



(12) **DEMANDE DE BREVET CANADIEN**
CANADIAN PATENT APPLICATION

(13) **A1**

(22) Date de dépôt/Filing Date: 2020/06/03

(41) Mise à la disp. pub./Open to Public Insp.: 2021/01/30

(30) Priorité/Priority: 2019/07/30 (DE10 2019 120 525.5)

(51) Cl.Int./Int.Cl. *F21V 15/01* (2006.01)

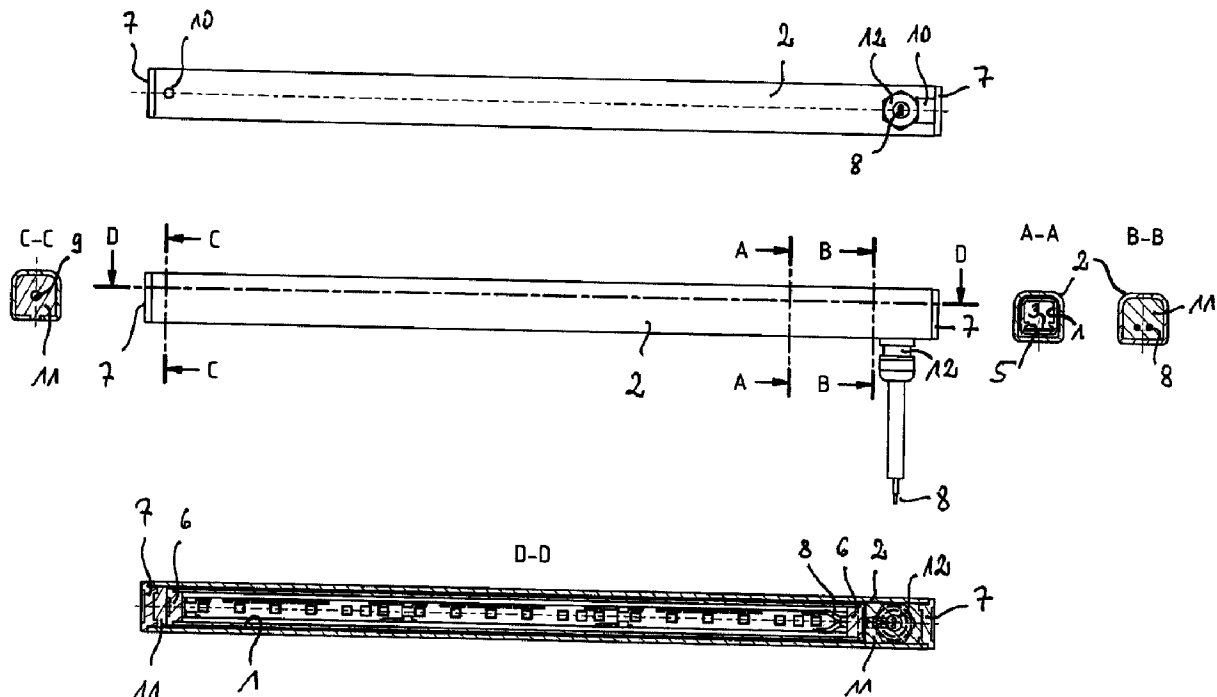
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(54) Titre : LUMIERE SUBMERSIBLE

(54) Title: SUBMERSIBLE LIGHT



(57) Abrégé/Abstract:

The invention relates to a submersible light, in particular for a swimming pool, comprising an elongated profiled inner housing into which an LED strip having a plurality of light-emitting diodes is inserted, and an elongated profiled outer housing into which the

(57) **Abrégé(suite)/Abstract(continued):**

profiled inner housing is inserted, an inner region of the profiled outer housing between the end thereof and the associated end of the profiled inner housing being filled with a cured potting compound on both ends of the arrangement of the inner and profiled outer housing. The invention also relates to a method of making a submersible light. FIG. 3.

Abstract

The invention relates to a submersible light, in particular for a swimming pool, comprising an elongated profiled inner housing into which an LED strip having a plurality of light-emitting diodes is inserted, and an elongated profiled outer housing into which the profiled inner housing is inserted, an inner region of the profiled outer housing between the end thereof and the associated end of the profiled inner housing being filled with a cured potting compound on both ends of the arrangement of the inner and profiled outer housing. The invention also relates to a method of making a submersible light.

