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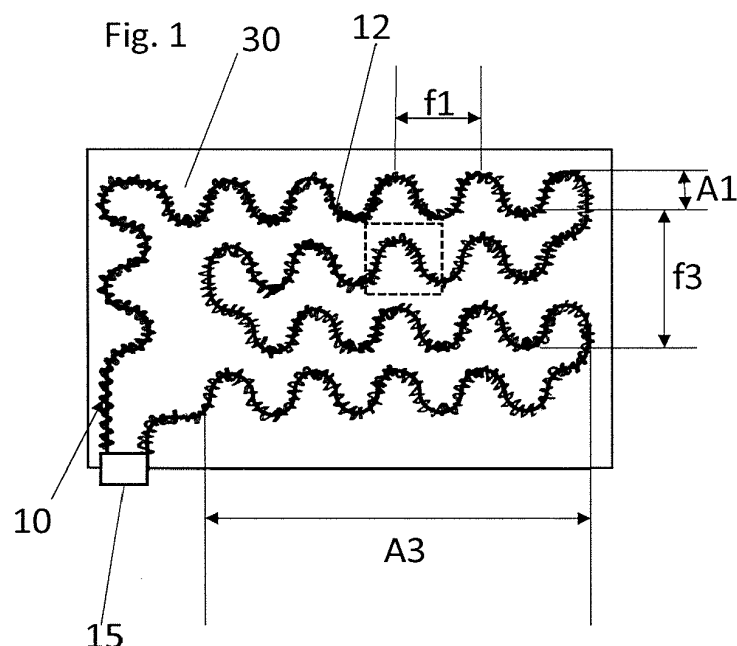
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(54) **HEATING ELEMENT FOR A TEXTILE OF AN INTERIOR PART OF A MEANS OF PASSENGER TRANSPORT, IN PARTICULAR A VEHICLE, TEXTILE AND INTERIOR PART COMPRISING SUCH A HEATING ELEMENT AND DEVICE FOR ATTACHING A HEATING ELEMENT TO A TEXTILE FOR AN INTERIOR PART**

(57) The present invention relates to a heating element (10, 10') for a textile (30) of an interior part of a means of passenger transport, in particular a vehicle, the heating element (10, 10') comprising a resistive element in form of wire (12) being arranged in a sinusoid-shape fashion with a first amplitude (A1) and/or a first frequency (f1), the wire (12) being a zigzag wire with a second am-

plitude (A2) and a second frequency (f2), the second amplitude (A2) being smaller than the first amplitude (A1) and/or the second frequency (f2) being smaller than the first frequency (f1). Beyond that the present invention relates to a textile (30) and an interior part, each comprising such a heating element (10, 10') and to a means of passenger transport comprising such an interior part.

**EP 4 440 244 A1**

Description

[0001] The present invention relates to a heating element for a textile of an interior space of a means of passenger transport, in particular a vehicle. Beyond that the present invention relates to a textile and to an interior part comprising such a heating element and to a means of passenger transport comprising such an interior part. Further, the present invention relates to a device for attaching a heating element to a textile for an interior part.

[0002] The means of passenger transport is embodied in particular as a vehicle, but can also be a ship, an aircraft, a train or the like. In the following the disclosure is explained with reference to vehicles, however, the explanations shall also apply to other means of passenger transport, such as ships, aircraft, trains or the like.

[0003] The means of textile is embodied in particular as a cloth, but is meant to comprise any kind of flat and flexible material.

[0004] In the pursuit of increasing the passenger comfort and safety more and more parts of the means of passenger transport can be heated. To provide such a heated interior part, it is known to arrange a resistive element, sometimes also referred to as resistor or resistance elements, inside the interior part near its surface. Especially for resilient interior parts as seats or armrests, the heating element is arranged in the textile of those interior parts. The heat generated by the electric resistance is used to heat the interior part. The resistive element is distributed as evenly as possible inside the interior part to provide an even temperature distribution. For this purpose the resistive element often is arranged in a meander or serpentine fashion in the textile of the interior part. One particular embodiment of such an interior part is an armrest or a seat that has a higher degree of resilience compared to other interior parts such as an instrument panel. A heated armrest or a heated seat together with its resilience is offering a high comfort for the persons using the means of transport.

