diffusion elements 68 are positioned on a terminal strip 76 which identifies a direction of extension S-S incident or inclined to said lateral end 52 of the light guide 40.

[0052] In other words, the diffusion elements are oriented on a terminal strip 76 which is not parallel but incident to the first light deviation/extraction elements 60.

[0053] According to one embodiment, said terminal strip 76 is positioned on a recess 80 made on the intermediate lens 72, said recess 80 extending towards the first light deviation/extraction elements 60.

[0054] According to one embodiment, said diffusion elements 68 are semi-spherical lenses.

[0055] According to one embodiment, said diffusion elements 68 are shaped so as to diffuse the luminous flow asymmetrically to said transversal direction Y-Y. In other words, the luminous flow may be distributed so as not to be perfectly symmetrical to an axis parallel to said transversal direction Y-Y, but to be, for example, asymmetrically projected in the longitudinal direction X-X, in one direction or the other depending on whether the vehicle light is for example rear or front, or in any case according to the design requirements.

[0056] In yet other words, with reference to figure 5, there may be, for design requirements, rays of transversal light T at an angle to said transversal direction Y-Y according to angles of incidence α and β not only opposite each other in the longitudinal direction X-X but also different from each other in terms of breadth.

[0057] The intermediate lens 72 is transparent at the portions facing the first and second light deviation/extraction elements 60, 64, so as to permit the passage towards the outer lenticular body 12 of the light extracted from the light guide body 44.

[0058] The intermediate lens 72 may also comprise screens, that is, portions opaque to the passage of light, depending on the aesthetic requirements of the vehicle light.

[0059] Preferably, the light guide 40, in an intermediate portion between said lateral 52 and longitudinal ends 56 is lacking light deviation/extraction elements so as to transmit the light from the lateral end 52 towards the longitudinal end 56 without dispersions of light.

[0060] The light guide 40 has an overall curved pattern substantially like the arc of a circle and/or parabola.

[0061] According to one embodiment, the vehicle light 4 according to the present invention comprises at least one second light guide 40", separate from said first light

guide 40, the second light guide 40" comprising a second light guide body 44" and a second light source 20" and further light deviation/extraction elements 64" which extract the light in a substantially longitudinal direction X-X.

[0062] Preferably, the said second light source 20" is electrically connected to said first light source 20 and is positioned near a lateral end 52" of the second light guide 40".

[0063] The vehicle light 4 may also comprise further light guides, such as for example a third light guide 40''' comprising a third light guide body 44''' and light deviation/extraction elements 64''' and relative light sources 20'''.

[0064] As may be seen from the description, the vehicle light according to the invention makes it possible to overcome the drawbacks of the prior art presented.

[0065] In fact, unlike the solutions of the prior art, the vehicle light according to the present invention makes it possible to contemporarily fulfil the function of lateral and longitudinal sidelight, whether front or rear, using a reduced number of components.

[0066] In particular the same light guide is able to provide, by means of the same light source, both the luminous beam for the lateral sidelight and the luminous beam for the longitudinal sidelight. The use of two specific and separate light guides or at least two specific and separate luminous sources is thereby avoided.

[0067] This way the construction of the vehicle light is simplified, and is therefore more economical to manufacture and to assemble. Moreover, the energy consumption is also reduced since the same light source fulfils the two aforementioned sidelight functions.

[0068] It is to be noted that, the same luminous source used for the two sidelight functions is optimised in terms of energy consumption. In fact, such luminous source is positioned at the lateral end so as to diffuse the luminous flow through the light guide body, towards the longitudinal end. Most of the luminous flow produced by the luminous source must be used for the longitudinal sidelight function and, consequently, the light guide is optimised depending on such longitudinal luminous flow. The second light deviation/extraction means are therefore preferably of the direct type that is, they extract the light from the light guide body following a single inner reflection. This way the dispersions of luminous flow are minimal: the emission of the longitudinal flow which, as seen, accounts for the greater part of the flow to be directed outwards of the vehicle light, is thereby optimised.

[0069] Moreover, as regards the lateral sidelight, it may be observed that the respective flow of transversal light is also optimised.

[0070] In fact, the transversal flow must comply with specific standards which regulate the angles of aperture, in the longitudinal direction, both forwards and rearwards.