FIG. 3.

SUBMERSIBLE LIGHT

5 The invention relates to a submersible light, in particular for a swimming pool. The invention also relates to a method of making such a light.

10 Submersible lights, for example those for a swimming pool, are generally known in the prior art. These are frequently designed so that light bodies are integrated into an underwater recess in a wall, the recess being covered by a transparent cover that ensures waterproofing. Such structures are elaborate and prone to faults with regard to their sealing.

15 In the prior art LED strips have generally become established for lighting objects, in particular since they can be easily fitted into relatively long grooves. Such LED strips also exist in a splashproof design, in which the strip-shaped circuit board and the LEDs mounted thereon are covered on at least one end by a potting compound. On the other hand, such strips are not suitable for use under water. LED strips that are embedded in a fundamentally watertight potting compound on all ends are not
20 suitable for permanent use under water, in particular in chlorinated water, since the chlorine in the water can diffuse into the potting compounds, can damage them and can eliminate the waterproofing thereof.

25 It is therefore an object of the invention to provide elongated submersible lights having an improved permanent sealing, in particular in chlorinated water, preferably such submersible lights that can be introduced into grooves in walls situated under water, for example in swimming pools. A further object is

preferably to provide such submersible lights that, after mounting for example in a groove, no longer have to be provided with by further coverings. Therefore, without further additional elements, the submersible lights themselves should preferably be permanently watertight, in particular even in chlorinated water.

This object is achieved by a submersible light that comprises an elongated profiled inner housing in which an LED strip having a plurality of light-emitting diodes is inserted and an elongated profiled outer housing into which the profiled inner housing is inserted, the inner region of the profiled outer housing between the end thereof and the associated end of the profiled inner housing being filled with a cured potting compound on both ends of the arrangement of the inner and profiled outer housing.

Thus, a method according to the invention for producing such a light provides that an LED strip is inserted into an elongated tubular profiled inner housing, the connection lines of the LED strip projecting out of the profiled inner housing at the end. The profiled inner housing is inserted into a longer profiled outer housing with spacings between the ends of the housings and subsequently at both ends the end regions of the profiled outer housing are filled with a liquid curable potting compound between the ends of both housings.

Such a respective housing profile can be formed, for example, by a tubular profile open at both ends, for example as an extruded section or extruded profile or also cast. In principle, the cross section can have any shape, for example round, a substantially 4-cornered, i.e. quadrilateral, cross section at least of the profiled outer housing, preferably both housings,

being preferred. In this case, transitions between housing walls are also understood as angular even if they are rounded.

With this configuration, enhanced permanent sealing is already obtained by arranging two housings one inside the other, since in this arrangement the profiled inner housing also remains watertight, if the profiled outer housing develop a leak, for example due to action of force from the exterior.

With the arrangement one inside the other it may preferably be provided that a gap completely surrounding the profiled inner housing is preferably provided between the outer wall surface of the profiled inner housing and the inner wall surface of the profiled outer housing. Thus, the outer cross section of the profiled inner housing is smaller by at least the gap dimension, preferably by two times the gap dimension, than the internal cross section of the profiled outer housing. This not only enables simplified insertion of the profiled inner housing into the profiled outer housing, for example by pushing in at the end, but also forces applied to the profiled outer housing are not transmitted directly to the profiled inner housing, so the latter is protected.

The embodiment according to the invention is particularly preferred if at least the profiled outer housing, preferably both housings, is/are made from a permanently chlorine-resistant material.

This can be achieved in a preferred embodiment, for example, if at least the profiled outer housing, preferably the outer and the profiled inner housing, is/are made from polyvinyl chloride, as this material is chemically saturated with chlorine

and thus cannot be penetrated by chlorine from the surrounding water, so that no chlorine-related damage to the housing material is to be expected.

