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(54) **ARTIFICIAL FIREPLACE**

(57) The invention relates to an artificial log set comprising an arrangement of at least two artificial logs (30.1, 30.2) that are partially translucent and arranged one above the other. A lighting device and an optical unit having a plurality of optical elements are adapted to illuminate the interior of the logs and to produce variable reflection of light from the at least one light source (40.1), wherein a control device (54) is constructed and configured to control the at least one light source (40.1) and the optical elements of the optical unit. To create a natural-looking fireplace, the arrangement of the logs is formed by at least one housing that encloses the lighting device and the optical unit. In addition, the housing is structured in such a way that the shape of individual logs and the surface structure of wood are simulated, the housing comprising a front side (33), a rear side (37), two sides (36), a bottom side (35) and a top side (34), of which the rear side (37) and the bottom side (35) are open at least in sections. The invention also relates to a fireplace comprising the log set.

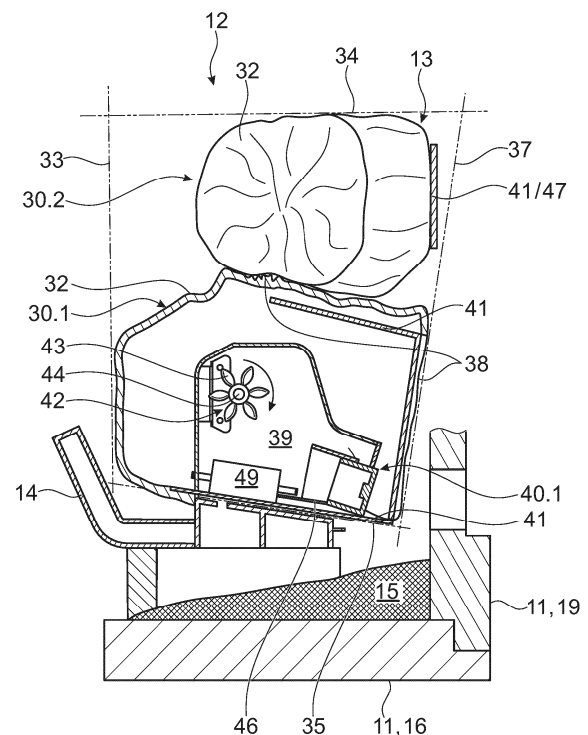


Fig. 5

Description

[0001] The invention relates to an artificial fireplace with the features according to the general term of the main claim, which is designed for use in particular in the living area or in the commercial area instead of a fireplace with an open fire.

[0002] Such artificial fireplaces are regularly installed in a wall niche or in a frame in front of a wall by means of a housing. For the purpose of differentiation, this housing is hereinafter referred to as "external housing" in relation to the invention. The known devices have light sources, often several LEDs, to produce the desired lighting effects. The lighting effects are produced in conjunction with simulated logs of wood, the light sources being directed at the logs or arranged in or between them. To simulate their apparent burning, the logs are usually made of a transparent plastic that glows yellowish to orange when exposed to light.

[0003] Such an artificial fireplace is known, for example, from WO 2022/251298 A1. It describes an "artificial flame" arranged in a fireplace-like housing, which is to be achieved by an arrangement of interconnected artificial logs by illuminating them with a light source. The light source is arranged below the logs. In order to achieve a flickering appearance similar to a flame, the light is directed in two different directions by means of a "flame generator". An arbitrary change between the two directions is realized by a reflector with several reflective elements, which is arranged above the light source and below the log arrangement. The reflecting elements rotate and consequently emit light in different directions and thereby randomly through the two openings. The description of the printed matter uses the term "three-dimensional simulated flame" for this appearance, although only the light passing through the logs and possibly light reflected from the rear wall of the fireplace and from a simulated fire bed simulates a glowing effect. The impression of a glowing log of wood or a fire cannot be simulated in this way.

[0004] From US 2012/0070583 A1 a simulated fire bed is known, which comprises logs that are cast in the mold, whereby the inner surface of the mold and thus the surface of the log resembles the structure of a log of wood. The material of the simulated logs of wood is translucent at least in sections and colored in such a way that a colored light source or several of them arranged in the log gives the impression of a glowing log of wood.

[0005] In addition, other publications describe lighting systems that are intended to generate ambient light and optionally create flickering effects in the opening of a fireplace (US 2009/0126241 A1).

[0006] The impression of the known artificial fireplaces is obviously that of artificial materials that are illuminated with artificial light. Even the color of the light, the surface structures of the artificial logs and the temporally and locally varying light intensity cannot eliminate the impression of an artificial fireplace.

[0007] There is therefore a need for an artificial log set and an accordingly equipped artificial fireplace that are better suited to a natural fireplace. This applies in particular to the lighting effects associated with a natural fire, including the flickering light that occurs in the vicinity of the fireplace. In this way, the different light at different locations in and around the fireplace and the different flickering should be better reproduced than is known from the prior art. This applies, for example, to the rear wall of the fireplace, the area of the cavities between the individual logs and the floor area in front of the fireplace. It is also desirable to incorporate the heat and noise perceived in natural fireplaces into the overall impression of the artificial fireplace.

[0008] To solve the problem, an artificial log set according to claim 1 and an artificial fireplace according to claim 9 are proposed, the latter comprising the artificial longest of claim 1. Preferred embodiments are described in the related dependent claims.

[0009] To solve the problem, an artificial log set is first proposed which comprises those features which are directly associated with the simulation of burning logs of wood. These are:

Unless expressly described otherwise, the term "light" is intended here to include the spectral range of the light sources used, but in particular the spectral range of visible light. Insofar as optical properties of optical elements, such as reflection, transmission or others, are described, these properties also refer to the spectral range of the light sources used.

[0010] The terms "top" and "bottom" refer to gravity, the terms "side" surface, "rear" surface and "front" surface refer to the usual viewing direction towards the hearth.

[0011] According to the invention, the artificial log set comprises a log arrangement comprising at least two artificial logs, optionally three, four or more logs. These are formed one above the other, as is known from natural fireplaces. This also includes one or more upper logs leaning against the lower log(s) so that the log arrangement reaches the desired height as a result. For the artificial longest described below, it may be advantageous if a lower log is larger than an upper log.

[0012] According to the invention, the artificial longest comprises an illumination device for generating luminous phenomena which simulates the luminous phenomena normally associated with a natural hearth. For this purpose, the illumination device comprises one or more light sources. LEDs are particularly suitable as a light source, as they require little space and power, can be easily integrated in a wide variety of positions and combined with each other and are available with various parameters, such as light color, intensity, size and others. Other light sources that are suitable for the application and arrangement described below can also be considered. This also includes future developments of light sources. The light color of the one or more light source(s) may be adapted to the color to be achieved, and additive color mixing may also be suitable to achieve the desired

color effect.

[0013] As described below, light sources are used that are suitable for creating various lighting effects on the artificial log set and its surroundings. This also includes light bands or light band systems in which one or more light sources extend linearly and/or several light sources. In the case of a linear light source, it can be advantageous if it is flexible enough to be adapted to a specific installation situation.

[0014] The one or more light source(s) are arranged in such a way that they illuminate the inside of the logs to create the simulation of burning logs. It is advantageous for sections of the logs to be translucent. This is achieved by various designs that can be combined with each other. On the one hand, the log itself consists of a transparent material which is coated on the surface with an opaque and coloring layer. The coloring is designed in such a way that both the more or less burnt wood and the glowing wood are depicted. Natural situations can be used as a template for this. On the other hand, openings can also be formed in the logs or in the log arrangement, through which the light from the light source emerges from the log.

[0015] The artificial log set also comprises an optical unit which, in terms of its design and arrangement, is suitable for deflecting and reflecting the light from the light sources used in the artificial longest in order to produce the flickering effect described above.

[0016] For this purpose, the optical unit has suitable optical elements, such as in particular reflectors, lenses, optical prisms, filters and others. In various embodiments, the optical elements of the optical unit can also be used to influence the color of the light or the luminous flux, for example wavelength-dependent filters or reflectors, as described below. At least some of the optical elements may be movably arranged and the optical unit may comprise a mechanism for moving the optical elements used for this purpose.

[0017] The artificial log set further comprises a control unit which is designed to control those components of the artificial log set which are electrically operated. These are, in particular, the at least one light source and the optical elements of the optical unit designed for this purpose. By means of the control unit, in particular a temporal modification of the radiation intensity of the light source and movements of the optical elements can be carried out in accordance with the following description. The latter also includes moving optical elements out of or into the beam path of light from the artificial longest or artificial fireplace. The control unit is preferably connected by radio to the control devices of the components to be controlled, preferably to all components of the artificial fireplace that can be modified by radio control. Since these are electrically operated components, the person skilled in the art can refer to the extensive state of the art for the design of the control unit and the control devices of the components concerned.