[0071] It has thus been found that the extraction of the luminous beam in a substantially transversal direction and its subsequent diffusion in a longitudinal direction permits a higher energy efficiency compared to the so-

lution of extracting the flow directly in a conical beam.

[0072] In fact, the solution proposed in the present invention makes it possible to extract the light in a transversal direction, using in this case too, light deviation/extraction elements of the direct type which require a single reflection of the luminous ray.

[0073] This first extraction step thereby entails a high luminous output. The subsequent step of opening the beam is equally efficient and permits, thanks to the diffusion elements, an extremely precise control of the geometry of the beam to be extracted. This way the geometry/aperture of the beam of transversal light emitted can be controlled with extreme precision.

[0074] A person skilled in the art may make numerous modifications and variations to the vehicles lights described above so as to satisfy contingent and specific requirements, while remaining within the sphere of protection of the invention as defined by the following claims.

Claims

1. Vehicle light (4) comprising

- a container body (8) and a lenticular body (12) which at least partially define a housing chamber (16) hosting at least one light source (20),
- said light source (20) being electrically connected to electrical connection means to power the same,
- wherein said vehicle light (4) comprises at least one light guide (40) having a light guide body (44) suitable for receiving the beam of light from the light source (20) so as to collect and propagate within itself the light emitted by the light source (20),
- wherein the light guide (40) is fitted with a plurality of light deviation/extraction elements (60, 64) applied to the light guide body (44), suitable for deviating/extracting the light propagated inside the light guide body (44) outwards of the light guide (40), **characterised in that**
- said light guide body (44) extends from a lateral end (52) to a longitudinal end (56) so as to transmit the light between said ends (52, 56), wherein at the lateral end (52) the light guide (40) emits a transversal beam of light, directed in a transversal direction (Y-Y), that is, perpendicular to a longitudinal or advancement direction (X-X) of the associable vehicle to which the light (4) is attached, and wherein at the longitudinal end (56) the light guide body (44) emits a longitudinal beam of light directed substantially in the direction of advancement (X-X) perpendicular to said transversal direction (Y-Y),
- wherein the light source (20) is situated near said lateral end (52) so as to emit a luminous beam which is propagated inside the light guide

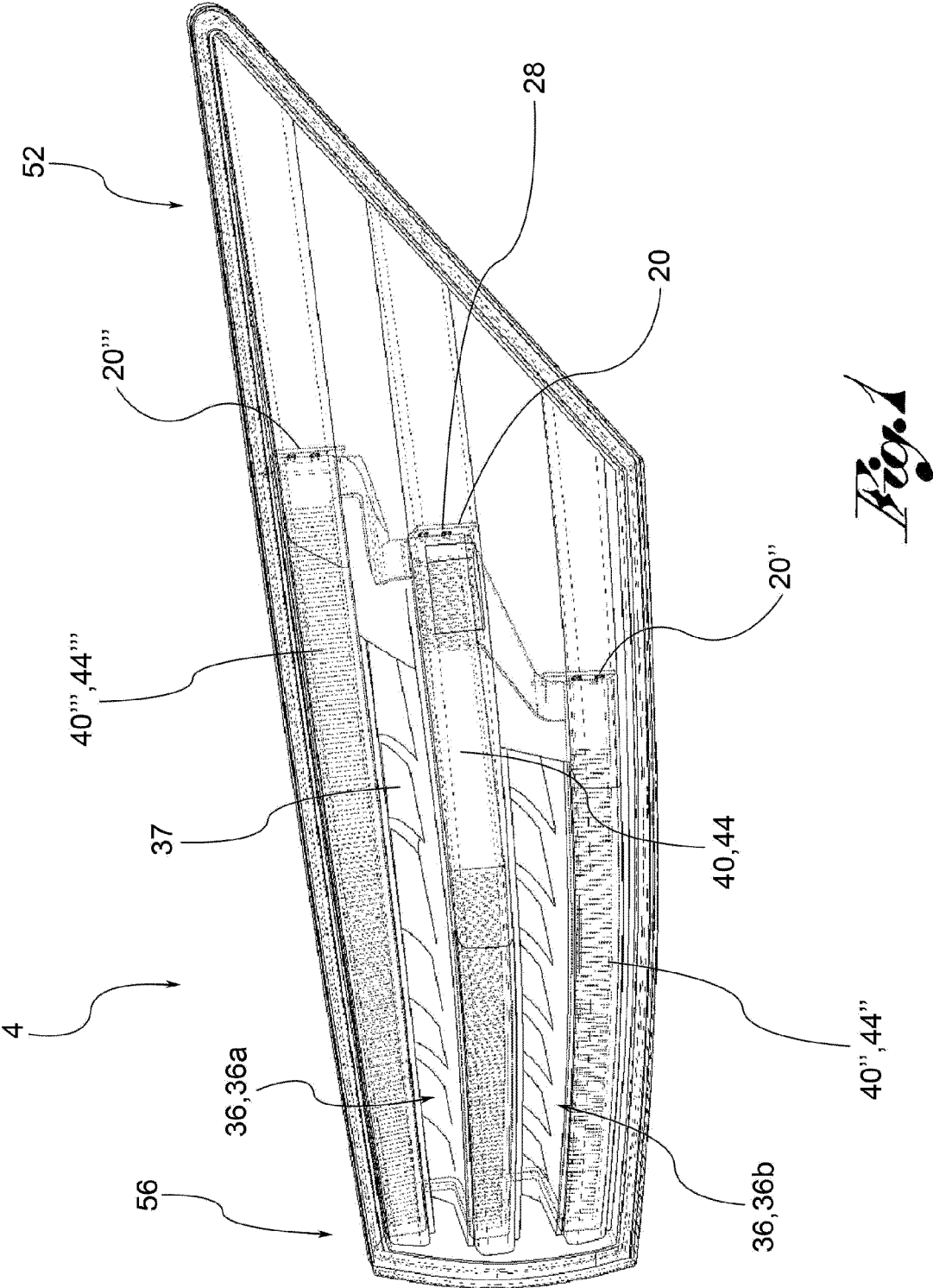
body (44) moving from the lateral end (52) towards the longitudinal end (56),