5 The material, in particular polyvinyl chloride, of the outer and/or inner housing is preferably mixed with diffuser particles, so that the generated light is diffused by these particles. As a result, the emitted light preferably appears homogeneous over the length of the light so that the eye of the observer can no longer detect any point light sources. The light
10 preferably emits homogeneous light over 270° around the longitudinal extension direction.

Furthermore, the potting in the inner region of the profiled outer housing between the end thereof and the respective end of the profiled inner housing preferably contributes to sealing
15 of the profiled inner housing relative to the outer housing and of the outer housing relative to the external environment by the potting compound. Thus, the potting compound seals both housings simultaneously relative to one another and to the exterior.

20 The ends of the profiled outer housing and profiled inner housing are considered to be associated if the ends of both housings are close to one another, that is to say adjacent one another, in particular if they are also facing one another.

25 A potting compound that is chlorine-resistant is likewise preferred. More preferably, the potting compound is transparent, but in an alternative embodiment it can also have diffuser particles.

In the submersible light according to the invention, it may preferably be provided that at least one open end, preferably

both open ends, of the inner housing and/or at least one open end, preferably both open ends, of the outer housing is/are each provided with an end cap.

5 The method may thus provide that the profiled inner housing is closed on both ends with inner end caps, in particular by ultrasonic welding, preferably after the LED strip has been inserted, and more preferably the connection cables of the LED strip are passed through one of these inner end caps.

10 Thus, in this embodiment, on at least one end, preferably both ends, of the arrangement of the inner and outer housings the end regions of the profiled outer housing between the opposing outer end caps can then be filled with the potting compound, or can be filled according to the method. The delimitation of the potting compound during filling of this region can be provided in a simple
15 manner by the inner and outer end caps. In particular, a respective inner end cap at the end of the profiled inner housing prevents the potting compound from penetrating into the interior of the profiled inner housing during potting.

20 More preferably, it may be provided that the outer end cap(s) of the profiled outer housing and/or the inner end cap(s) of the profiled inner housing is/are made from the same material as the associated housing, that is to say for example PVC. Particularly preferably, each end cap is connected in a watertight manner to the respective housing profile by ultrasonic welding.
25 So, a hermetically sealed fastening of the respective end caps on the respective housing profiles can be produced.

A respective end cap, preferably at least the inner cap of the inner housing, more preferably of the inner and outer

housings, can more preferably likewise be made from a material, for example polyvinyl chloride (PVC), which is mixed with diffuser particles, in particular as is the case with the housings.

5 Due to the light diffusion thus achieved in the end regions of the inner housing, light is diffused into the potted region between the end of the inner housing and the end of the outer housing. Thus, a plurality of lights could be in a row axially, in particular abutted, without a decrease in light intensity in the transition region of the lights being perceptible
10 to the eye of the observer.

In a preferred embodiment, the material of the inner housing and/or outer housing and/or the end caps may be pure polyvinyl chloride, except for the admixed diffuser particles.

15 Furthermore, according to the invention the electrical connection cables of the LED strip are guided through one of the inner end caps. Thus, the connection cables in the potted region between the ends of both housings are outside the profiled inner housing and thus externally before the respective outer end cap. In particular, in this region a watertight seal is produced in this
20 way along the entire inner extent of the connection cables, that is to say in the region of the connection cables in the profiled outer housing.

25 One of the inner end caps of the profiled inner housing, in particular the end cap opposite the connection end preferably has a spacer projecting toward the adjacent outer end cap of the profiled outer housing. Alternatively, the spacer can also be on the outer end cap of the outer housing and can project toward the respective inner end cap. The spacer may be, for example, pin-

shaped. Due to the spacer, when the profiled inner housing is pushed into the profiled outer housing the adjacent ends have a spacing that in particular corresponds at least substantially to the longitudinal length of the spacer, thus producing a defined region that can be filled with potting compound between the ends, or between the end caps.

The method preferably provides that the profiled inner housing with the end cap at the front, preferably with the spacer projecting outward, is inserted into the profiled outer housing, in particular after previous closure of an end of the profiled outer housing by an outer end cap.

The profiled inner housing is shorter in its longitudinal extension direction than the profiled outer housing, in particular shorter than the profiled outer housing at least by the length of two regions in the longitudinal direction to be filled with potting compound.