[0018] As is known from the prior art, the optical unit is designed in particular to generate the flickering effect

generally associated with an open fire. For this purpose, the optical unit comprises a plurality of movable reflector surfaces and a movement unit which is designed and communicatively connected to a control device of the artificial log set designed for this purpose in order to change the direction of reflection of the reflector surfaces in a time-dependent manner. In the reflector devices previously described in the prior art, an arrangement of several reflectors is used, which have a small surface area and can be in the form of leaves or paddles or other designs, for example. These can be individually movable. For example, their mounting can be flexible enough to allow each reflector to move randomly as a result of a momentum effect, whether due to the weight of the reflectors due to movement or airflow or other causes affecting the entire reflector array. For example, the reflectors can be mounted on an axle and set in rotation by means of the axle. Other designs of the reflectors and devices with single and/or multi-part reflectors are also suitable, with which a continuous change in their light propagation in the log arrangement, a flickering effect, can be produced as a result of the movement of the reflector or reflectors. In addition to the aforementioned several small reflectors, at least one ribbon-shaped reflector can also be used, for example, which winds helically around an axis of rotation, optionally with variable parameters such as pitch and/or diameter.

[0019] According to the invention, the log arrangement is formed by a housing which forms the at least two artificial logs lying one above the other. If the log arrangement comprises more than two logs, these can be implemented in one or more interconnectable log arrangements. The arrangement of both or more logs in one housing or several connected housings has the advantage that the illumination device illuminates the logs together, so that the lighting effects produced correspond more closely to the fire of a burning stack of logs. This is because the logs in the natural stack always burn together and form a single flame.

[0020] A housing of the log arrangement is described by means of a cuboid, which is formed by six surfaces, namely the front surface, rear surface, two side surfaces, top surface and base surface. The resemblance of the shape of the log arrangement to that of a cuboid merely serves to assign the surfaces to the application of the artificial logs in an artificial fireplace and does not reflect the shape of the log arrangement. The housing is made of a material that is transparent to the light from the light source, such as a resin or a plastic that is comparable in terms of transparency. Such a material has the advantage that it is possible to change the basic color of the transmitted light from orange to red. Processes for manufacturing the logs and their arrangements are known to those skilled in the art.

[0021] The shape of the housing is apparently modeled on a natural stack of logs. For this purpose, the surfaces have a surface structure that represents both the separate logs and a surface structure similar to that of wood,

preferably partially charred wood. Natural materials and arrangements can serve as a template, provided that the log arrangement is made from a castable raw material.

[0022] According to the invention, the housing is not closed on all sides. Of the aforementioned surfaces, the rear surface and the base surface remain open, at least in sections. This has the advantage that at least the rear of the fireplace behind the hearth and optionally also the fire bed under the hearth can be included in the lighting effect produced by the illumination device. In this way, the flickering illumination appears as a single unit. On the other hand, the cavity of the log arrangement which covers the inside of both logs can be designed large enough to accommodate the extensive equipment of the illumination device and the optical unit, including the device for moving a large number of reflectors and their control. In addition, such a housing is suitable for integrating flat reflectors, filters or other components so that, for example, the coloring and flickering can be specifically influenced and can be produced as the luminous appearance of a hearth.

[0023] The size and shape of the open sections depends, among other things, on the size and shape of the log arrangement and the design of the illumination device and can be optimized and/or varied through testing. In particular, the shape can be chosen so that the open sections are not visible during normal use of the artificial fireplace. If reference is only made here to open sections in the rear surface and floor area, this does not exclude the possibility that the other surfaces may also contain passages, as described below. However, these are much smaller, as they serve specific and limited lighting effects or represent passages for the power supply or other functions, for example.

[0024] For the coherent lighting effects of the artificial log set described above, it has proven to be advantageous if, according to one embodiment of the invention, the log arrangement is constructed in such a way that a lower log forms the base of the log arrangement, on which the further log or logs are stacked. One or more light sources, the optical unit and other necessary or advantageous components of the artificial longest or artificial fireplace can be arranged in the base. It can be advantageous to make the one base log, or optionally several of them, larger in order to create the necessary space in the housing. This also corresponds to the common idea of a wood pile of a hearth.

[0025] The arrangement of the logs and the light sources can be done in different ways. It has been found that the use of a lower log and at least two upper logs arranged on it allows for a natural-looking indirect lighting of a rear side of the fireplace arranged behind the log set. This is achieved by arranging the two upper logs in a row, based on their longitudinal extension. Both logs enclose an angle which is in the range of 120° to 170°, preferably from 130° to 170°, more preferably from 140° to 170°, more preferably from 150° to 170°, more preferably from 150° to 165°. Since the logs are formed like those of

natural, essentially cylindrical logs, a gap forms at the abutting edges of the logs due to the angular arrangement and the irregular surface of the logs. The gap and the common cavity cause the light from the first light source in the lower log to illuminate the rear wall of the fireplace behind the upper logs as well, even if they are closed at the back, as described below. At the same time, the upper logs cast a shadow that masks the projection of light onto the rear plate, trimming its edges and forming a perimeter, like a mask, in the shape of a rounded triangle, resembling real flames. The described effect can be achieved with a distance between the log set and the rear wall and log set if this is less than 10 mm, preferably less than 7 mm, more preferably less than 5 mm, more preferably 3 mm. The smallest distance between the rear wall of the fireplace and the log set is measured.

[0026] In a further embodiment, in which an upper log on the base log or adjacent to it comprises at least one further light source, the latter is also part of the illumination device and part of the lighting concept. In this way, the impression can be created that the upper logs burn intensively and with a brighter flame, as can be observed with a natural hearth. The impression can be influenced in various ways, for example by the surface structure and/or the light transmission of the upper log in question compared to the lower log. The light intensity of the relevant light source can also be suitably configured or set for this purpose. Optionally, several upper logs can also supplement the base log, whereby more than one further light source can also be arranged in the upper logs.

[0027] In accordance with further embodiments of the invention, the illumination device can include further optical elements which can be used to approximate the appearance of the light to a real fire. For example, the at least one light source may have a radiation shield which is suitable and designed to limit the radiation angle of the relevant light source. A similar effect can be achieved with diffusing lenses. Furthermore, the at least one light source may have radiation shield that prevents unwanted light from spreading to the rear plate. In further embodiments focusing lenses, can be used for spotlights. Both effects are also subject to a temporal variance due to the variable incidence of light from the reflector device. Optionally, other or all light sources can also have radiation shield s. For example, it has proven advantageous if the reflector device also has a radiation shield, which is arranged in such a way that no light passes directly from the reflectors to the inner surface of the front of the lower log. Such direct and alternating illumination is contrary to the simulation of burning wooden logs.

[0028] In general, the optical elements of the invention can be used in conjunction with one or more light sources to generate locally differentiable light effects, flame effects that simulate a flame and glowing effects that simulate glowing logs, for example differences between the central light effect and the light effect at the end face of the logs, corresponding to a natural, burning log arrangement.

[0029] An advantageous influence on the color of the rear and bottom luminous appearance of the light source(s) arranged in the log arrangement can be achieved with additional optical elements, for example with optical prisms or filters. The latter can absorb light in a wavelength-dependent manner, so that the illumination only occurs with a preferred color range, or over the entire spectral range of the light from the light source. In the latter case, the light can be reduced in certain areas, whereby the luminous appearance of the artificial log set can be approximated to that of a natural fire, as will also be described below for another area in the vicinity of the artificial longest.

[0030] Thus, according to a further embodiment, it has proven to be advantageous for the luminous appearance of the artificial log set if openings are formed in the front surface and/or the top surface and/or one or both side surfaces, the shape of which resembles a crack in the bark of a log or a gap, i.e. a sectional space, between two logs. Such a simulation of details of natural log arrangements enhances the impression of a natural hearth and can also increase the intensity of the glow, depending on the number and size of the openings. Such openings in a log correspond advantageously with the wood-like surface structure of the log(s).

[0031] Furthermore, an open area of the back surface and/or the bottom surface of the housing wall can be partially or completely closed with an opaque material and several or all areas that remain open can be closed with an optical filter that is predominantly transparent. At least one of the openings can be transparent in the wave range of orange to red light, i.e. in the wavelength range of 590 - 780 nm. The second one can be closed with a similar filter or with a white diffuser panel. As a result of the filter resp. diffuser effect and the arrangement of the filter or diffuser in the bottom surface of the housing, a fire bed arranged under the log arrangement can also be illuminated realistically. Predominantly transparent in a wavelength range means at least 40%, preferably at least 50%, more preferably at least 60% transparency for the said wavelength range. The term "shutter" as used above refers to an optically effective shutter. Irrespective of this, a suitable cover that does not alter the desired optical effect can be arranged to protect the device in the housing.

