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(54) **AUTOMOTIVE LIGHTING AND/OR SIGNALING DEVICE PROVIDED WITH PHOTOLUMINESCENT DEVICES WITH STEREOSCOPIC EFFECT**

(57) A lighting and/or signaling device (4) for vehicles, comprising a container body (8) delimiting a containment seat (12) at least partially closed by a lens body (20), said containment seat (12) housing at least a first light source (16') adapted to emit at least a first input light beam (32'), at least a first emitting plate (36) having an inlet wall (40) and an outlet wall (42) spaced apart from each other along a direction of the thickness (S) of said first emitting plate (36), said inlet wall (40) facing said at least a first light source (16') and being provided with a layer of photoluminescent material adapted to be excited by said first input light beam (32') and in turn emit an output light beam (44) having different spectral features from said first input light beam (32') so as to be unadapted to excite said photoluminescent material forming said layer, the output light beam (44) extending along a main output direction (Y-Y). The outlet wall (42) is provided with means (48) for delimiting the output light beam (44), which at least partially frame/surround the layer of photoluminescent material, along the main output direction (Y-Y).

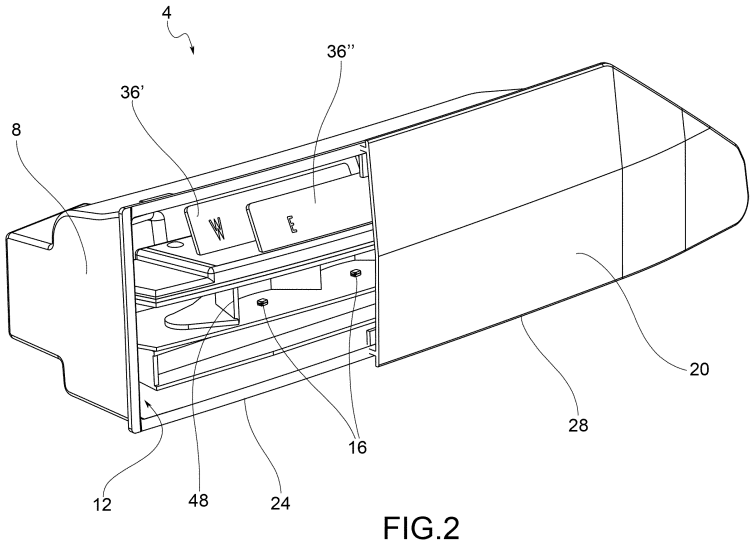

FIG.2

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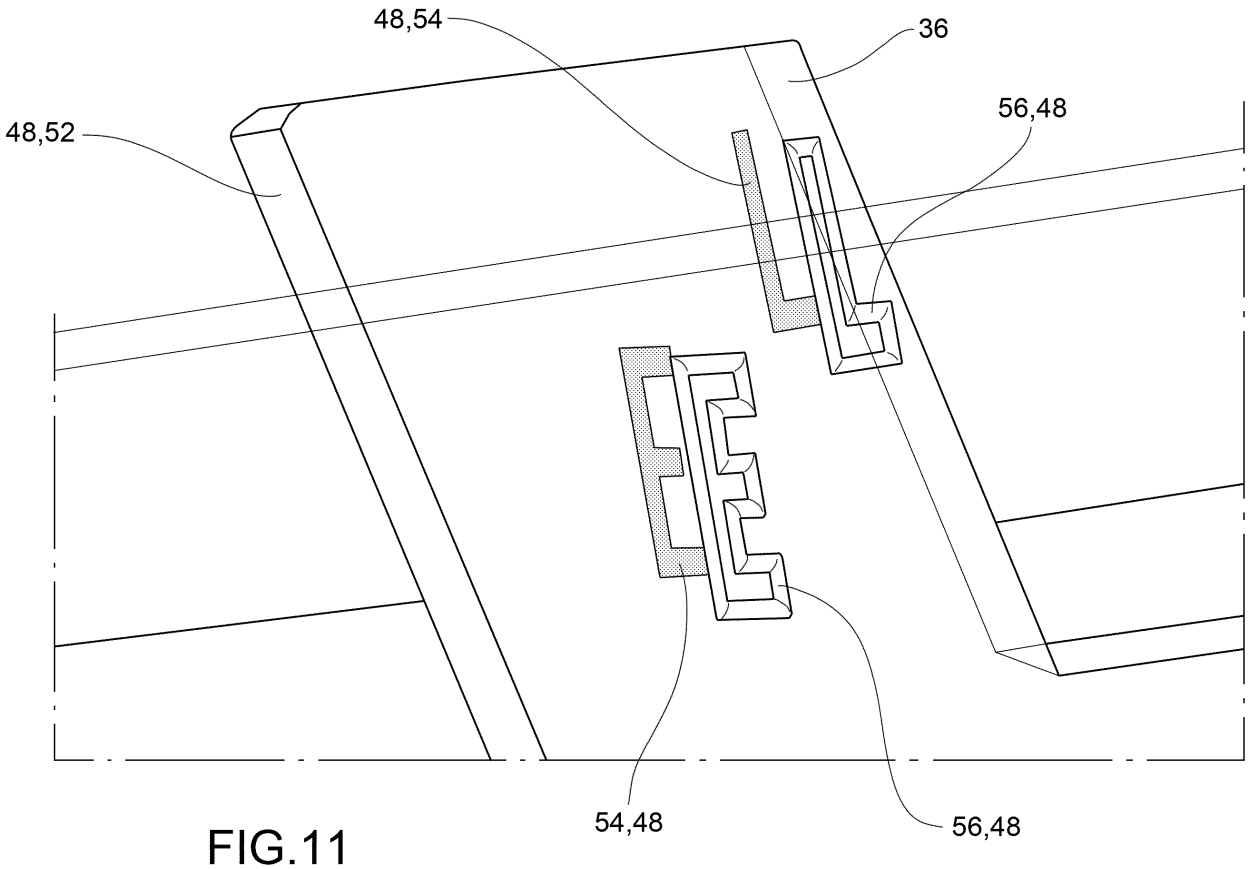

FIG.11

Description

FIELD OF APPLICATION

[0001] The present invention relates to an automotive lighting and/or signaling device provided with photoluminescent devices with stereoscopic effect.

BACKGROUND ART

[0002] The term automotive lighting and/or signaling device is used herein in a very broad sense to comprise an either rear or front automotive light, the latter also referred to as a headlight or headlamp.

[0003] As is known, an automotive light serves to provide a signal or make the roadbed visible for the driver. In other words, the automotive light is a device intended to provide at least one lighting and/or signaling function of the vehicle. Lighting and/or signaling functions of the vehicle include, for example, position light, turn signal light, brake light, rear fog lamp, reversing light, dipped beam light, high beam light, daytime running light, and further similar lights typical of automotive light assemblies.