In order to simplify the filling with potting compound, in accordance with the invention the housing wall of the profiled outer housing has at least one hole, preferably at both ends, in the region between its outer end, in particular its outer end cap and the associated outer end of the profiled inner housing, in particular its inner end cap. The filling with initially liquid potting compound can be carried out through these holes. A preferably second hole simplifies the escape of displaced air, but is not absolutely necessary.

Furthermore, the connecting cables of the LED strip pass through a hole on one the outer ends of the profiled outer housing, and in particular a cable feedthrough for these connecting cables

is fastened to the hole. In this case, this may preferably be the hole through which the filling with potting compound is also carried out.

5 The cable guiding is preferably achieved by the above-described embodiment so that, at least in a region adjacent to the profiled outer housing, the cable outside the profiled outer housing extends perpendicular to the longitudinal extension direction of the housings.

10 However, the invention may also provide that the connecting cables of the LED strip are guided in parallel with the longitudinal extension direction of both housings through the end caps of both housings into the outer region of the submersible light.

15 A further preferred embodiment may additionally provide that the above-described preferably provided gap between the profiled inner housing and the profiled outer housing is closed on at least one end, preferably on both ends of the profiled inner housing by a sealing element, in particular made from an elastomer, preferably silicon. Thus, potting compound can be prevented from
20 penetrating into the gap during filling of the region between the outer ends of both adjacent housings.

25 The invention can also provide that the profiled inner housing has a guide into which the LED strip can be inserted and guided, the LED strip being held by the guide close to the inner surface, preferably in contact with the inner surface of a wall of the profiled inner housing.

This wall to which the LED strip is close may also be understood as the base of the profiled inner housing, regardless of

whether or not a guide is present. The opposite wall of the profiled outer housing that is close to it may be understood as the base of the profiled outer housing. The above-described respective holes for filling and/or ventilation and/or cable guiding can preferably be in the base of the profiled outer housing.

The guide can be formed, for example, by two opposing guide grooves, and each guide groove is formed by the same wall, or the base of the profiled inner housing and two projections spaced apart therefrom and pointing toward one another on walls of the profiled inner housing extending perpendicularly to this common wall.

More preferably, the circuit board of the LED strip may be fastened to a metallic support element. This can provide a sufficient thermal capacity for storage and dissipation of heat from the LED strip. The support element is preferably in contact with the wall of the profiled inner housing designated as the base.

A preferred design is shown in the drawings and is described below with reference to the drawings that show the same design.

The drawings show a submersible light, preferably for use in chlorinated water, with a profiled inner housing 1 and a profiled outer housing 2 into which is fitted the profiled inner housing 1 that is shorter in the longitudinal extension direction.

An LED strip 3 having a plurality of LEDs 4 spaced apart in the longitudinal extension direction is laid in a guide formed by the groove 5 in the inner housing 1 close to the wall thereof that is defined as the base.

Both housings 1, 2 are tubular profiles that are open at the ends and have a substantially 4-cornered, i.e. quadrilateral, cross section, the open ends in the assembled light each being closed by respective inner and outer end caps 6, 7.

5 On the electrical connection end of the light the connecting cables 8 of the LED strip 3 pass through the inner end cap 6. This can be easily seen in the exploded view of FIG. 3. The connecting cables 8 extend out of the profiled outer housing 2 at an angle of 90° to the longitudinal extension direction of the housings 1, 2. The wavy lines in the housings 1, 2 and 3 should
10 make it clear that these housings are not limited to the illustrated length, and in particular in each case have any length, so long as they fit into one another.

15 On the end opposite the connection end, the inner end cap 6 of the profiled inner housing has a pin-shaped projection 9 that points toward the outer end cap 7 of the adjacent profiled outer housing and serves as a spacer. In this way, a spacing of defined length between the end caps 6 and 7 is kept free and, after the assembly of the light, is potted with an initially liquid, curable
20 potting compound. Such potting takes place on the connection end between the end caps 6 and 7 there.