- wherein at the lateral end (52) the light guide (40) comprises first light deviation/extraction elements (60) which extract the light from the light guide (40) in a substantially transversal direction (Y-Y) and in the direction of the lenticular body (12),

- wherein at the longitudinal end (56) the light guide (40) comprises second light deviation/extraction elements (64) which extract the light from the light guide (40) in a substantially longitudinal direction (X-X) and in the direction of the lenticular body (12).

2. Vehicle light (4) according to claim 1, wherein the first and second light deviation/extraction elements (60, 64), are direct prisms suitable for encouraging the extraction of the light from the light guide body (44) by means of a single reflection of said light on each single prism.
3. Vehicle light (4) according to claim 1 or 2, wherein at the lateral end (52), the light (4) comprises a plurality of diffusion elements (68) of the luminous flow, said diffusion elements (68) being positioned between the light guide (40) and the lenticular body (12) so as to receive the transversal beam of light and to expand it in said transversal direction (Y-Y) at one or more predefined aperture angles.
4. Vehicle light (4) according to claim 3, wherein said diffusion elements (68) are directly facing the lateral end (52) of the light guide (40) and are supported by an intermediate lens (72) positioned between the lenticular body (12) and the light guide (40).
5. Vehicle light (4) according to claim 3 or 4, wherein said diffusion elements (68) are positioned on a terminal strip (76) which identifies a direction of extension (S-S) incident or inclined to said lateral end (52) of the light guide (40).
6. Vehicle light (4) according to claim 5, wherein said terminal strip (76) is positioned on a recess (80) made on the intermediate lens (72), said recess (80) extending towards the first light deviation/extraction elements (60).
7. Vehicle light (4) according to any of the claims from 3 to 6 wherein said diffusion elements (68) are semi-spherical lenses.
8. Vehicle light (4) according to any of the claims from 3 to 7 wherein said diffusion elements (68) are shaped so as to diffuse the luminous flow asymmetrically to said transversal direction (Y-Y).