[0004] There is an increasingly common tendency for the lighting and/or signaling device to serve an aesthetical function too, such as lighting devices which show logos and the like, which can be located both outside and inside the vehicle.

[0005] Obviously, the technical lighting and/or signaling function and the aesthetical function can coexist in the same device: for example, the tendency is known to obtain the vehicle signaling by lighting a particular pattern which can, for example, identify the brand of the vehicle on which the lighting and/or signaling device is mounted.

[0006] Moreover, vehicle manufacturers are increasingly asked to manufacture lighting and/or signaling devices with stereoscopic effect, i.e., having lighting portions with three-dimensional effects.

[0007] The need to obtain three-dimensional lighting patterns however conflicts with the need to manufacture lighting and/or signaling devices with a reduced depth since they should integrate with the bodywork of the vehicle to which they are applied.

[0008] The current solutions of the prior art are not capable of meeting such antithetical needs, i.e., it is not possible to keep small the physical volumes of the device as well as the manufacturing and assembly costs of the lighting and/or signaling devices which emit light portions with stereoscopic effect.

PRESENTATION OF THE INVENTION

[0009] It is the object of the present invention to provide a lighting and/or signaling device which overcomes the above-described drawbacks and limitations.

[0010] Such a need is met by an automotive lighting and/or signaling device according to claim 1.

[0011] Other embodiments of the present invention are described in the dependent claims.

DESCRIPTION OF THE DRAWINGS

[0012] Further features and advantages of the present invention will become more apparent from the following description of preferred and non-limiting embodiments thereof, in which:

Figure 1 shows a perspective view, with separated parts, of a lighting and/or signaling device according to a possible embodiment of the present invention;

Figure 2 shows a perspective view, in an assembled configuration, of the lighting and/or signaling device in Figure 1, from which a part of the front lens body was omitted;

Figures 3-4 show perspective views, from different angles, of certain internal components of the lighting and/or signaling device in Figure 1;

Figure 5 shows a front view of the internal components, shown in Figure 3-4, of the lighting and/or signaling device in Figure 1;

Figures 6-9 show sectional views of the internal components in Figures 3-4, along the section plane VI-VI indicated in Figure 5, according to possible variants;

Figures 10-11 show perspective views, according to different embodiments, of the internal component VII indicated in Figure 5.

Elements or parts of elements common to the embodiments described below will be indicated by the same reference numerals.

DETAILED DESCRIPTION

[0013] With reference to the aforesaid drawings, reference numeral 4 indicates, as a whole, a lighting and/or signaling device, such as an automotive light, to which the following disclosure will refer without however losing in generality.

[0014] As mentioned above, the term "lighting and/or signaling device" can indifferently mean an automotive rear light or an automotive front light, the latter also referred to as a headlight or headlamp, comprising an external light of the vehicle serving a lighting and/or signaling function, such as a position light, for example, which can be a front or rear or side position light, a turn signal light, a brake light, a rear fog lamp, a high beam light, a dipped beam light, and the like.

[0015] Thus, as better described below, the device in its signaling function can comprise the possibility of sending light signals, logos, but also words and lit messages of any kind. Hence, it is possible for the device to serve a merely aesthetical function, as in the case of lighting devices showing logos and the like, which can be arranged both outside and inside the vehicle.

[0016] The lighting and/or signaling device 4 compris-

es a container body or hollow housing 8, usually made of a polymer material, such as acrylonitrile butadiene styrene, or ABS, for example, which typically allows fixing the lighting and/or signaling device 4 to the related vehicle or to any type of support.

[0017] For the purposes of the present invention, the container body or housing 8 can have any shape, size or position: for example, the container body 8 can also not be directly connected to the bodywork or other external, or even internal, fixings of the associable vehicle.

[0018] The container body 8 delimits a containment seat 12 which houses a plurality of components of said lighting and/or signaling device 4, such as reflectors, light guides, and the like, for example.

[0019] In particular, the containment seat 12 houses at least a first light source 16' adapted to emit at least a first input light beam 32' having an input wavelength. The at least a first light source 16' preferably comprises an LED, mini LED, OLED or laser light source adapted to emit a light beam.

[0020] The first light source 16' is configured so that the respective input wavelength thereof is between 380 μm and 500 pm.

[0021] For example, a lens body 20 can be placed to close at least partially the container body 8 so as to close said containment seat 12 which houses the light source 16' .

[0022] For the purposes of the present invention, the lens body 20 is outside the lighting and/or signaling device 4 so as to define at least one outer wall of the lighting and/or signaling device directly subject to the atmosphere, thus integrating with the line of the car, when the container body 8 is firmly recessed in the chassis of the vehicle.

[0023] According to possible embodiments, the material of the lens body 20 is of the polymer type, i.e., a resin such as PMMA (poly methyl methacrylate), PC (polycarbonate), and the like. Therefore, said material of the lens body 20 is at least partially transparent or semitransparent or translucent, one or more opaque portions being also possibly included.

[0024] As seen, the containment seat 12 extends along a first peripheral edge 24 and is closed by the lens body 20 which extends along a second peripheral edge 28 at least partially counter-shaped to and overlapping said first peripheral edge 24.

[0025] At least a first emitting plate 36 made of a transparent or semitransparent or translucent material, such as a PMMA (poly methyl methacrylate) or PC (polycarbonate) resin, or the like, for example, is also contained inside the containment seat 12. The first emitting plate 36 is delimited by an inlet wall 40 and an outlet wall 42. The inlet wall 40 is at least partially coated by a layer of photoluminescent material adapted to be excited by the first input light beam 32', which is characterized by an input emission spectrum, while the outlet wall 42 is provided with means 48 for delimiting the output light beams 44.

[0026] The layer of photoluminescent material applied to the inlet wall 40 can be a fluorescent or phosphorescent material. Such a layer can be applied, for example, by means of a gluing or welding process and is preferably shaped so as to define a pattern, logo, sign, image, alphanumeric wording, or the like.

[0027] In a further embodiment, it is also possible to provide for the layer of photoluminescent material to extend along a thickness S of the at least one emitting plate 36, between the inlet wall 40 and the outlet wall 42.

[0028] Preferably, said thickness S of the emitting plate is between 1 mm and 15 mm.

[0029] For example, the at least one emitting plate 36 can be formed by co-molding. In greater detail, a matrix of transparent or semitransparent or translucent material can be co-molded with an internal area 54 of photoluminescent material so that the latter appears in the inlet wall 40.

[0030] Said at least a first emitting plate 36 faces, at the inlet wall 40, said at least a first light source 16' so as to be hit by said at least a first input light beam 32' and to emit, at an outlet wall 42, an output light beam 44 having an output emission spectrum which is different from the input emission spectrum emitted by the first light source 16' and not adapted to in turn excite the photoluminescent material, the output light beam 44 extending along a main output direction Y-Y.