25 In order to pot the light, which has been closed after assembly, between the end caps 6 and 7 on both ends, the profiled outer housing 2 has, in a region of the housing wall between the end caps 6 and 7 on each of the two ends, at least one hole 10 through which the potting compound 11 can be introduced into the inner region of the profiled outer housing 2 between the end caps 6

and 7. Air can escape either through the filling hole 10 or an additional unillustrated vent hole.

Furthermore, on the connection end a cable feedthrough 12 is mounted in the filling hole 10 but does not completely block the hole 10 there, so that filling through this hole remains possible.

5

Claims

1. A submersible light, in particular for a swimming pool, comprising an elongated profiled inner housing into which an LED strip having a plurality of light-emitting diodes is inserted, and an elongated profiled outer housing into which the profiled inner housing is inserted, an inner region of the profiled outer housing between the end thereof and the associated end of the profiled inner housing being filled with a cured potting compound on both ends of the arrangement of the inner and profiled outer housing.

2. The submersible light according to claim 1, characterized in that at least one open end, preferably both open ends, of the inner housing and/or at least one open end, preferably both open ends, of the outer housing is/are provided with end caps, and on at least one end, preferably both ends, of the arrangement of inner and profiled outer housing the inner region of the profiled outer housing between the opposing end caps is then filled with the potting compound.

3. The submersible light according to claim 2, characterized in that electrical connection cables of the LED strip are guided through one of the end caps of the profiled inner housing.

4. The submersible light according to claim 2 or 3, characterized in that one of the end caps of the profiled inner

housing has a spacer projecting in the direction toward the end cap of the profiled outer housing or one of the end caps of the profiled outer housing has a spacer projecting in the direction toward the end cap of the profiled inner housing.

5

5. The submersible light according to any of the preceding claims, characterized in that in the housing wall the profiled outer housing has at least one hole, preferably at both ends, in the region between its end, in particular its end cap and the associated end of the profiled inner housing, in particular its end cap, in particular for filling with potting compound and/or ventilation during filling.

6. The submersible light according to claim 5, characterized in that the connecting cables of the LED strip pass through a hole on one of both ends of the profiled outer housing, and in particular a cable feedthrough for these connecting cables is mounted in the hole, this hole preferably opening into the open end of the profiled outer housing.

20

7. The submersible light according to any of the preceding claims, characterized in that a gap between the profiled inner housing and the profiled outer housing is closed on at least one end, preferably both ends of the profiled inner housing by a sealing element, in particular made from an elastomer, preferably silicon.

25

8. The submersible light according to any of the preceding claims, characterized in that at least the profiled outer housing, preferably the outer and the profiled inner housing, more preferably also the end caps of the housing, is/are preferably made from polyvinyl chloride, preferably from polyvinyl chloride mixed with diffuser particles, even more preferably from pure polyvinyl chloride apart from the diffuser particles.

9. The submersible light according to claim 8, characterized in that the end caps of the profiled outer housing and/or the end caps of the profiled inner housing are made from the same material as the associated housing, the end caps being preferably connected and sealed to the respective housing profile by ultrasonic welding.

10. The submersible light according to any of the preceding claims, characterized in that the profiled inner housing has a guide into which the LED strip can be inserted and guided, the LED strip being held by the guide close to the inner surface, preferably in contact with the inner surface of a wall of the profiled inner housing.

11. The submersible light according to claim 10, characterized in that the guide is formed by two opposing guide grooves, and each guide groove is formed by the same common wall of the profiled inner housing and two projections spaced apart therefrom and pointing toward one another on walls of the profiled inner housing extending perpendicularly to this common wall.

12. The submersible light according to any of the preceding claims, characterized in that a circuit board of the LED strip may be fastened to a metallic support element.

5 13. A method of making a submersible light, in particular according to any of the preceding claims, comprising the following steps:

10 a) inserting an LED strip into an elongated tubular profiled inner housing having connection lines projecting out of an end of the profiled inner housing;

b) inserting the profiled inner housing into a relatively long profiled outer housing with spacing between respective ends of the housings;

15 c) potting the inner region on both ends in the profiled outer housing between the ends of both housings with a liquid curable potting compound.

20 14. The method according to claim 13, characterized in that the profiled inner housing is closed on both ends with inner end caps, in particular by ultrasonic welding, in particular after the LED strip has been inserted, and the connection cables of the LED strip are passed through one of the inner end caps.