9. Vehicle light (4) according to any of the claims from 4 to 8 wherein said intermediate lens (72) is transparent at the portions facing the first and second light deviation/extraction elements (60,64), so as to permit the passage towards the outer lenticular body (12) of the light extracted from the light guide body (44). 5
10. Vehicle light (4) according to any of the previous claims, wherein the light source (20) is a light source comprising at least one light-emitting diode (28). 10
11. Vehicle light (4) according to any of the previous claims, wherein the light guide (40), in an intermediate portion between said lateral and longitudinal ends (52,56) is lacking light deviation/extraction elements, so as to transmit the light from the lateral end (52) towards the longitudinal end (56) without dispersions of light. 15
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12. Vehicle light (4) according to any of the previous claims, wherein the light guide (40) has a curved pattern substantially like the arc of a circle and/or parabola. 25
13. Vehicle light (4) according to any of the previous claims, wherein said vehicle light (4) comprises at least one second light guide (40"), separate from said first light guide (40), the second light guide (40") comprising a second light guide body (44") and being provided with a second light source (20") and further light deviation/extraction elements (64") which extract the light in a substantially longitudinal direction (X-X). 30
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14. Vehicle light (4) according to claim 13, wherein said second light source (20") is electrically connected to said first light source (20) and is positioned near a lateral end (52") of the second light guide (40"). 40
15. Vehicle light (4) according to claim 13 or 14, wherein the light (4) comprises a third light guide (40''') having a third light guide body (44''') and light deviation/extraction elements (64''') and relative light sources (20'''), wherein said third light source (20''') is electrically connected to said first and second light sources (20',20"). 45
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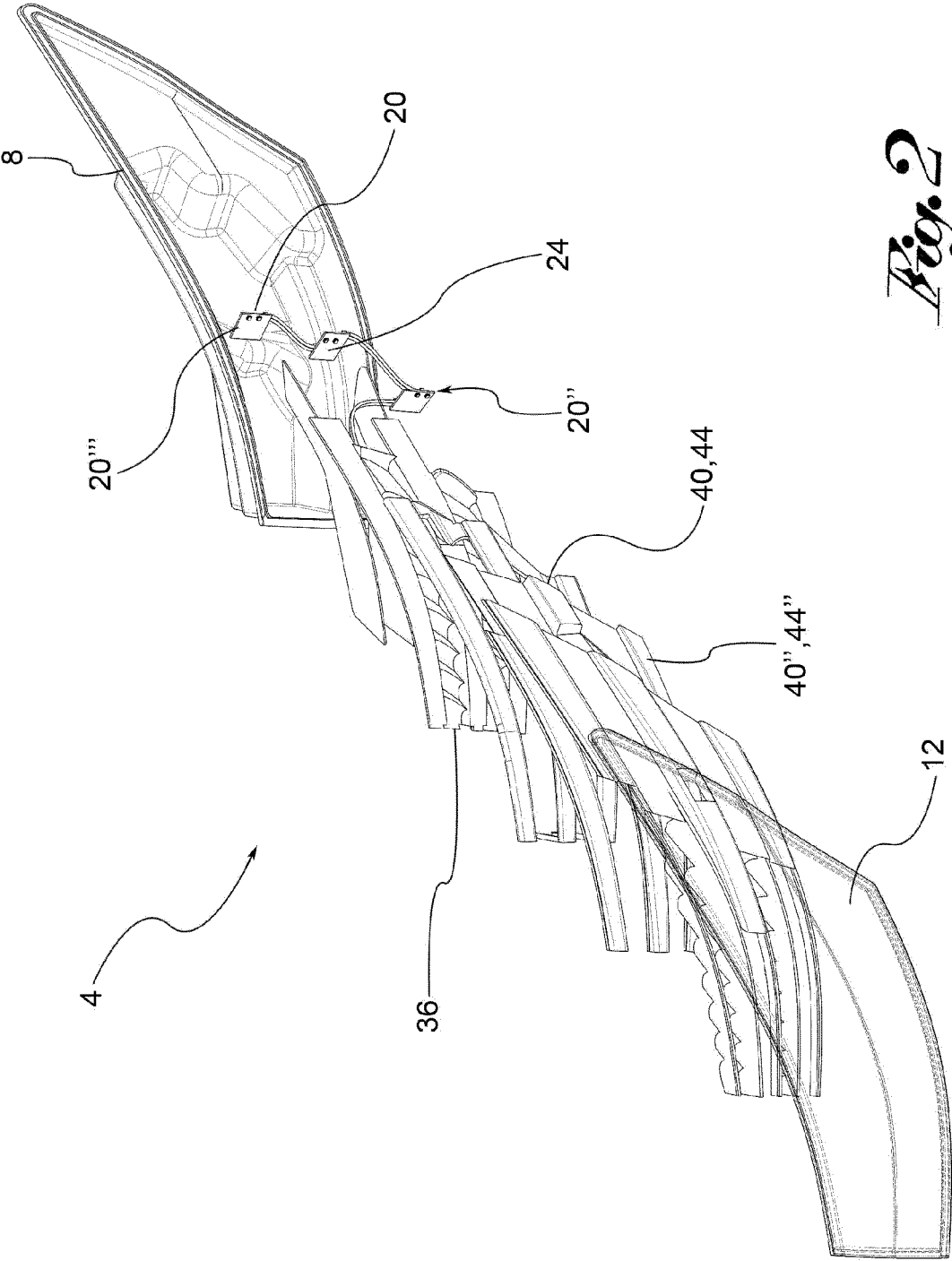