[0031] Advantageously, the delimiting means 48 applied in the outlet wall 42 are configured to frame, or surround, at least partially the layer of photoluminescent material applied in the inlet wall 40 along the main output direction Y-Y. Therefore, the delimiting means 48 form a kind of frame, preferably but not necessarily a continuous frame, possibly exhibiting at least one discontinuity, for example extending intermittently. Moreover, the frame defined by the delimiting means 48 has a stretch, i.e., a thickness, preferably between 0.1 mm and 10 mm.

[0032] Thereby, the output light beams 44, generated by the layer of photoluminescent material excited by the first light source 16' and placed at the inlet wall 40 of the emitting plate, cross the thickness of the emitting plate itself to then pass inside a frame formed by the delimiting means 48, along the main output direction Y-Y, giving rise to predetermined light patterns, dictated by the shape, pattern, logo, sign, image, alphanumeric wording, or the like, of the layer of photoluminescent material.

[0033] It can be seen that the predetermined light pattern, defined by the shape of the layer of transparent material, has a stereoscopic effect, i.e., a three-dimensional effect, when it is framed by the delimiting means 48 located at a distance equal to at least one portion of the thickness of plate 36, along the main output direction Y-Y.

[0034] According to a further possible embodiment, said means 48 for delimiting the output light beams 44 emitted by said at least one emitting plate 36 comprise the peripheral shaping of the whole emitting plate 36 to the inlet wall 40 of which the layer of photoluminescent

material is applied or co-molded.

[0035] In other words, the peripheral edges 52 of the emitting plates 36, 40 can be shaped so as to exactly replicate the predetermined patterns. Thereby, the output light beams 44, obtained by exciting the photoluminescent material of the emitting plate 36 hit by the input light beams 32, will exactly replicate the shape of the predetermined patterns. Therefore, in this embodiment, the emitting plates 36 are shaped to obtain the desired pattern, logo, sign, image, alphanumeric wording, or the like.

[0036] According to a possible embodiment, said means 48 for delimiting the output light beams 44 emitted by the layer of photoluminescent material comprise a mask 56. Mask 56 is opaque to the input light beams 32 and is arranged on the outlet wall 42 of the at least one emitting plate 36. Mask 56 is applied to the outlet wall 42 with known techniques. For example, by co-molding, or by means of a tampon printing, laser engraving, or gluing process, or by means of an interlocking fastening system, etc.

[0037] It is worth noting that the embodiments of the delimiting means 48 described above are not alternative to one another, rather they can coexist within the same lighting and/or signaling device 4.

[0038] According to a possible embodiment, the lighting and/or signaling device 4 comprises a plurality of light sources, e.g., a first light source 16' and a second light source 16'', which emit a first input light beam 32' and a second input light beam 32'', respectively, having an input wavelength. The first light source 16' directly faces the first emitting plate 36' so that the first input light beam 32' at least partially hits the first emitting plate 36'. The second light source 16'' directly faces a second emitting plate 36'', made as the first emitting plate, so that the second input light beam 32'' at least partially hits the second emitting plate 36''.

[0039] Preferably, the first light source 16' and the second light source 16'' are positioned in the container body 8 so that the respective first and second input light beams 32', 32'' are not visible through the lens body 20, along said main output direction Y-Y of the output light beams 44.

[0040] For example, the first input light beam 32' is shaped to exclusively hit the first emitting plate 36' and not hit the second emitting plate 36'', while the second input light beam 32'' is shaped so as to exclusively hit the second emitting plate 36" and not hit the first emitting plate 36'.

[0041] Preferably, said first and second emitting plates 36', 36" at least partially lie on mutually distinct lying planes P', P".

[0042] According to a possible embodiment, the first light source 16' and the second light source 16" are independently activatable so as to give an animated effect to the light patterns generated by the first and second emitting plates 36', respectively.

[0043] Naturally, according to a possible, less sophisticated embodiment, it is also possible for the layers of photoluminescent material of the first emitting plate 36' and the second emitting plate 36" to be excited by a single light source 16'.

[0044] Said lying planes P', P'' can be parallel or even incident to each other.

[0045] Said first and second emitting plates 36', 36" can be flat or even at least partially concave or convex.

[0046] According to a possible embodiment, said first and second emitting plates 36', 36" are at least partially aligned with each other so that the first output light beam 44 of the first emitting plate 36' at least partially hits the second emitting plate 36".

[0047] The emitting plates 36', 36" can have various orientations and shapes.

[0048] According to a possible embodiment, the first input light beam 32' propagates along a first main propagation axis X'-X' and the first emitting plate 36' is oriented so that said first main propagation axis X'-X' is incident on the first emitting plate 36' with a first acute angle α.

[0049] According to a possible embodiment, the second input light beam 32'' propagates along a second main propagation axis X''-X'' and the second emitting plate 36" is oriented so that said second main propagation axis X"-X" is incident on the second emitting plate 36" with a second acute angle β.

[0050] According to a possible variant, said first and/or second emitting plates 36', 36" are operatively connected to motor means so as to vary the inclination and/or distance thereof with respect to the respective first and second light sources 16', 16''.

[0051] Preferably, said first and second emitting plates 36', 36" are made of materials which are transparent to the input light beams 32', 32'' incident thereon. Thereby, the emitting plates 36', 36" do not act as shields against possible output light beams 44 incident thereon and having, as seen, an output wavelength which is not capable of exciting them.

[0052] The operation of a lighting and/or signaling device according to the present invention will now be described.

[0053] In particular, the spectrum of the radiation emitted by the light source 16 is capable of exciting the layer of photoluminescent material applied in the first inlet wall 40 of the emitting plate. The output beam 44 generated by the layer of photoluminescent material crosses the thickness S of the emitting plate to then exit from the outlet wall 42 of the emitting plate within a periphery or outline defined by the delimiting means 48. By virtue of the fact that the latter are placed at a distance from the emitting layer equal to a portion of the thickness S of the emitting plate 36 along the main output direction Y-Y, the light pattern generated by the layer of photoluminescent material takes a stereoscopic effect, i.e., a three-dimensional effect, for an external viewer.

[0054] Moreover, in the case of a plurality of light sourc-

es, when activated, the light sources 16, 16', 16'' emit respective input light beams 32', 32'' having an input wavelength such as to excite the respective layers of photoluminescent material applied in the inlet walls of the emitting plates 36', 36''.

[0055] Naturally, it is also possible for the layers of photoluminescent material applied in the inlet walls of the emitting plates 36', 36'' to be excited by a single light beam emitted by the same light source 16. In any case, when excited, the layers of photoluminescent material in turn emit output light beams 44, which are framed by the delimiting means 48 so as to generate predetermined patterns with a three-dimensional effect. Said predetermined patterns may have both a signaling function and a mere aesthetical function.

[0056] As can be appreciated from the above description, the present invention allows overcoming the drawbacks of the background art.