25 15. The method according to claim 14, characterized in that the profiled inner housing with the end cap at the front, with a spacer projecting outward, is inserted into the profiled outer housing, in particular after previous closure of a hole of the profiled outer housing by an end cap.

16. The method according to any of the preceding claims 13 to 15, characterized in that both ends or at least the still open end of the profiled outer housing is/are closed in each case by an end cap, in particular by ultrasonic welding.

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17. The method according to any of the preceding claims 13 to 16, characterized in that the potting takes place in each case through a hole in a wall region of the profiled outer housing, the hole being between the adjacent end caps of both housings.

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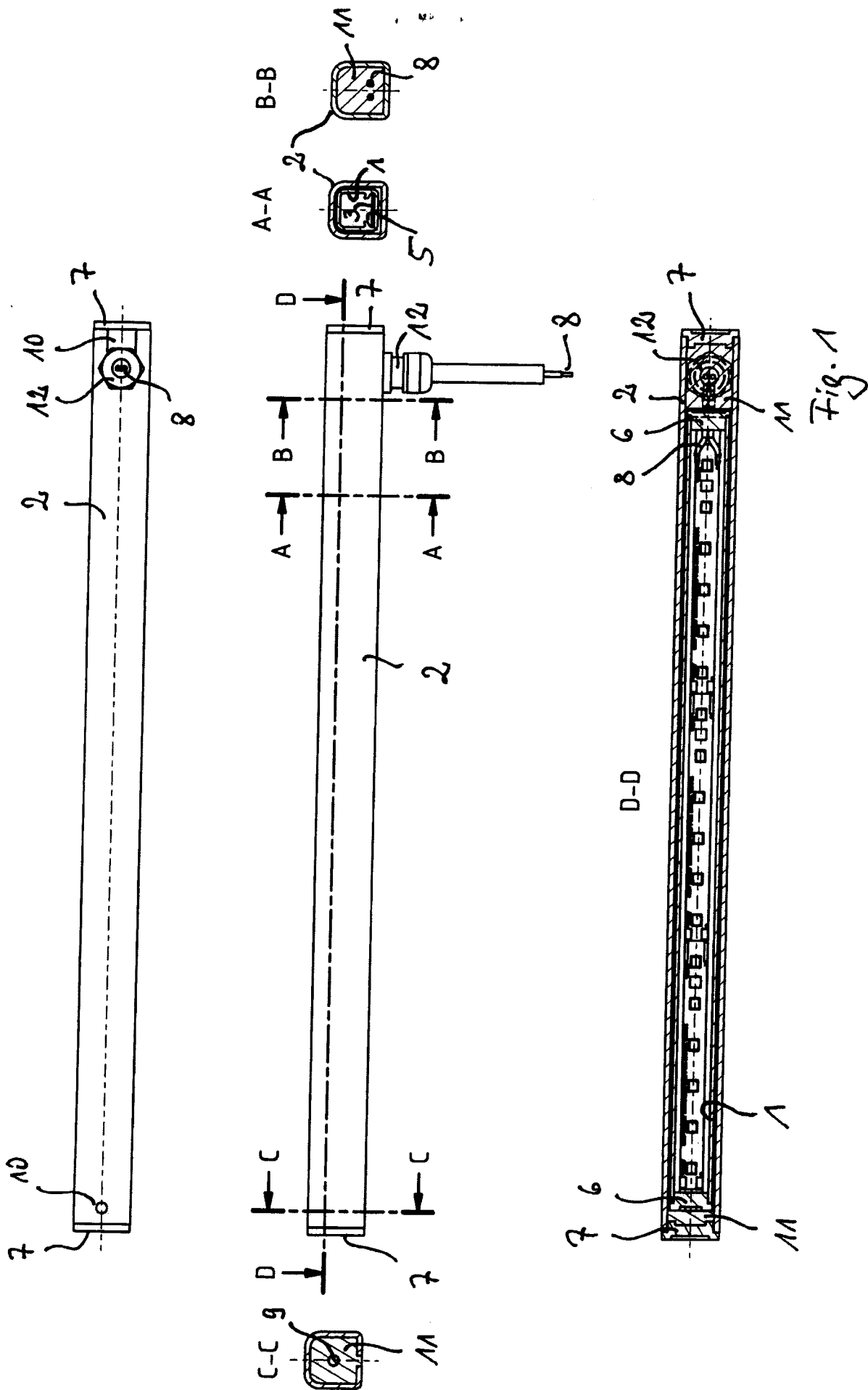