[0032] In a further embodiment, it can be advantageous for a realistic lighting effect if the light from the upper light source(s) does not fall on the back of the niche of the fireplace or falls on it to at least a reduced extent. To achieve this, the rear of the log or logs in question can be sealed with a non-transparent material. The log in question can be sealed with a rigid or flexible sheet-like material, for example. Suitable materials include, for example, a metal plate, foil, fleece or other material, whereby the material and the light source should not negatively influence each other's functions. To avoid disturbing reflections, the material can be black.

[0033] In a further embodiment, the natural impression

of the hearth can be enhanced if the typical sounds of a wood fire are also simulated. For this purpose, it has proven to be advantageous if at least two loudspeakers are arranged in the log arrangement, which reproduce the sounds recorded from a natural wood fire. A realistic impression is created in particular if the at least two loudspeakers are directed in different directions, for example if the loudspeakers are arranged on both sides of the hearth. Further loudspeakers and/or other directions are possible.

[0034] The invention also relates to an artificial fireplace which is designed to accommodate the artificial log set as described above. Such a fireplace can have the shape of a niche integrated into a wall or installed in front of a wall, whereby the niche itself is not part of the invention. The artificial fireplace according to the invention comprises only the lining of the niche and the other components described below. These are used to implement functions that are associated with a conventional fireplace and can supplement the artificial log set. This relates in particular to the design of the visible surfaces of the niche, the fire bed of the artificial log set, the ambient light of the artificial log set and the heat emitted by the fire.

[0035] In addition to the features of the artificial log set described above, a fireplace according to the invention comprises an outer housing. This encloses the artificial log set on five sides and is open at the front. In terms of its general orientation, the front side obviously corresponds to the front surface of the artificial logs, since its front surface is the visible surface of the hearth as described above. Consequently, in the arrangement of the artificial logs in the artificial fireplace, the rear wall and the rear surface, the side plates and the side surfaces, the top plate and the top surfaces as well as the base plate and the base surface are located opposite each other, whereby an artificial log set as described above is arranged on the base plate of the fireplace. Said plates of the artificial fireplace are connected to each other in a suitable manner to form a five-sided closed outer housing.

[0036] According to one embodiment of the invention, either the artificial log set or the artificial fireplace comprises an artificial fire bed. This is a common component of a natural hearth and plays a not insignificant part in the perception of the fireplace, as the fire bed is a bright orange glowing component of the hearth. Alternatively, the fire bed can be connected to the log arrangement or to the base plate of the fireplace. In both cases, the artificial log set is positioned on the fibered and illuminated by its illumination device in the same way as the artificial logs. The arrangement of the artificial longest "on" the fibered does not necessarily require direct contact between the two components, provided that the lack of contact is concealed by other components of the fireplace in the view. This can be achieved, for example, by a log arranged between the log arrangement and the fire bed, as described below. Other designs are also suitable, for example a narrow overhang of the bottom log.

[0037] In this way, a natural-looking fire bed can be

incorporated into the overall design of the fireplace. Furthermore, the fire bed can be integral with the base plate of the outer housing, which can simplify the design. The integral design can be achieved, for example, by structuring the base plate in three dimensions.

[0038] The cladding of the existing niche represents the visible surfaces of the artificial fireplace and can be three-dimensionally structured at least on the surface in sections. The surface structuring can simulate a preferred wall design for fireplaces, for example a brick or quarry stone wall or other structures, for example of a smaller size and shape. For the generation of the above-described luminous appearance of the artificial log set, it can be advantageous if a section of the rear wall is free of the said 3D structures or if this depth of the 3D structures is a few millimeters, preferably less than 2 mm, more preferably less than 1 mm. Preferred is this area without any grain structure or other pattern. Said section lies directly behind the artificial log set plus an area adjoining it. The latter preferably has an essentially triangular shape or the shape of a circular section, for example a semicircle or a larger or smaller circular section. For optimal color reproduction, it is advantageous if the rear plate is gray or black or has a color that supports the color of the backlight. The latter can be determined by trial or simulation. Such an area is often visible in natural fireplaces, as fewer soot particles are deposited there than in the remaining inner wall of the fireplace enclosure. It has also been found that the smooth glow created by the artificial log set behind the hearth is most effective in this way.

[0039] According to a further embodiment of the artificial fireplace, a second illumination device is arranged in the cover plate of the outer housing, which also comprises at least one light source, preferably several of them. This at least one light source is aligned in such a way that it predominantly illuminates an area in front of the fireplace. This means that the area of the floor in front of the fireplace illuminated by the second illumination device is larger than the light from this illumination device falling into the outer housing. Preferably, the area on the floor in front of the fireplace is at least 20% larger, more preferably at least 30%, more preferably at least 40%. More preferably the second lighting device should illuminate exclusively outside the fireplace. This supplementary lighting extends over a width, measured parallel to the front of the fireplace, which is greater than the width of the artificial log set. The illumination of the surrounding ground in front of the fireplace is regularly observed in a natural fire and is also an essential component of the lighting effect of a natural fireplace. For this purpose, the at least one light source is aligned at an angle that has a sufficiently large deviation from the vertical, apparently downward direction of radiation. With regard to various embodiments of the light source, reference is made to the above explanations of the light source of the first illumination device.

[0040] It is advantageous if the size of the illuminated

area in front of the fireplace and the illuminance are adapted to the size and brightness of the artificial log set and can be adjusted according to a further embodiment. The adjustability can concern at least the illuminance and optionally the direction of radiation and the opening angle of the light source, whereby suitable further optical elements, such as exchangeable filters, variable radiation shields and other elements can be arranged on the light source. The photometric illuminance is measured in lux and can be varied for different light sources. For the ambient light of the artificial fireplace considered here, however, setting a percentage of the illuminance achievable with the relevant light source may be sufficient to adapt the ambient light to the luminous appearance of the artificial longest. Further parameters of the light source can be adjusted. The settings of the second illumination device can be made using its control device.

[0041] According to a further embodiment, the at least one light source or one of the several light sources or all light sources of the second illumination device can be designed in several parts. The components of the multi-part light source are referred to here as "emitters" merely for the sake of linguistic differentiation, even if they are of the same type as the light source of the first or the one-part light source of the second illumination device. For a realistic ambient light, it has proven to be advantageous if one emitter of the multi-part light source emits yellow or white light and the at least second emitter emits orange light. For the latter, the technical literature specifies the wavelength range of the visible white light from 380 nm to 750 nm and of the yellow to orange light from 590 nm to 700 nm, whereby for the latter deviations to smaller and/or larger wavelengths of up to 10 nm or 15 nm or 20 nm or 25 nm or 30 nm may be possible, depending on the color temperature of the white light of the first emitter, in order to adapt the ambient light to the luminous color of the artificial log set.

[0042] In this embodiment, both emitters are positioned next to each other so that their radiation beams overlap. In this way, the desired and optionally modifiable effect can be achieved by means of the at least one light source arranged in the cover plate of the outer housing, both in terms of the illuminance and the color of the light. A symmetrical arrangement of colored and white emitters in one light source is advantageous for the desired effect. This can be easily achieved if a light source has a central white emitter and an orange emitter on either side of it. It is preferable to use several adjacent light sources of this type.

[0043] In this embodiment of the artificial fireplace, it can be advantageous if said light source comprises a diffuser which produces a diffuse scattering of the light passing through it. Such a diffuser, also known as a matt diffuser, is arranged in front of the two or more adjacent emitters and produces a diffuse and therefore glare-free light of uniform brightness and color. A diffuser consists of a sheet or film that is transparent to the light from the light

source and has a rough surface at least on the output side, optionally on both sides, on which the light passing through is scattered unevenly. Optionally, the diffuser can also modify the color of the light source, for example if it itself contains color particles.

[0044] According to a further embodiment, the artificial fireplace may comprise a sound device for generating the sounds associated with burning wood. The sound device comprises a suitable sound generator and at least one loudspeaker, preferably two loudspeakers, the latter being oriented in different directions. When two loudspeakers are used, these are preferably directed to the right and left and further preferably in the direction of the side plates of the outer housing, so that the sounds appear to come from the hearth.

[0045] According to a further embodiment, the artificial fireplace also comprises a hot fan, which is designed in terms of its heat output and its fan to simulate the heat emanating from a real fireplace, optionally also the decreasing heat of a fire. The hot fan can be installed in various positions. It has proven to be advantageous for the fireplace according to the invention if it is arranged behind the cover plate of the outer housing and blows through openings in the cover plate onto the floor directly in front of the fireplace.