[0057] In particular, by virtue of the present invention, a lighting and/or signaling device which serves both the technical lighting and/or signaling function and the aesthetical function, with particular reference to three-dimensional or stereoscopic lighting effects, can be provided.

[0058] Moreover, the signaling and/or lighting device according to the present invention is affordable to manufacture and assemble.

[0059] Moreover, the signaling and/or lighting device according to the present invention has a compact size in terms of depth, despite the three-dimensional lighting effects it allows to obtain.

[0060] Thus, the signaling and/or lighting device according to the present invention can be easily integrated with bodywork components or panels of a vehicle since it is very thin.

[0061] Those skilled in the art, with the purpose of meeting contingent and specific needs, may make several changes and variations to the lighting and/or signaling devices described above.

[0062] The scope of protection of the present invention is defined by the following claims.

Claims

1. A lighting and/or signaling device (4) for vehicles, comprising:

   - a container body (8) which delimits a containment seat (12) at least partially closed by a lens body (20),
   - said containment seat (12) housing at least a first light source (16') adapted to emit at least a first input light beam (32'),
   - at least a first emitting plate (36) having an inlet wall (40) and an outlet wall (42) spaced apart from each other along a direction of the thickness (S) of said first emitting plate (36), said inlet wall (40) facing said at least a first light source (16') and being provided with a layer of photoluminescent material adapted to be excited by said first input light beam (32') and in turn emit an output light beam (44) having different spectral features from said first input light beam (32') so as to be unadapted to excite said photoluminescent material forming said layer, the output light beam (44) extending along a main output direction (Y-Y), the lighting and/or signaling device (4) being **characterized in that** the outlet wall (42) is provided with means (48) for delimiting the output light beam (44), which at least partially frame/surround the layer of photoluminescent material, along the main output direction (Y-Y).

2. A lighting and/or signaling device (4) according to claim 1, wherein the photoluminescent material is applied to said inlet wall (40).

3. A lighting and/or signaling device (4) according to claim 1 or 2, wherein the photoluminescent material extends along a thickness (S) of the at least one emitting plate (36), between the inlet wall (40) and the outlet wall (42).

4. A lighting and/or signaling device (4) according to claim 1, 2 or 3, wherein said means (48) for delimiting the output light beams (44) emitted by said at least one emitting plate (36) comprise the peripheral shaping of the photoluminescent layer applied to the inlet wall (40) of the emitting plate (36) along the main output direction (Y-Y) and are applied to the outlet wall (42) of the emitting plate (36).

5. A lighting and/or signaling device (4) according to any one of claims 1 to 4, wherein said means (48) for delimiting the output light beams (44) emitted by said at least one emitting plate (36) comprise a mask (56).

6. A lighting and/or signaling device (4) according to claim 5, wherein the mask (56) is applied to the outlet wall (42) by co-molding, tampon printing, laser engraving, gluing, or by means of an interlocking fastening system.

7. A lighting and/or signaling device (4) according to any one of claims 1 to 6, comprising:

   - a first light source (16') and a second light source (16") which emit a first input light beam (32') and a second input light beam (32''), respectively, having an input wavelength,
   - wherein the first light source (16') directly faces the inlet wall of the first emitting plate (36'),
   - wherein the second light source (16'') directly faces an inlet wall (40) of a second emitting plate

(36'').

8. A lighting and/or signaling device (4) according to claim 7, wherein the first light source (16') and the second light source (16") are independently activatable.

9. A lighting and/or signaling device (4) according to claim 7 or 8, wherein a first input light beam (32') emitted by the first light source is shaped to hit the first emitting plate (36') and not hit the second emitting plate (36"), and wherein the second input light beam (32'') emitted by the second light source is shaped to hit the second emitting plate (36") and not hit the first emitting plate (36').

10. A lighting and/or signaling device (4) according to claim 7, 8 or 9, wherein said first emitting plate (36') and second emitting plate (36") at least partially lie on mutually distinct, parallel or incident lying planes (P', P").

11. A lighting and/or signaling device (4) according to any one of claims 7 to 10, wherein said first emitting plate (36') and second emitting plate (36") are at least partially concave or convex.

12. A lighting and/or signaling device (4) according to any one of claims 1 to 11, wherein said at least a first emitting plate (36') is operatively connected to motor means so as to vary the inclination and/or distance thereof with respect to the respective first light source (16').

13. A lighting and/or signaling device (4) according to any one of claims 1 to 12, wherein the light sources (16, 16', 16") are configured so that the respective input wavelength is between 380 μm and 500 pm.

14. A lighting and/or signaling device (4) according to any one of claims 1 to 13, wherein said photoluminescent material is a fluorescent or phosphorescent material.

15. A lighting and/or signaling device (4) according to any one of claims 1 to 14, wherein said thickness (S) of the emitting plate is between 1 mm and 15 mm.

16. A lighting and/or signaling device (4) according to any one of claims 1 to 15, wherein the delimiting means (48) have a thickness between 0.1 mm and 10 mm.