[0005] KR 10-2030752 B1 discloses an armrest with heating function using a heating wire arranged in a meander or serpentine fashion.

[0006] Such a resistive element is usually made of a brittle material. Due to the resilience of the specific interior part, especially the textile of the interior part, it gets deformed when a passenger places its arm thereon or takes a seat. The deformation of the interior part is transmitted to the resistive element. Due to its brittleness the resistive element may be damaged or even destroyed by the deformation of the interior part. The proper functioning of the heating element may not be given anymore.

[0007] It is one task of one embodiment of the present disclosure to propose a heating element for an interior part of a means of passenger transport, in particular a vehicle, which may be used in interior parts of high resilience without the danger of being damaged or destroyed by the deformation in use of that interior part. Moreover, an embodiment of the present invention has the object

to provide a textile of an interior part and an interior part being equipped with such a heating element and to provide a means of passenger transport, in particular a vehicle, comprising such an interior part. Further, an embodiment of the present invention has the object to provide a device for fastening a heating element on the textile for an interior part.

[0008] The task is solved by a heating element comprising the features specified in claim 1, a device for attaching a heating element to a textile for an interior part comprising the features specified in claim 10, a textile of an interior part comprising the features specified in claim 12, an interior part comprising the features specified in claim 13, and a means of passenger transport comprising the features specified in claim 15.

[0009] Advantageous embodiments are the subject of the dependent claims.

[0010] According to an embodiment of the present invention a heating element for a textile of an interior part of a means of passenger transport, in particular a vehicle, comprises a resistive element in form of wire being arranged in a sinusoid-shape fashion with a first amplitude and/or a first frequency, the wire being a zigzag wire with a second amplitude and a second frequency, the second amplitude being smaller than the first amplitude and/or the second frequency being smaller than the first frequency.

[0011] The core idea of the present invention is to use a zigzag wire instead of a straight wire. The zigzag wire is more flexible and can easily bend in case the textile is bent. Due to the fact that the zigzag wire has a longer length than a straight wire, the zigzag wire can more easily follow the movements of the textile of the interior part and therefore adapt to the deformation of the interior part.

[0012] The danger of being damaged or destroyed by the deformation in use of the respective interior part therefore can significantly be reduced. Moreover, the stretchability of the textile can be enhanced.

[0013] The arrangement of the zigzag wire in the sinusoid-shape fashion enables a high area coverage that contributes to an even temperature distribution on the interior part. Moreover, the high area coverage can be reached without a crossing of the resistive element. The second amplitude being smaller than the first amplitude and/or the second frequency being smaller than the first frequency results in the fact, that the sinusoid-shape arrangement has an additional structure realized by the zigzag structure. To improve the area coverage, according to a preferred embodiment the sinusoid-shape arranged zigzag wire can be arranged in a further sinusoid-shape, meander or serpentine fashion with a third amplitude and a third frequency.

[0014] According to a preferred embodiment, the ratio of the first amplitude to the second amplitude might be 4:1 or higher.

[0015] According to a further preferred embodiment, the ratio of the first frequency to the second frequency might be 2:1 or higher.

[0016] According to an embodiment of the invention, the second amplitude is between 2 mm and 5 mm.

[0017] Preferably, the second frequency is between 2 mm and 5 mm.

[0018] According to an embodiment of the invention, the wire has a diameter of 0,1 mm to 0,2 mm.

[0019] These kind of dimensions are suitable for providing a flexible and stretchable wire that can adapt to deformation of a textile or an interior part.

[0020] According to a further embodiment of the invention, the wire is made of a conductive alloy, preferably of copper alloy. The respective heating element can be inexpensively manufactured and uniformly heated.

[0021] Preferably the wire comprises several filaments, for example three to five filaments. The size of the cross section of the plurality of filaments may be chosen such that the area-related electric power is roughly the same as is the case for one single wire. The size of the cross section of one of the filaments is smaller compared to the size of the single wire. As a consequence the heating element may generate the same heat as a heating element comprising one single wire using less material. Further, by using a plurality of filaments the flexibility of the resistive element is increased compared to a heating element comprising one single wire only.