[0046] Preferably, the aforementioned components comprise control devices which are designed to realize the described functions of the artificial fireplace. Furthermore, it is advantageous if these can be operated by means of the above-mentioned control unit of the artificial fireplace and the control unit communicates wirelessly with the control devices of the artificial fireplace.

[0047] In the following, the invention is explained by way of example with reference to the attached figures with reference to a preferred embodiment, whereby the features shown below can represent an aspect of the invention both individually and in various combinations with one another. The accompanying drawings show in

Fig. 1 an exemplary artificial fireplace in perspective view,

Fig. 2A a log arrangement according to Fig. 1,

Fig. 2B a top view of the log arrangement according to Fig. 1,

Fig. 3 an outer housing of fireplace according to Fig. 1,

Fig. 4 a rear view of the artificial log set, according to Fig. 1,

Fig. 5 sectional view of the artificial log set within the outer casing, shown in Fig. 1,

Fig. 6 a sectional view of the artificial fireplace including an exemplary light source of the sec-

ond illumination device, and

Fig. 7 a light source of the second illumination device.

[0048] It is understood that other embodiments may be used, and structural or logical changes may be made without departing from the scope of protection of the present invention. It is to be understood that the features of the various exemplary embodiments described herein may be combined with each other, unless specifically indicated otherwise. The following detailed description is therefore not to be construed in a limiting sense, and the scope of protection of the present invention is defined by the appended claims.

[0049] The figures only show the details necessary for understanding. They do not claim to be complete or true to scale. In the figures, identical or similar elements are provided with identical reference symbols where this is appropriate.

[0050] Fig. 1 shows an embodiment of the artificial fireplace 1, also abbreviated to fireplace in the description of the figure, which can be installed in a wall niche (not shown), or a niche constructed in front of the wall.

[0051] An outer housing 11 closed on five sides comprises a base plate 16, a top plate 17 opposite it, two side plates 18, which connect the base plate 16 and top plate 17 to each other, and a rear plate 19 connecting all four plates to each other. An artificial log set 12 is arranged in the outer housing 11. The artificial log set 12 comprises a log arrangement 13, which is arranged on a log grate 14. The log grate 14 is designed to receive the log arrangement 13 and to hold it at a distance AL from the base plate 16 of the outer housing 11. The log grate 14 has a grid-shaped base, which is folded up at the front, and feet for adjusting the distance AL. A log grate 14 is a common component of a fireplace and can have various designs that are suitable and attractive for the functions mentioned. The fire bed 15 is formed at the distance AL.

[0052] The outer housing 10 as shown in Fig. 1 is made up of several parts. Fig. 2 shows the main components of the outer housing 11 in an exploded view. It comprises an outer wall 20 with a trapezoidal horizontal cross-section. The two side walls 21 of the wall 20 each have a side panel 22, which are the angled front edges of the walls 21 and designed for mounting the outer housing 11 on a wall (not shown) or a frame designed for this purpose (not shown). The upper end of the wall 20 forms the top plate 17 of the outer housing 11 and is formed with a cavity (Fig. 6), in which components of the fireplace 10 are arranged, as described below. The lower end 23 is flat, as are all other parts of the wall 20. At the rear, the wall 20 is closed with a rear wall 24 and completely open at the front.

[0053] The side panels 22 and the rear wall 24 are faced with a facing shell 25. The facing shell 25 is provided with a 3D structure on its inner side 26 facing away from the wall 20, which is merely an example of unplastered masonry. The 3D structure is not formed in a central

area of the facing shell 25 that covers the rear wall 24 (marked with a dashed line) but is only represented by differences in color. The facing shell 25 continues on the lower end 23 of the wall 20. This part of the facing shell 25 comprises a central elevation which simulates the fire bed 15 and whose shape is modeled on a real ember bed with solid components and whose size is adapted to the size of the fire bed 15 (Fig. 1).

[0054] The facing shell 25 according to the design example is made in two parts. The vertical components form one part, the horizontal component forms the second part. Other, also detachable connections of the components are possible. The facing shell 25 is connected to the wall 20 using suitable connecting means sufficiently known to the skilled person. In conjunction with the associated components of the facing shell 25, the named surfaces of the wall 20 form the base plate 16, the top plate 17 and the side plates 18 as shown in Fig. 1. The outer housing 11 also has an electrical connection 27 and a variation of the ventilation openings 28 in the top plate 17, through which the cavity there (Fig. 6) can be ventilated.

[0055] Fig. 3 A shows a front view of the log arrangement 13 as used in the embodiment example. Other designs of the log arrangement 13 are possible based on natural log arrangements, both in terms of the number and sizes of the logs 30.1, 30.2, their arrangement in relation to each other, their surface designs, and other properties of the logs 30.1, 30.2.

[0056] The log arrangement 13 comprises, for example, three logs 30.1, 30.2, a lower log 30.1, which is arranged horizontally and essentially parallel to the rear plate and the base plate (both not shown here) of the fireplace 10, and two upper logs 30.2 lying next to each other and on the lower log 30.1. The logs 30.1, 30.2 are designed in such a way that they do not lie on top of each other over their entire surface and there is a gap to the lower log in sections. Their surfaces are designed in such a way that they are modeled on the structure of wood. Both upper logs 30.2. Both logs 30.1, 30.2 are arranged in such a way that they form an obtuse angle when viewed in the horizontal plane, for example an angle of approx. 170°, other obtuse angles are possible. the obtuse angle between the two upper logs creates a gap at this angle through which light exits the back of the log set and illuminates the area (shown dashed) behind the log set on the rear plate 19.

[0057] Fig. 3B shows the artificial log set 12 including the log arrangement 13 according to Fig. 3A. The log arrangement 12 is arranged on the log grate 14, which is positioned on the base plate 16. The log grate is positioned in such a way that the log arrangement 13 is above the fire bed.

[0058] Fig. 4 shows a sectional view of the log arrangement in Fig. 3A along the intersection line D-D of Fig. 3A and looking forwards. The log arrangement 13 is made in one piece, whereby the three logs 30.1, 30.2 used are connected to each other, optionally manufactured in one

piece. The logs 30.1, 30.2 together form the housing 31 of the artificial log set 12. The front of the housing wall 32 of the logs 30.1, 30.2 forms the front surface 33, the top forms the top surface 34, the bottom forms the bottom surface 35 and the sides, which are stepped in the embodiment example, form the side surfaces 36. The rear surface 37 (Fig. 5) is not shown in Fig. 4. It lies in front of the drawing plane in the direction of view. The housing wall 32 of the logs 30.1, 30.2 consists of a pourable and transparent resin, which preferably has an orange color. This was poured into a mold whose inner surface has the desired structure for the surface of the logs 30.1, 30.2.

[0059] A light source 40.1 of the first illumination device is arranged in the cavity of each of the two upper logs 30.2 by means of suitable holders 38. These radiate towards the front surface 33 and are therefore in the direction of view from the holder 38 and are only shown by means of a corresponding symbol. Both upper logs 30.2 are closed towards the rear (Fig. 6) with a closure plate 41, which is black on the inside, i.e. towards the cavity. The closure plate 41 of the upper right log 30.2 is only partially shown in Fig. 4 in order to make the installations in the log 30.2 visible.

[0060] The cavity of the lower log 30.1 is connected to the cavities of the two upper logs 30.2 by means of openings 38 in the housing wall 32. Further components of the first illumination device are arranged in the common cavity. In the present embodiment example, these are three light sources (Fig. 5), a reflector device 42, its holders 38, a closure plate 41 for closing the bottom of the common cavity of the log arrangement 13 and optical filters, which are predominantly transparent in the wave range of orange to red light inclusive, i.e. in the wavelength range of 590 - 780 nm.

[0061] The reflector device 42 comprises a plurality of reflectors 43, which in the embodiment example have the shape of leaves and are arranged on a rotatable axis 44. The reflectors 43 are arranged distributed over the length and circumference of the rotatable axis 44, so that they reflect the light incident from the three light sources (Fig. 5) apparently randomly and continuously in different directions and produce a flickering effect. The light coming from the reflectors 43 penetrates outwards through passages of the housing wall 32 of the log arrangement 13. To create the impression of burning logs, the diffusers 47 simulate cracks in the burning wood and are both distributed over the surfaces of the logs 30.1, 30.2 and arranged between the logs 30.1, 30.2. Due to the material of the housing wall 32, the light passing through the housing wall 32 glows yellow to orange, depending on the color and thickness of the housing wall 32.

[0062] The bottom closure plate 41 of the log arrangement 13 closes the cavity towards the fire bed (Fig. 5) largely to completely, but also has openings 38, each of which is closed with one of the aforementioned optical filters 46. In this way, the fire bed 15 (Fig. 5) is illuminated in orange to red by means of the first illumination device.