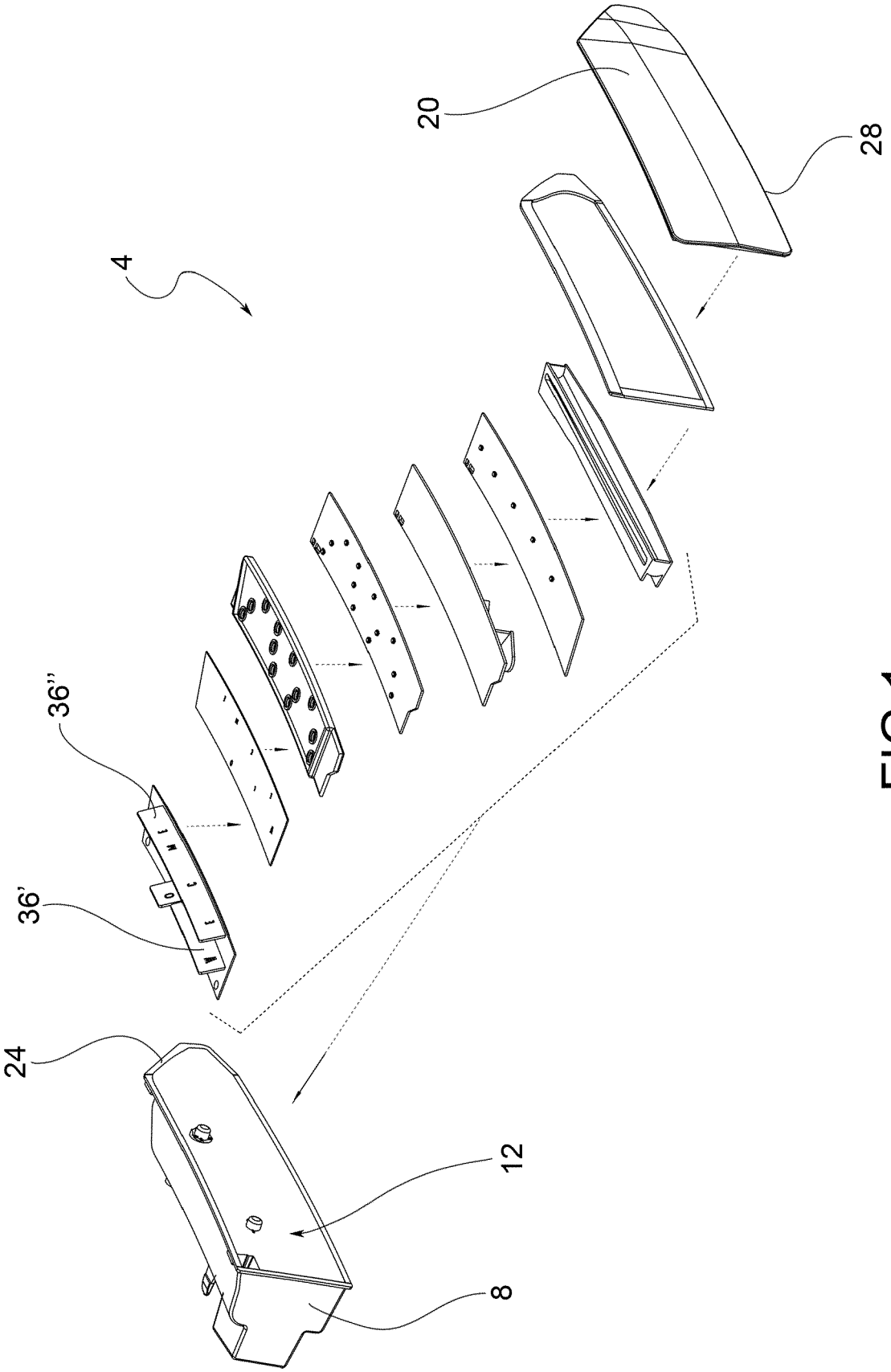

FIG.1

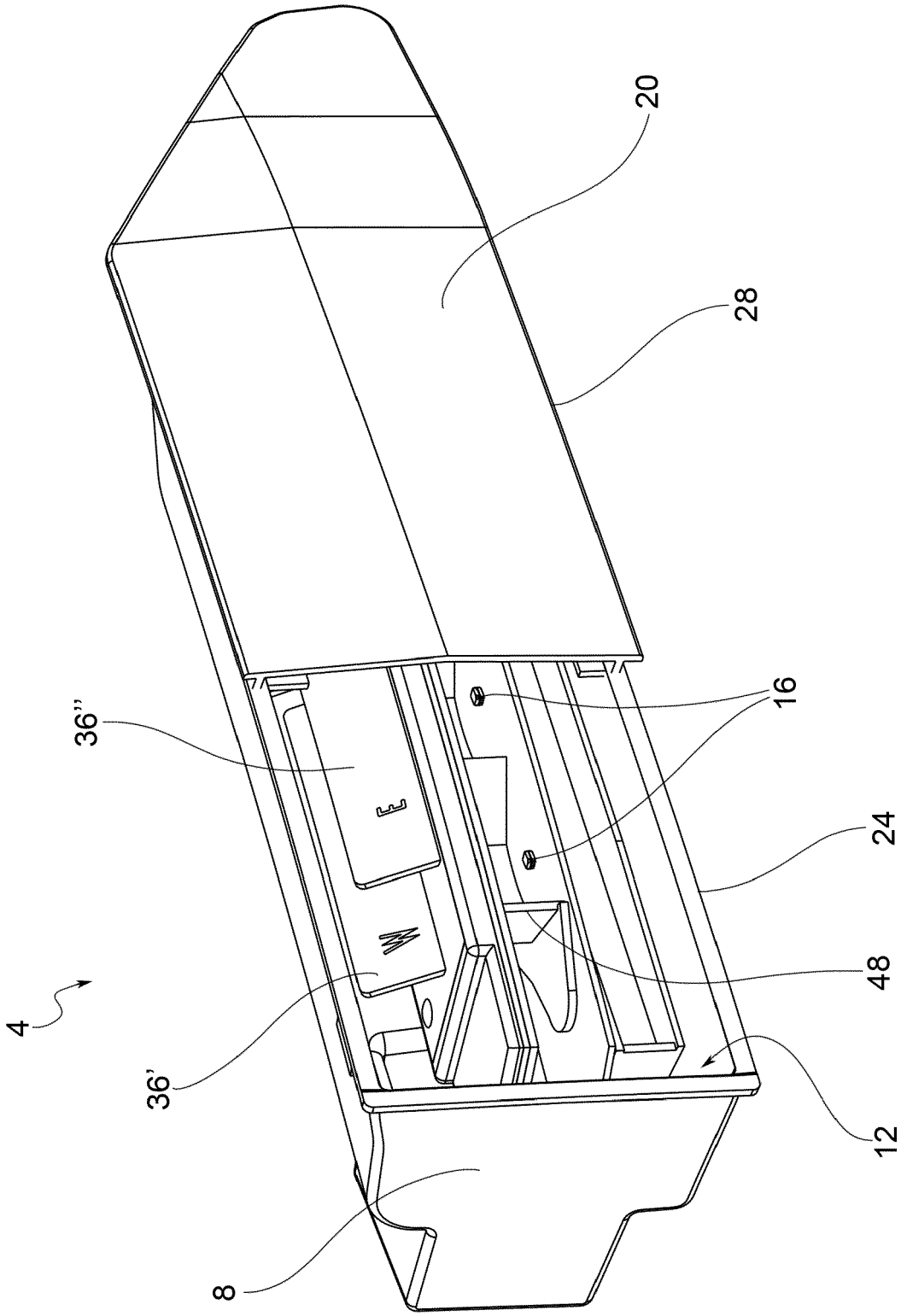

FIG.2

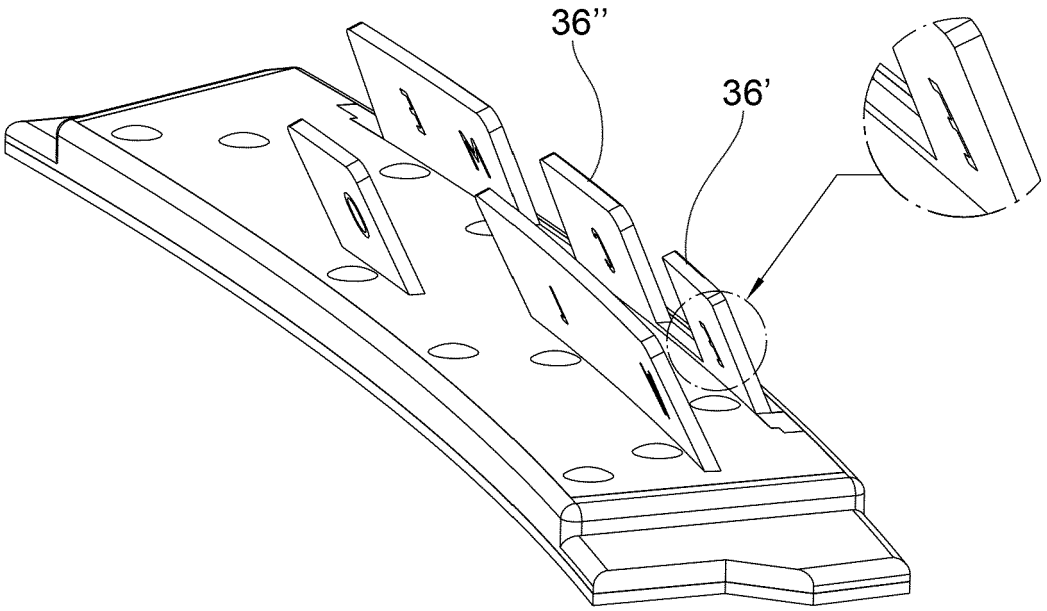

FIG.3

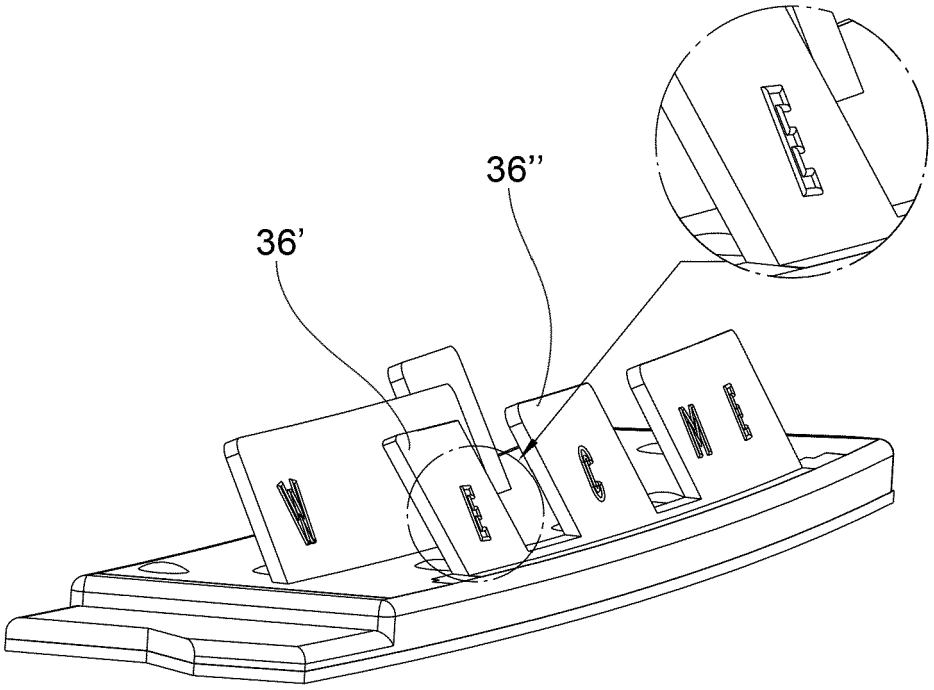