Fig. 2

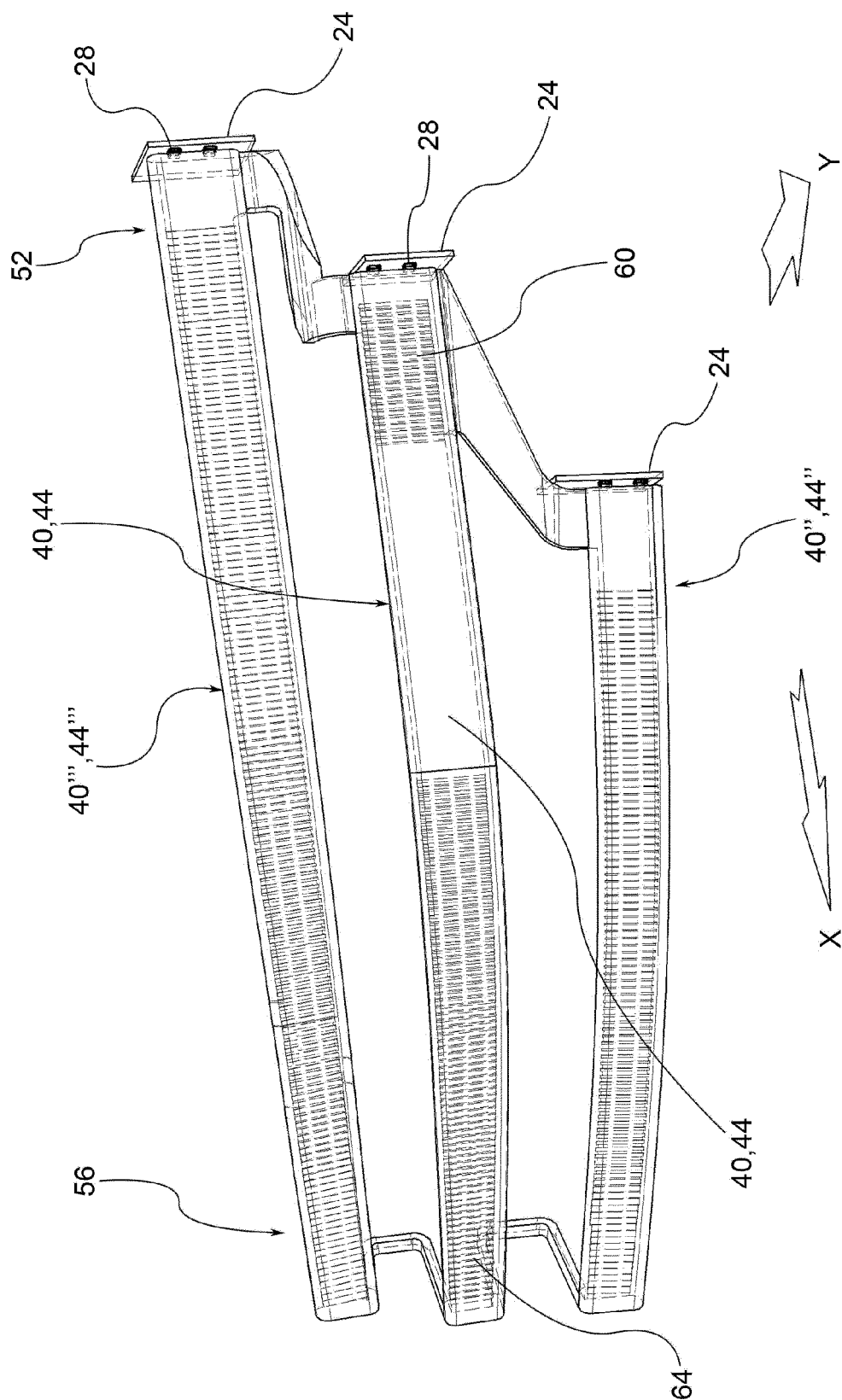


Fig. 3

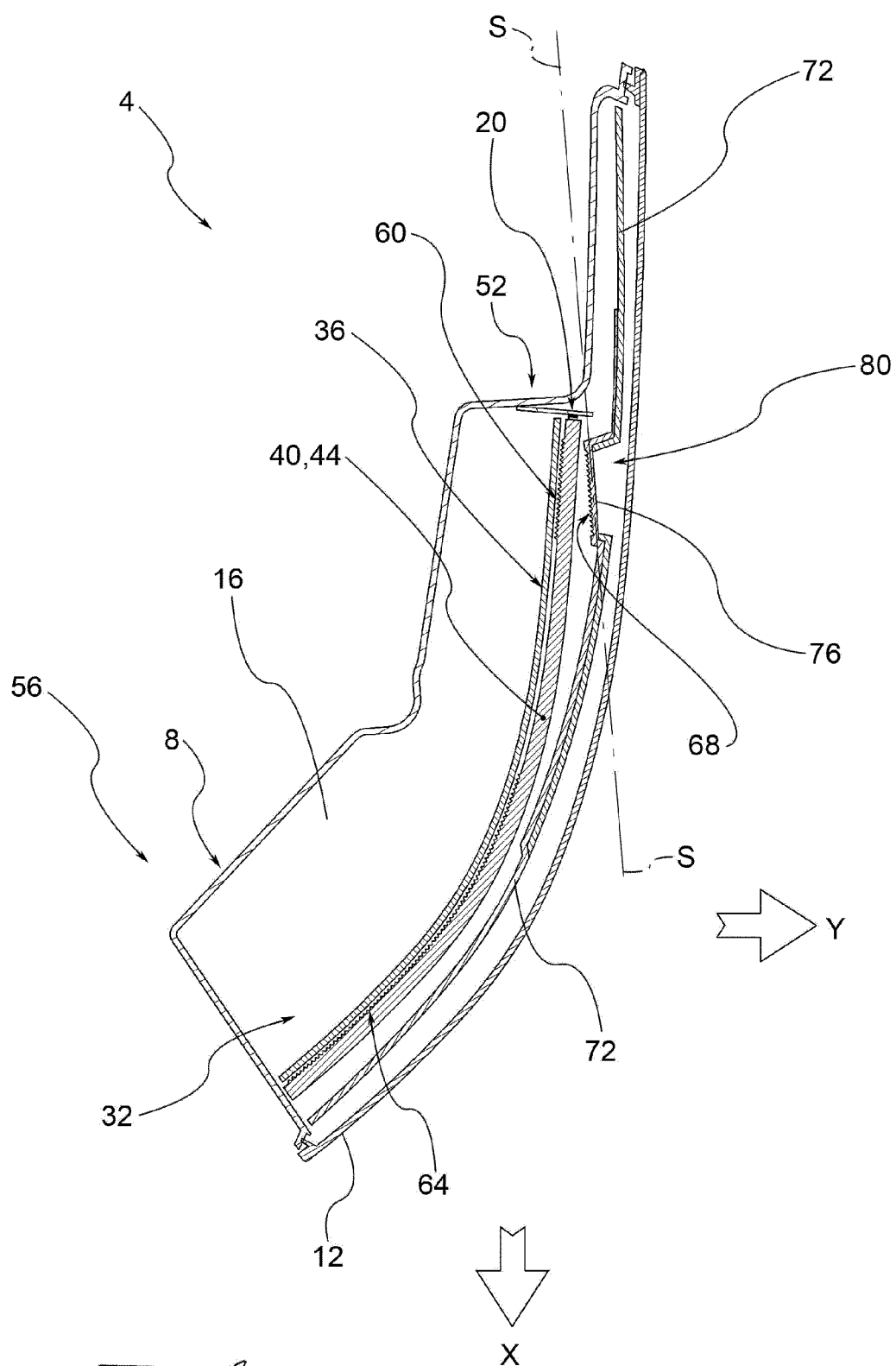


Fig. 4

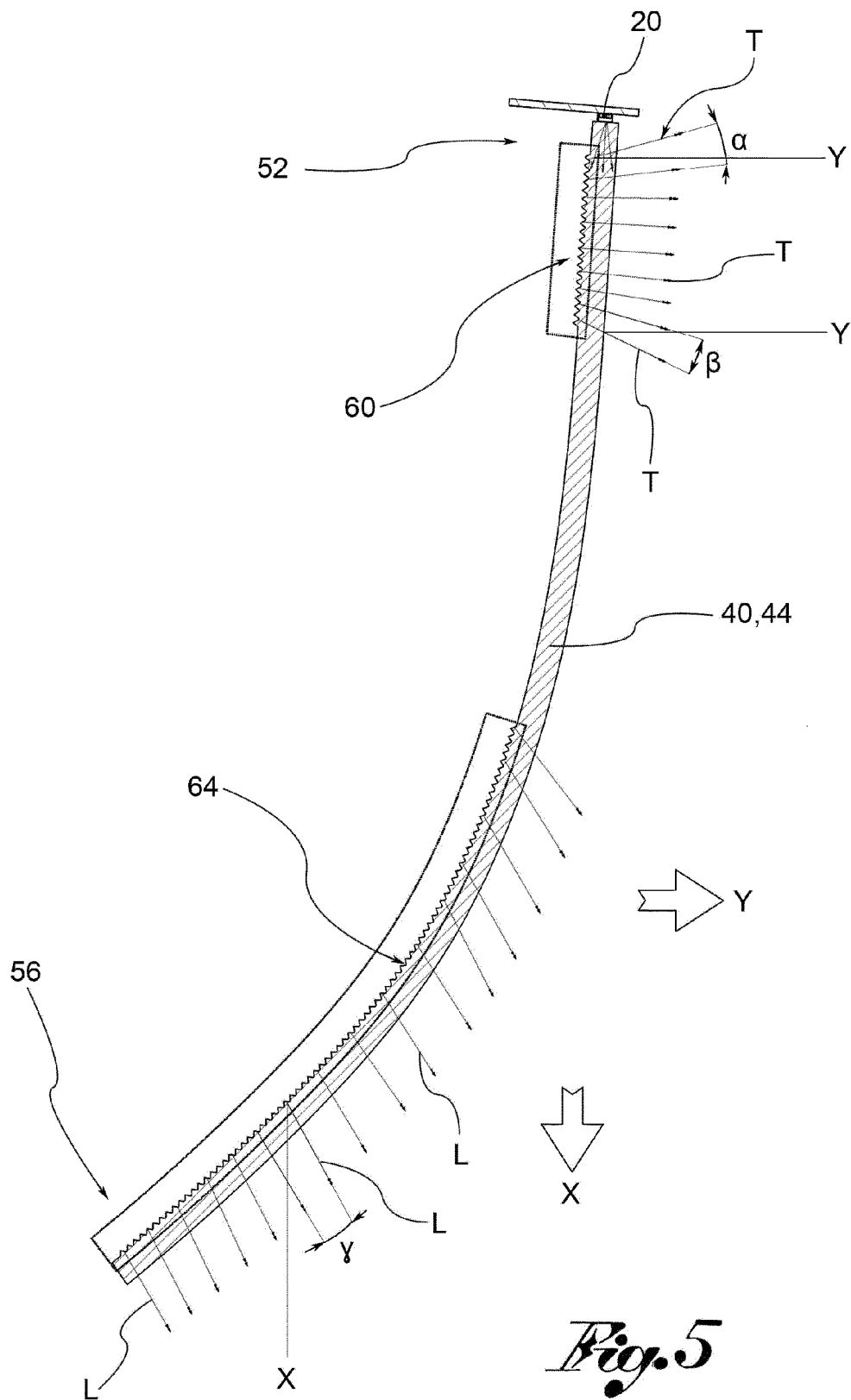


Fig. 5



EUROPEAN SEARCH REPORT

 Application Number
EP 12 19 8731

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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 15 February 2013	Examiner Goltes, Matjaz
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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