[0063] Fig. 5 shows a sectional view of the artificial log

set 12 with the arrangement of the log arrangement 13 as well as the log grate 14 and the fire bed 15 arranged below it. For a better spatial classification of the terms used for the housing 31 of the log arrangement 13, the boundary surfaces of the housing 31, which are only conceptually rectilinear, are added: the front surface 33, the top surface 34, the bottom surface 35, the rear surface 37 and, as a result, the side surfaces 36 connecting these surfaces. Fig. 5 also shows the arrangement of the light sources 40.1 and the reflector device 42 of the first illumination device by means of their brackets 39 in the lower log 30.1. The light sources 40.1 are directed towards the front surface 33, so that their light is continuously directed in different directions by means of the reflectors 43 located in their beam path and due to their rotation. The light source 40.1 itself is surrounded by a radiation shield 48 on at least two sides, upwards and towards any neighboring light source. The sound generator 49 is shown only schematically on the bottom surface 37 of the housing 31. Its loudspeakers (not shown) are arranged in both side surfaces 36 as described above. The closure plates 41 of the lower log 30.1 and the upper log 30.2 described in Fig. 4 are also shown. For their design and for the design of the other components, reference is made to Fig. 4.

[0064] The light of the first illumination device described above is distributed in the following directions by means of the reflector device 42 and the design of the log arrangement 13: to the fire bed 15, to the front of the log arrangement 13, into the upper logs 30.2 and the spaces between the upper logs 30.2 and the lower log 30.1 and to the rear plate 19. Due to this distribution in conjunction with the combination of the features of the log arrangement 13, the design of its housing wall 32 with openings 38 and openings 47, the position and design of the light sources 40.1 of the first illumination device and the closure plates 41 and optical filters 46, the flickering effect generated by the reflector device 42 occurs both on the inside of the rear plate 19 of the outer housing 11 and on the log arrangement 13 and the fire bed 15 together, so that a good simulation of a natural fire is possible.

[0065] The simulation is further enhanced by the ambient light effect, which is generated by the second illumination device. Fig. 6 shows a vertical section through the fireplace 10 showing the arrangement of the artificial log set 12 according to Fig. 5 in the lower area of the fireplace 10 and the second illumination device arranged in the cavity 50 of the top plate 17 of the outer housing 11. These emit the light through an opening 38 in the underside of the top plate 17 at such an angle, in relation to the vertical direction, towards the surrounding floor 51 that it strikes an area directly in front of the fireplace 10. A distance between the illuminated floor surface and the fireplace 10 is shown. This is possible, but not necessary, provided that such an area on the floor 51 is illuminated which can be clearly assigned to the light phenomenon. For this purpose, the direction of the light source 40.2 can be adjustable and/or limited. In the illustrated embodi-

ment example, the second illumination device comprises several light sources 40.2, which are arranged next to each other in a horizontal direction. Each light source 40.2 comprises a radiation shield 48 for limiting the direction of light propagation. The limitation is also a limitation to the respective neighboring light source 40.2.

[0066] Fig. 6 also shows a hot fan 53, which is also arranged in the cavity 50 of the top plate 17. The hot fan 53 is designed and arranged in such a way that it blows warm air into the area in front of the artificial log set through a further opening 38 in the underside of the top plate 17, optionally through the opening 38 of the second illumination device.

[0067] The light sources 40.1, 40.2 in both illumination devices are individual LEDs. Other light sources are possible as described above. For a better overview, the electrical connections to the components of the fireplace and the parts required to control the components are not shown. Fig. 6 shows for the sake of completeness a control device 54, which is designed to control the light sources 40.1, 40.2 of both illumination devices, the reflector device 42, the sound device and the hot fan 53 of the shown artificial fireplace 10.

[0068] Fig. 7 shows an embodiment of a multi-part light source 40.2 of the second illumination device. This comprises for example three emitters 52.1, 52.2 arranged next to one another, a central white emitter 52.1 emitting white light and two side emitters 52.2 arranged on either side of it. The latter emit orange-colored light in the wavelength range from approx. 590 nm to approx. 700 nm. Deviations from the specified wavelength range are possible to the extent specified above. The emitters 52.1, 52.2 are arranged at such a distance from one another that their light cones overlap, preferably completely on the floor 51. The overlapping and the choice of illuminance of the emitters 50.1, 50.2 is made to such an extent that the light on the floor is uniformly bright and orange colored. Other arrangements of the multiple light sources and/or their emitters are possible.

List of reference symbols

[0069]

10	fireplace
11	outer casing
12	artificial log set
13	log arrangement
14	log grate
15	fire bed
16	base plate
17	top plate
18	side plates
19	rear plate
20	wall
21	folded edge
22	side panel
23	bottom end

24	rear wall
25	facing shell
26	inner side
27	electrical connection
28	ventilation openings
30.1, 30.2	lower, upper log
31	housing
32	housing wall
33	front surface
34	top surface
35	bottom surface
36	side surface
37	rear surface
38	opening
39	bracket
40.1, 40.2	light source
41	closure plate
42	reflector device
43	reflector
44	rotatable axis
45	drive
46	optical filter
47	diffuser
48	radiation shield
49	sound generator
50	cavity
51	floor
52.1, 52.2	central emitter, side emitter
53	hot fan
54	control device
AL	distance log arrangement - floor panel
α	angle between upper logs

Claims

1. Artificial log set, comprehensive

- an arrangement of at least two artificial logs (30.1, 30.2), which are translucent in sections and arranged one above the other,
- an illumination device with at least one light source (40.1) which is designed to illuminate the inside of the logs (30.1, 30.2),
- an optical unit with a plurality of optical elements which are designed and arranged for variable reflection of the light from the at least one light source (40.1), also described here as a reflector device (42), and
- a control device (54) being constructed and configured to control the at least one light source (40.1) and optical elements of the optical unit,

characterized in that

- the log arrangement (13) is formed by at least one housing which encloses the illumination device and the optical unit,

- the housing comprises a front surface (33), a rear surface (37) opposite the front surface (33), two side surfaces (36) laterally connecting the front surface (33) and the rear surface (37), as well as a bottom surface (35) and a top surface (34), the rear surface (37) and the bottom surface (35) being open at least in sections, and

- the housing wall (32) is structured in such a way that the shape of separate logs (30.1, 30.2) and the surface structure of wood are simulated.

2. Artificial log set according to claim 1, **characterized in that** the housing (31) of the log arrangement (13) is structured in such a way that a lower log (30.1) forms the base of the log arrangement (13), in which the at least one light source (40.1) and the reflector device (42) are arranged.

3. Artificial log set according to claim 1 or 2, **characterized in that** the illumination device comprises at least one further light source (40.2) which is arranged in the at least one upper log (30.1) and/or the structure of the front surface (33) of the housing (31) has at least one opening (38) which is designed in such a way that it simulates a crack in a log (30.1, 30.2) or a sectional distance between two logs (30.1, 30.2).

4. Artificial log set according to one of the preceding claims, **characterized in that** the optical unit comprises at least one further optical element from the following list:

- a radiation shield (48) for limiting the radiation angle of the at least one light source (40.1, 40.2),
- diffusing or focusing lenses,
- optical prisms,
- absorbing filters which absorb the light of at least one light source in the visible spectral range in a wavelength-dependent manner or in this entire spectral range.

5. Artificial log set according to claim 4 or 5, **characterized in that** said at least one upper log (30.1) is closed on the back with a material which is opaque to the light of the further light source (40.2).

6. Artificial log set according to one of the preceding claims, **characterized in that** at least one open region of the rear surface (37) or the bottom surface (35) of the housing (31) is closed with an optical filter which is transparent in the wavelength range of orange to red light inclusive.

7. Artificial fireplace, comprising an outer casing (11) open at the front, with a base plate (16) and a top plate (17) opposite thereto, with two side plates (18) connecting the base plate (16) and top plate (17) to

one another and with a rear plate (19) connecting all four plates to one another, **characterized in that** an artificial log set (12) according to one of the preceding claims is arranged on the base plate (16).