FIG.4

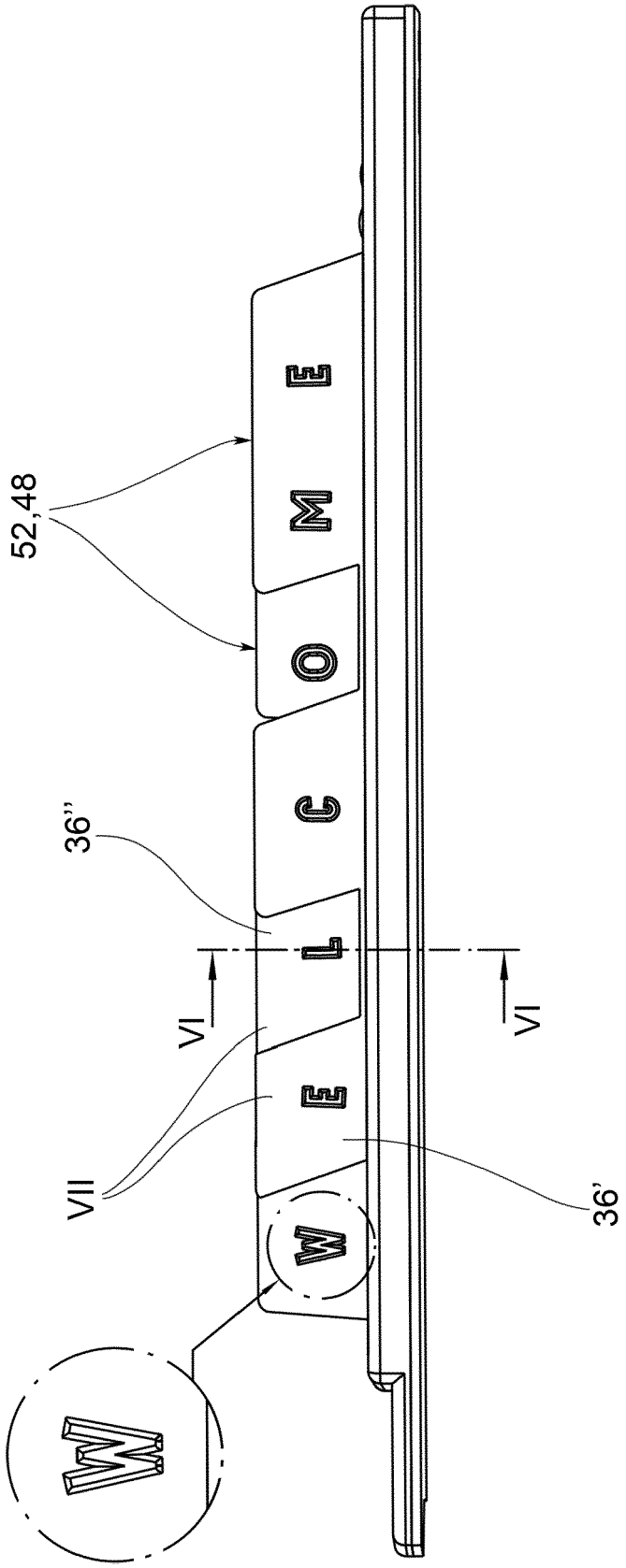

FIG.5

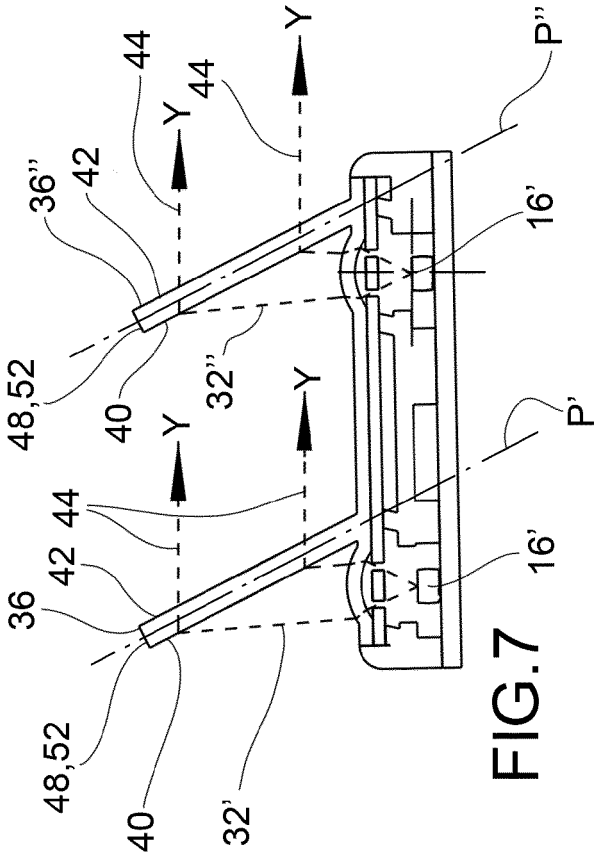

FIG.7

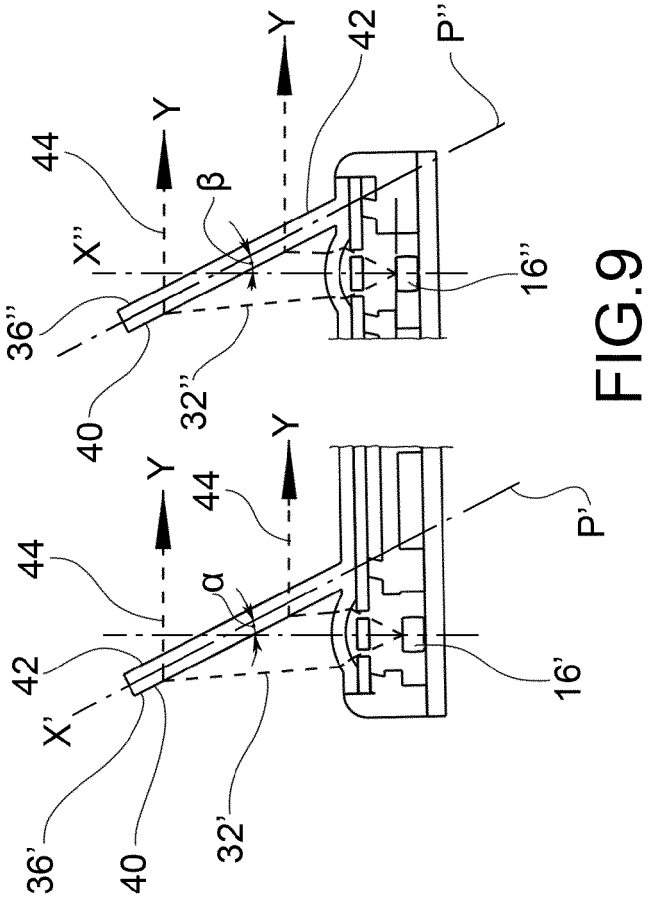

FIG.9

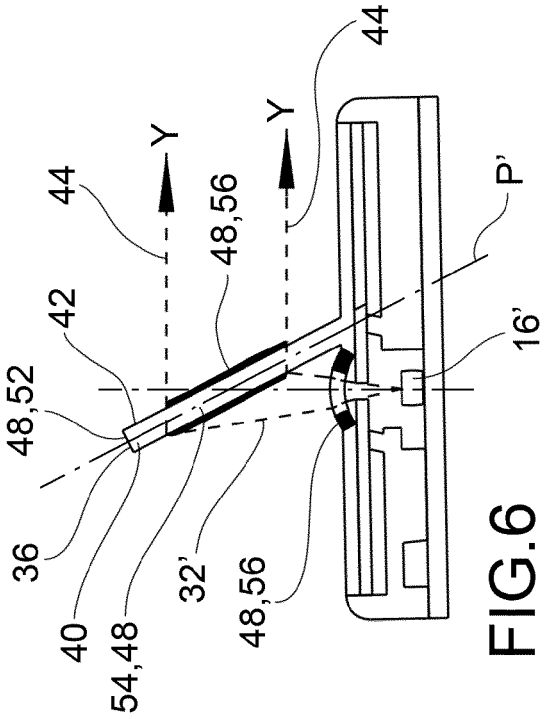