Fig. 1

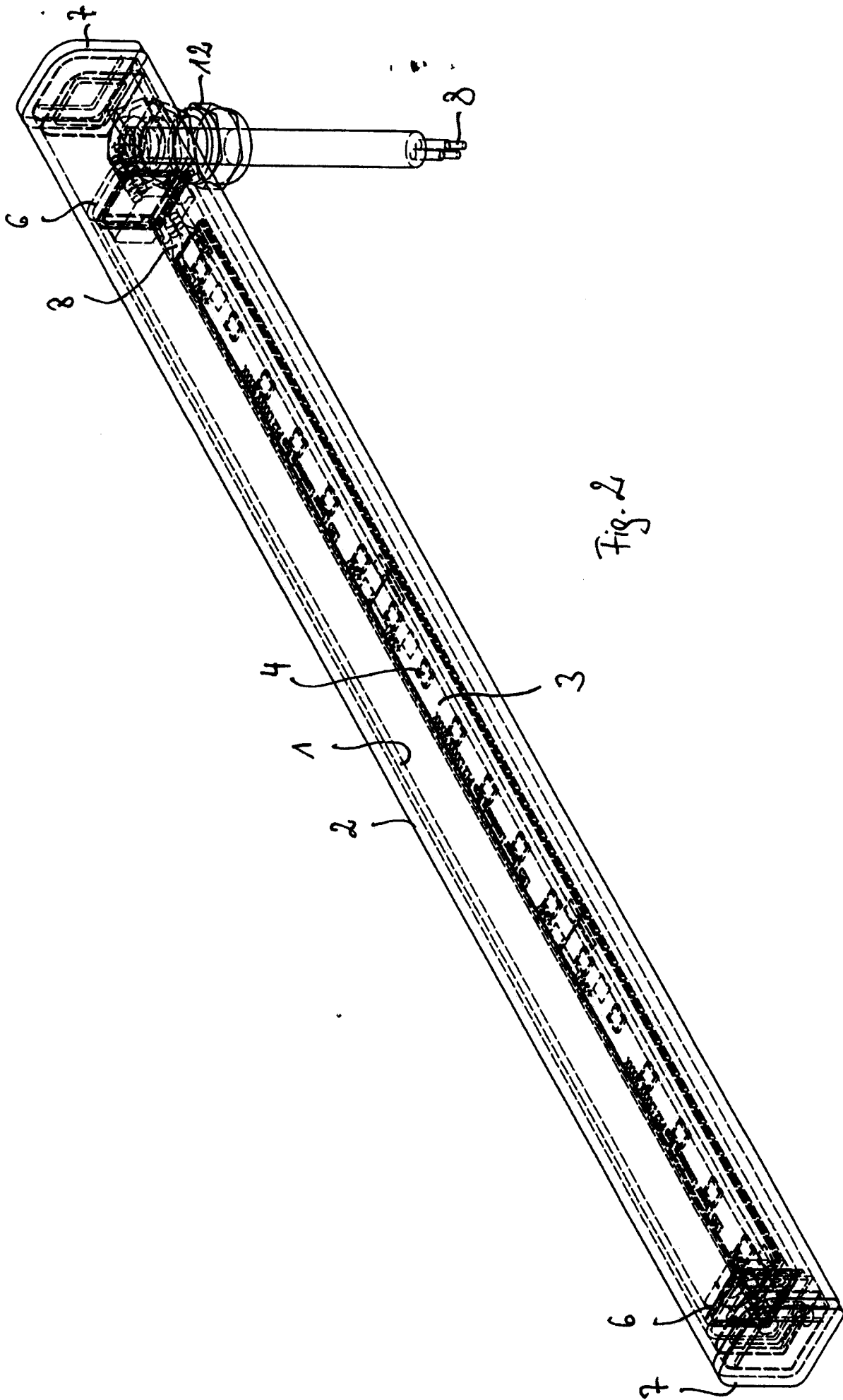