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8. Artificial fireplace according to claim 7, **characterized in that** the artificial fireplace (10) comprises a fire bed (15) which is located below the log arrangement (13) and on the base plate (16) of the artificial fireplace (10) and is illuminated by the illumination device of the artificial log set (12). 10
9. Artificial fireplace according to one of claims 7 or 8, **characterized in that** the surfaces of at least the side plates (18) and the rear plate (19) of the outer casing (11) facing the artificial log set (12) are three-dimensionally structured, with the exception of a section of the rear wall (24) which extends above the artificial log set (12), said section being free of the three-dimensional structures. 15 20
10. Artificial fireplace according to claims 7 to 9, **characterized in that** a further illumination device is arranged in the top plate (17), the at least one light source (40.2) of which is directed onto an area in front of the artificial fireplace (10). 25
11. Artificial fireplace according to claim 10, **characterized in that** said control device (54) or a further control device is constructed and configured to control the light source (40.2) of the further illumination device and to adjust the illumination intensity of at least one of light sources (40.1, 40.2) of the first illumination device and/or the further illumination device. 30 35
12. Artificial place according to claim 10 or 11, **characterized in that** the at least one light source (40.2) of the further illumination device comprises at least two adjacent emitters (52.1, 52.2) which emit white light and orange light with overlapping light cones, the latter in the wavelength range from 590 nm to 700 nm. 40
13. Artificial fireplace according to one of claims 7 to 12, **characterized in that** at least one open area of the housing (31) and/or the at least one light sources (40.1, 40.2) of at least one of the illumination devices includes a diffuser (47). 45 50
14. Artificial fireplace according to any one of claims 7 to 13, **characterized in that** the artificial fireplace (10) comprises a sound device including a sound generator (49) and two loudspeakers which are directed in different directions. 55
15. Artificial fireplace according to any one of claims 7 to 14, **characterized in that** the artificial fireplace (10)

comprises a hot fan (53) which blows heated air onto an area in front of the fireplace (10).