FIG.6

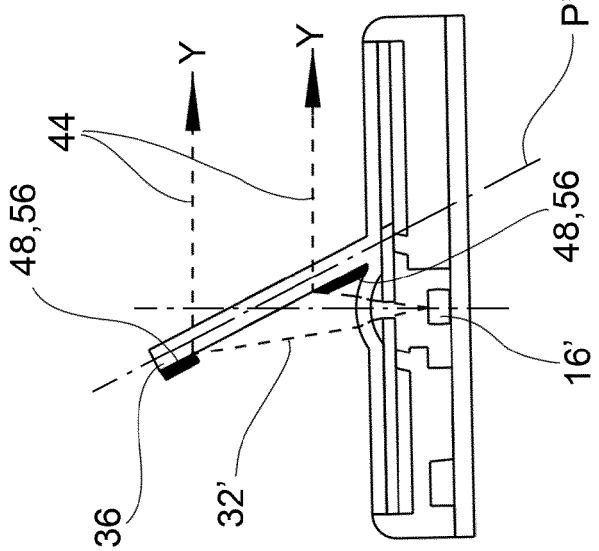

FIG.8

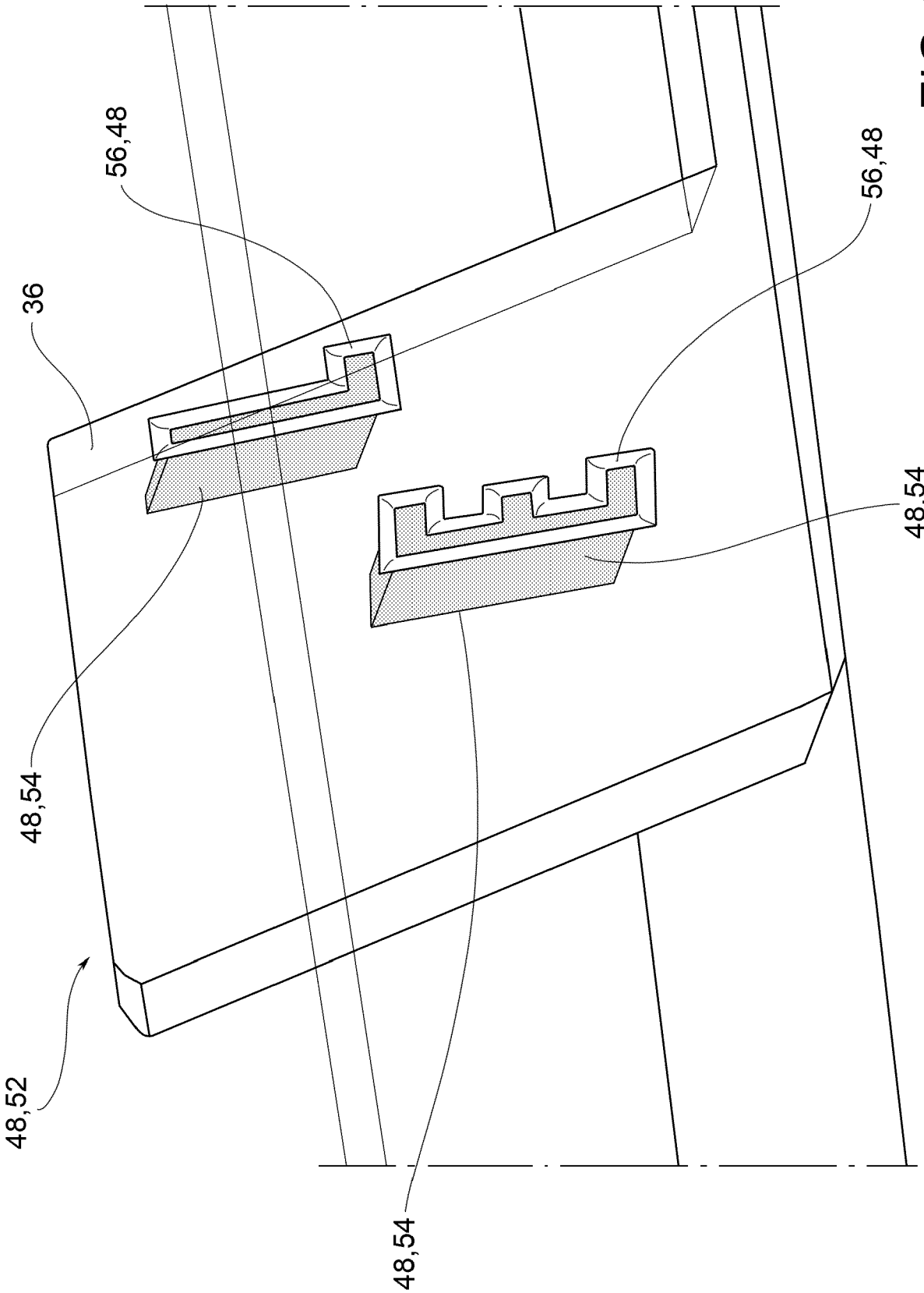

FIG.10

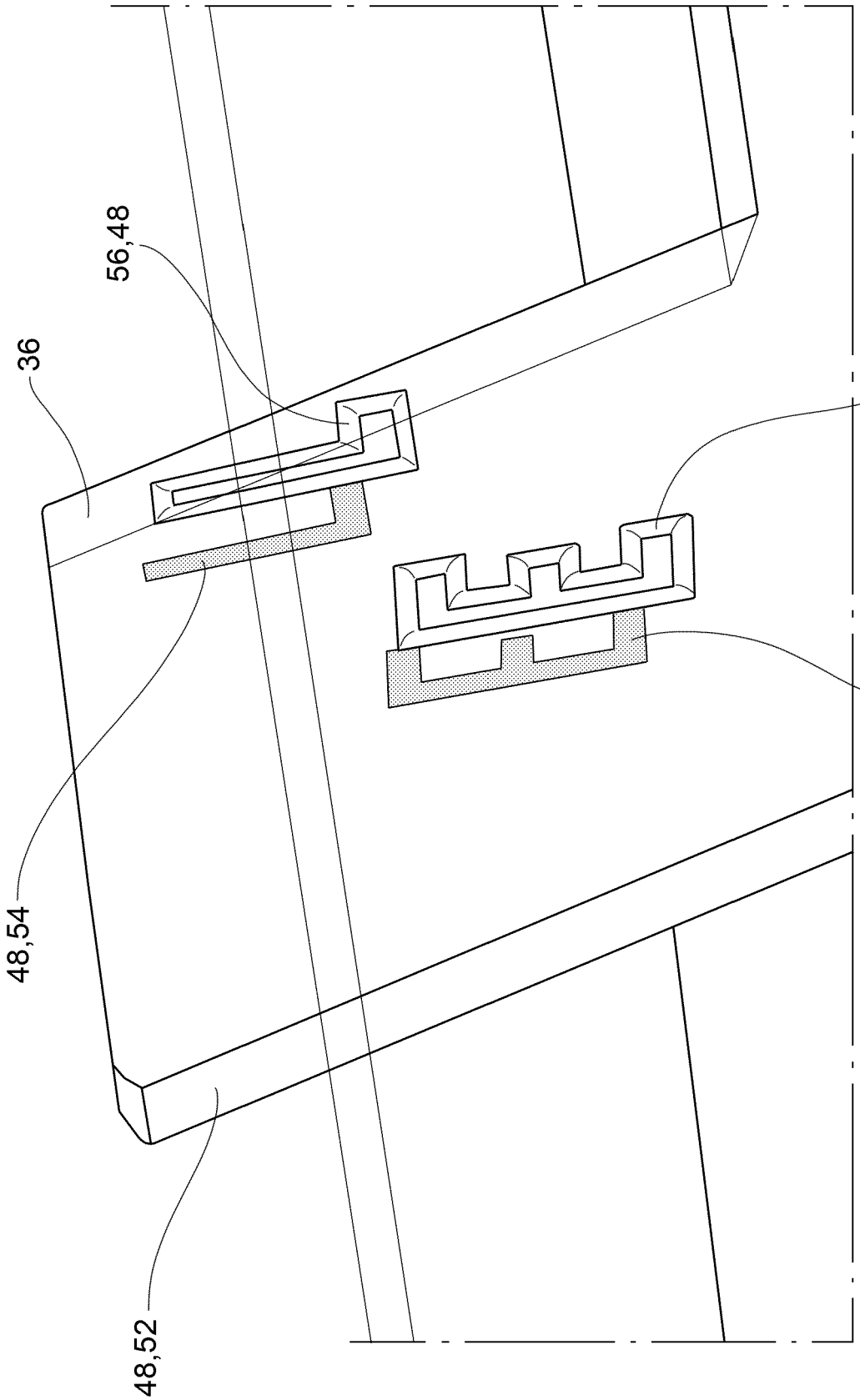

FIG.11

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EUROPEAN SEARCH REPORT

Application Number
EP 22 21 6385

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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