Fig. 2

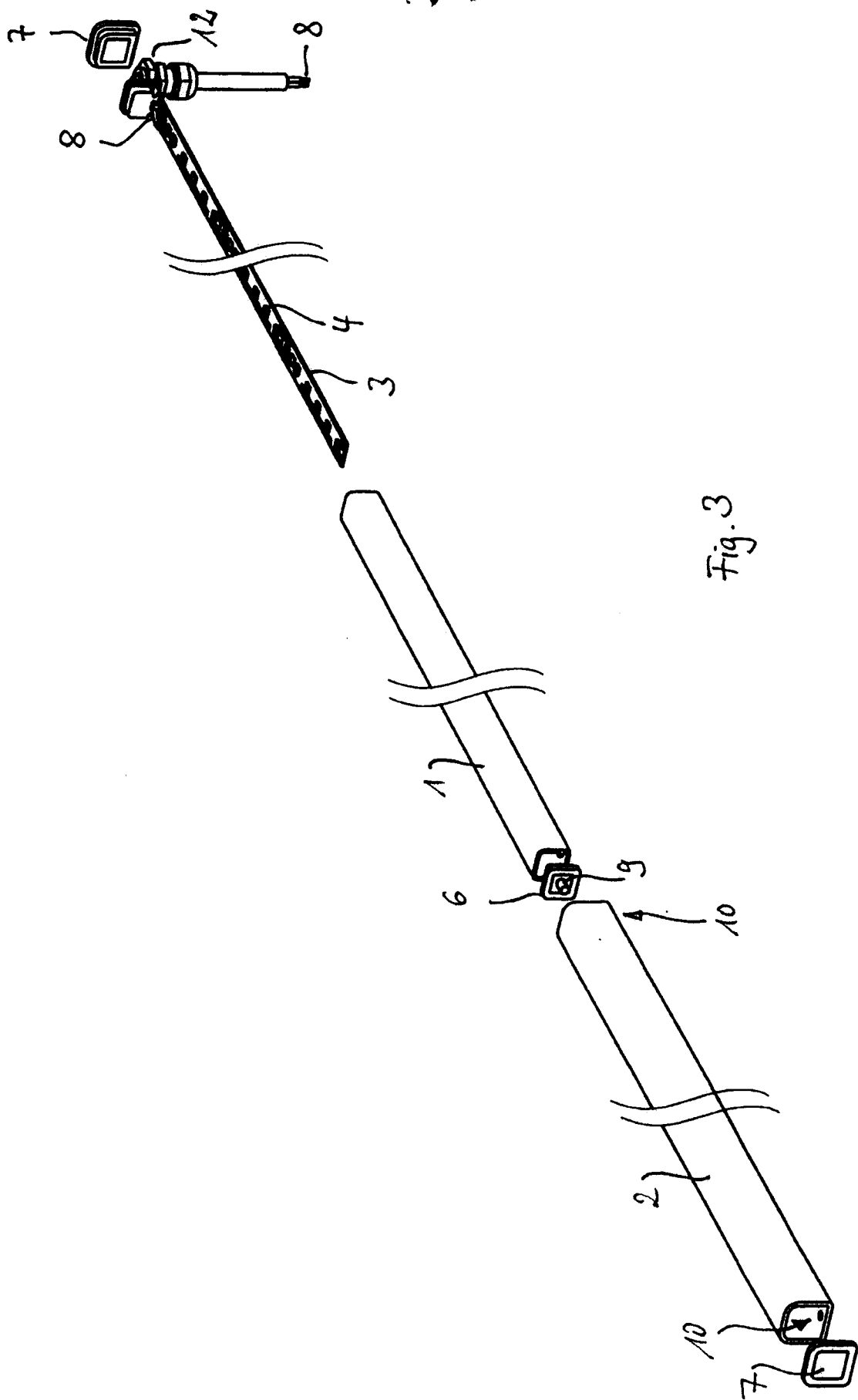


Fig. 3