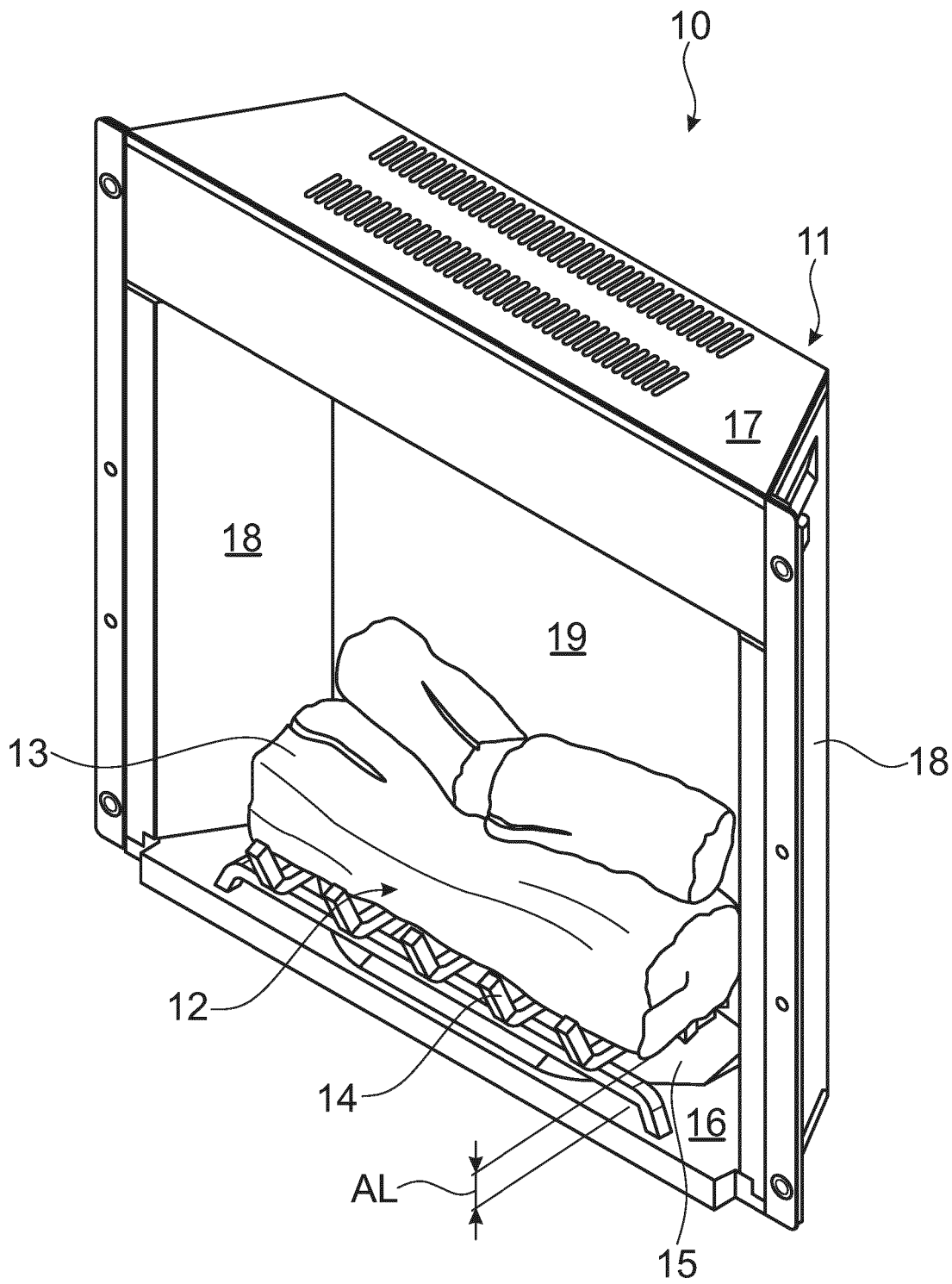


Fig. 1

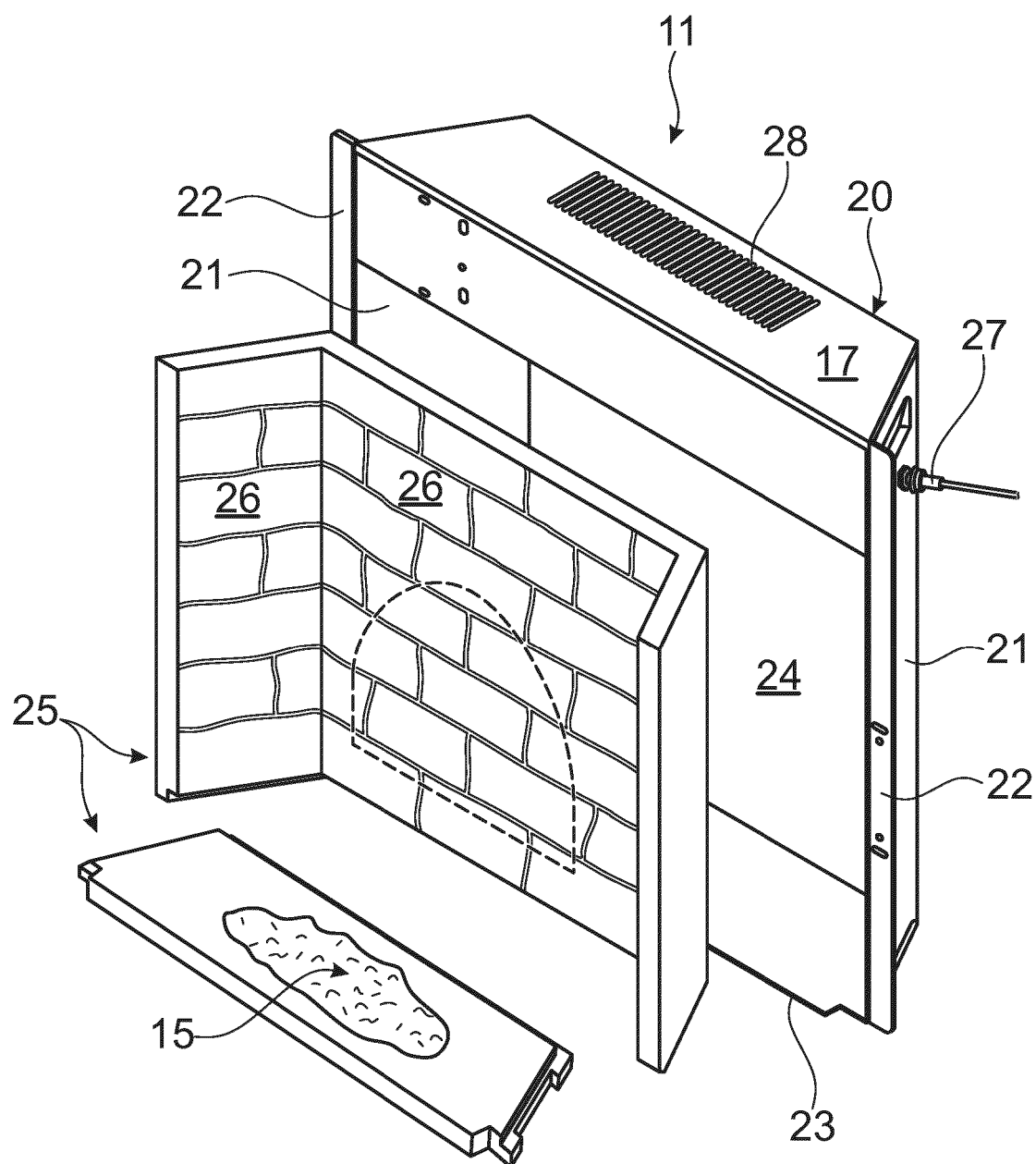


Fig. 2

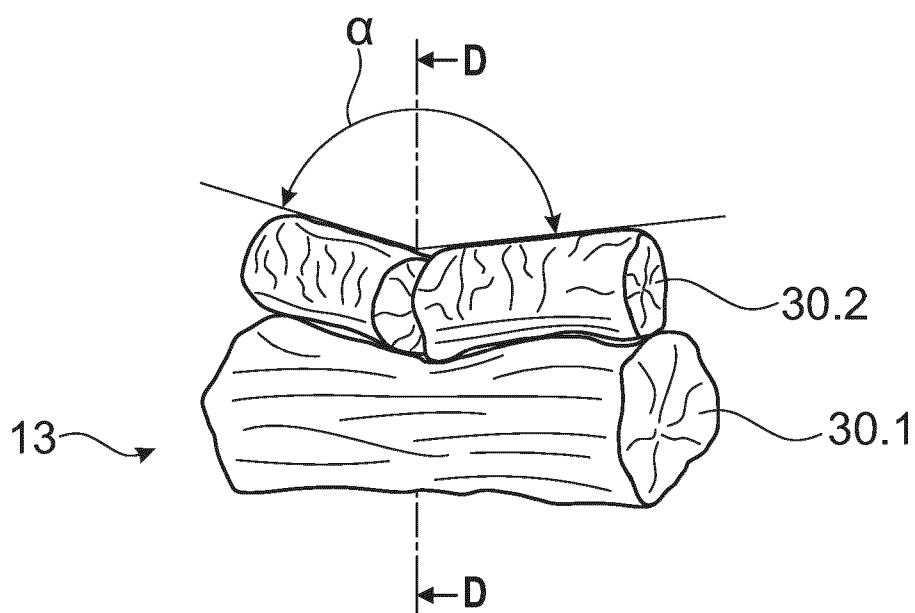


Fig. 3A

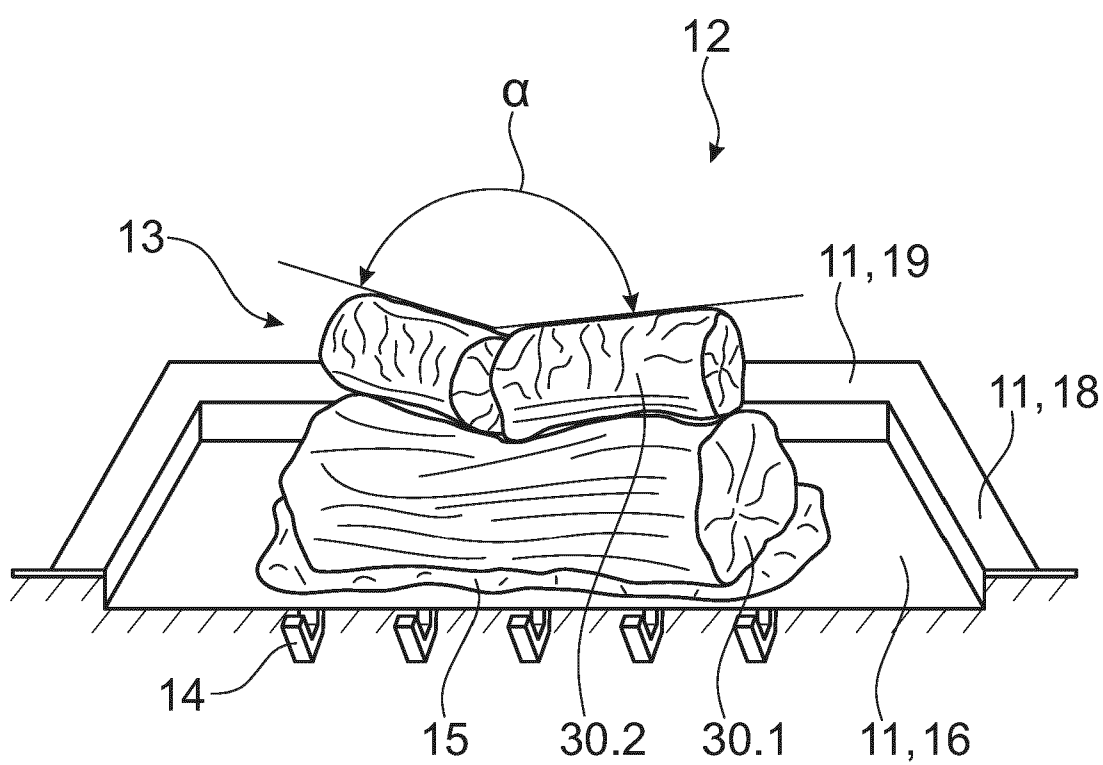


Fig. 3B

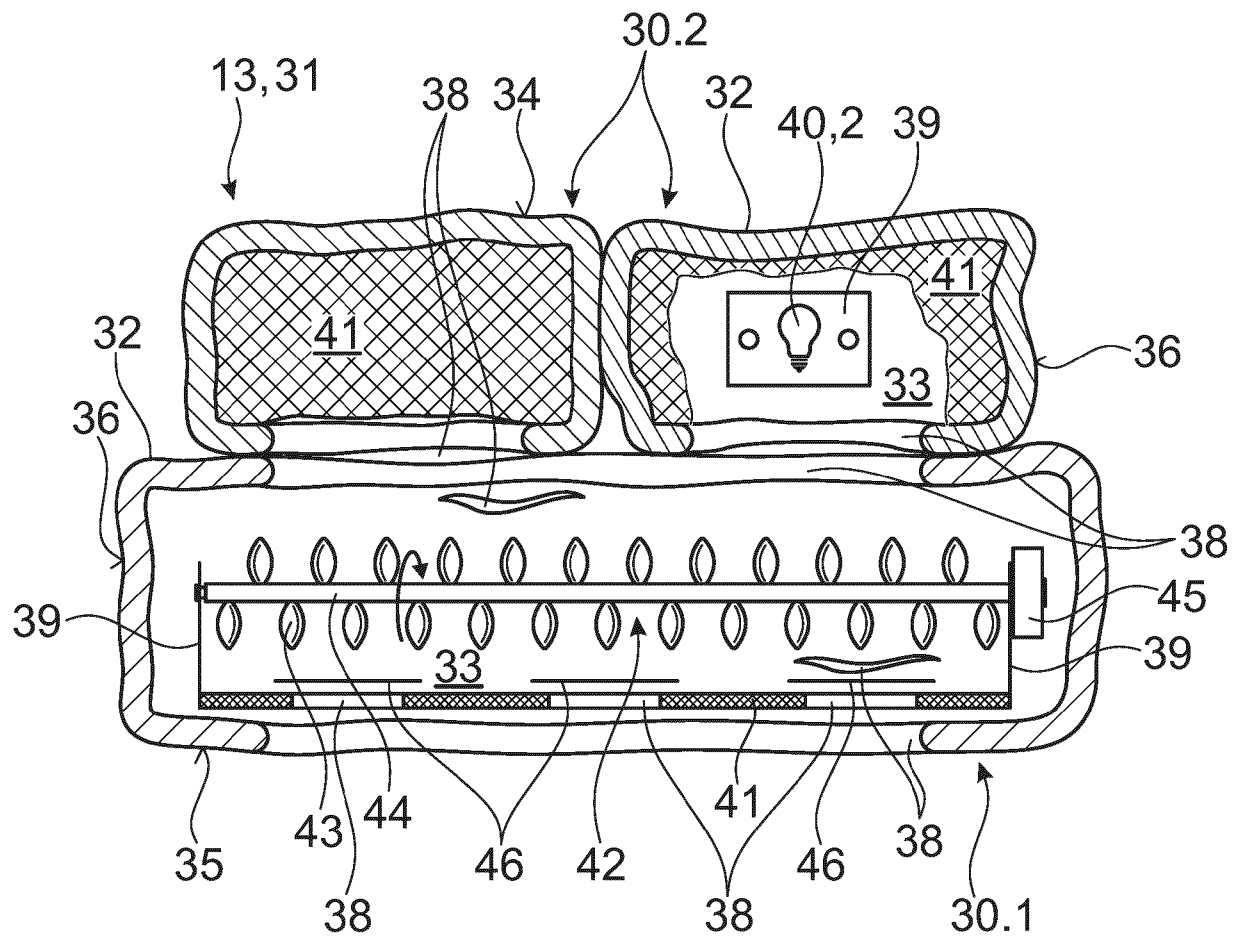


Fig. 4

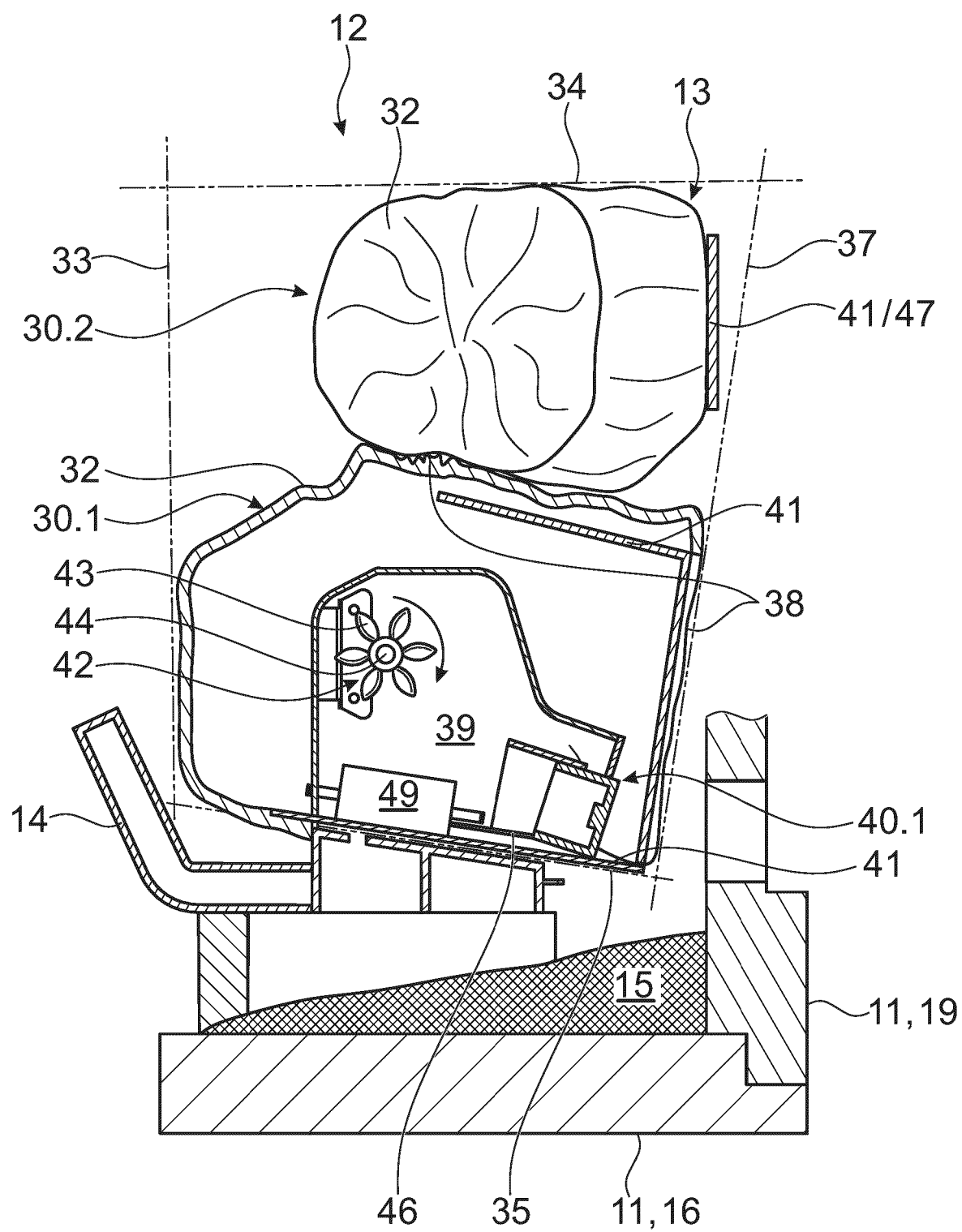


Fig. 5

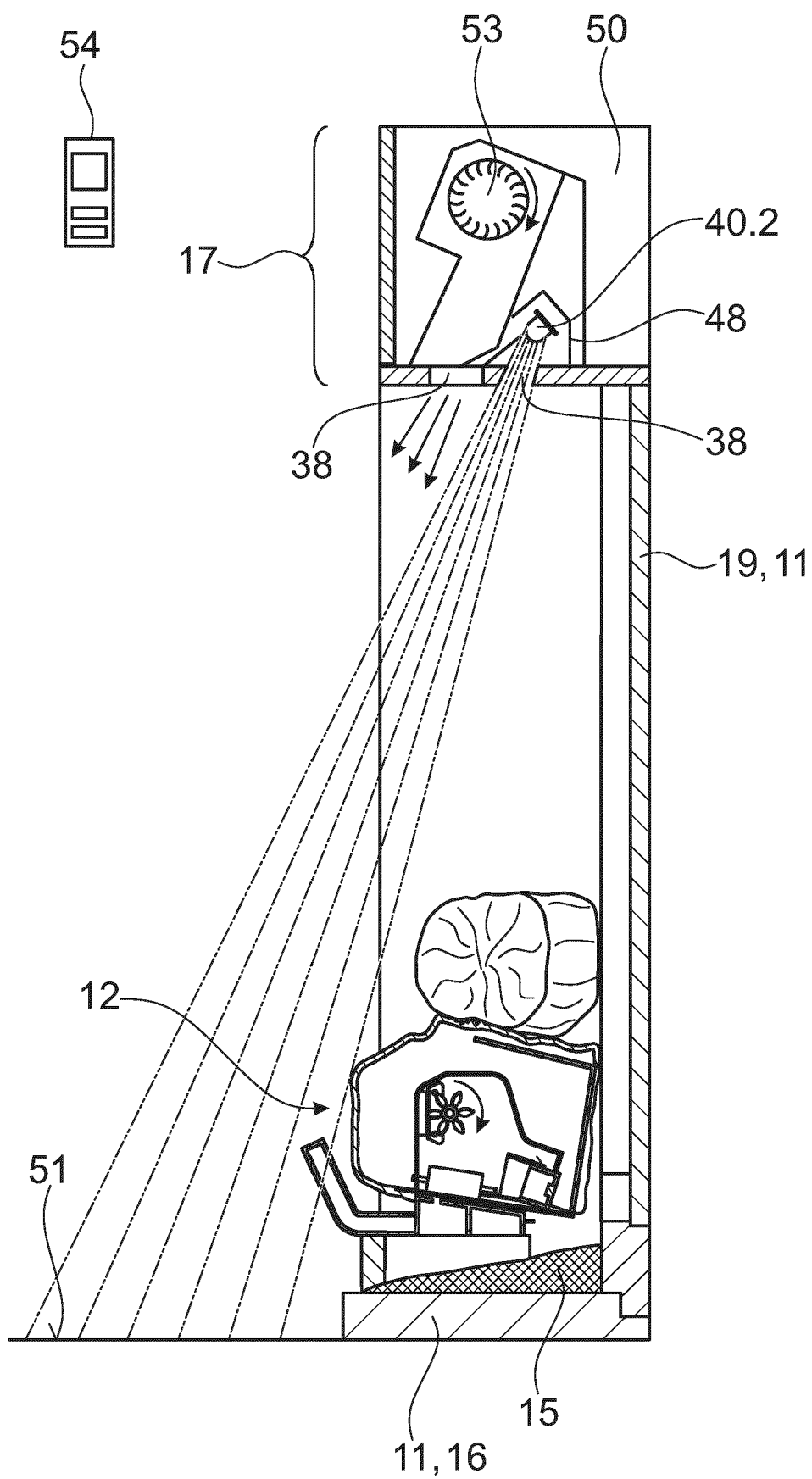


Fig. 6

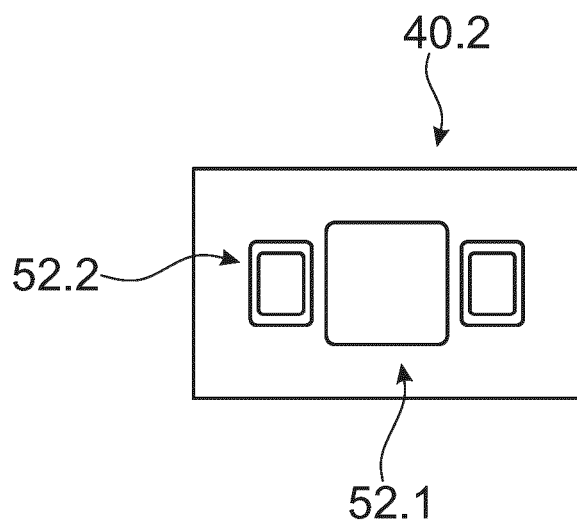


Fig. 7



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Application Number

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The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		17 March 2025	Adant, Vincent
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