[0022] To protect the wire, according to a preferred embodiment the wire might comprise an insulation layer, the insulation layer preferably being a painted layer.

[0023] Another aspect of the invention is directed to a device for attaching a heating element comprising a resistive element in form a wire to a textile for an interior part, the device comprising

- a zigzag-forming device comprising two toothed wheels being meshingly engaged, the wire being formed as a zigzag wire when passing through the wheels,
- a stitching device for attaching the zigzag wire to the textile with a thread,

the stitching device being arranged following the zigzag-forming device.

[0024] A zigzag-forming device comprising two toothed wheels being meshingly engaged, the wire being formed as a zigzag wire when passing through the wheels, allows for an easy production of the zigzag wire.

[0025] A stitching device for attaching the zigzag wire to the textile with a thread enables to fasten the wire effectively to the textile.

[0026] Because a zigzag wire is not easy to store, the core idea of the invention is to attach the zigzag wire to the textile directly after forming the zigzag wire. Therefore, the stitching device is arranged following the zigzag-forming device, especially close to the zigzag-forming device.

[0027] According to a preferred embodiment of the invention, the toothed wheels turn with a first speed, and the stitching device stitches with a second speed, the

first speed and the second speed being adjusted to each other. Such an arrangement enables to attach the zigzag wire to the textile directly after forming the zigzag wire without deformation of the zigzag wire.

[0028] Another implementation of the invention is directed to a textile for an interior part of a means of passenger transport, in particular a vehicle, comprising a heating element according to one of the embodiments described above. The advantages and technical effects described with reference to the heating element equally apply to the interior part. In short the danger of a damage or destruction of the resistive element in form of a wire by the deformation of the respective interior part is reduced.

[0029] Another implementation of the invention is directed to an interior part of a means of passenger transport, in particular a vehicle, comprising a textile with a heating element according to one of the embodiments described above. The advantages and technical effects described with reference to the heating element equally apply to the interior part. In short the danger of a damage or destruction of the resistive element in form of a wire by the deformation of the respective textile is reduced.

[0030] According to an embodiment of the invention, the interior part might be an armrest or a seat.

[0031] Another aspect of the invention is directed to a means of passenger transport comprising an interior part according to one of the implementations described above for interior parts of the means for passenger transport. The advantages and technical effects described with reference to the heating element and the interior part equally apply to the means of passenger transport. In summary the danger that the resistive element in form of a wire may be damaged or destroyed by the deformation of the respective interior part is reduced.

[0032] The present invention is described in detail with reference to the drawings attached wherein

Figure 1 is a principle illustration of a heating element according to a first embodiment of the present invention,

Figure 2 is an enlarged view of the framed area of the heating element shown in figure 1,

Figure 3 is a principle illustration of an embodiment of a device for attaching a heating element to a textile, and

Figure 4 is a principle illustration of part of a heating element attached to a textile.

[0033] In Figures 1 and 2 a heating element 10 according to a first embodiment of the invention is shown by means of a principle sketch. The heating element 10 comprises a resistive element being formed as a wire 12. On its two ends the resistive element is connected to an energy supply 15 (see figure 1). The energy supply might

comprise at least one energy storage for storing electrical energy. When activated the resistive element is heated up by its electric resistance. The generated heat is then transferred to the environment of the heating element 10, for example to a textile 30 of an interior part.

[0034] The wire 12 is arranged in a sinusoid-shape fashion with a first amplitude A1 and a first frequency f1, and can be arranged in a further sinusoid-shape, meander or serpentine fashion with a third amplitude A3 and a third frequency f3, to enable providing heat evenly over a large area of the textile. The wire 12 is formed as a zigzag wire with a second amplitude A2 and a second frequency f2. The second amplitude A2 is smaller than the first amplitude A1 and the second frequency f2 is smaller than the first frequency f1. As shown in figures 1 and 2, this leads to an arrangement in which the sinusoid-shape arrangement of the wire 12 has an additional structure realized by the zigzag structure. Especially, the ratio of A1:A2 might be 4:1 or higher, as for example shown in figure 2, illustrating a heating element 10' according to a second embodiment of the invention by means of a principle sketch. The ratio of f1:f2 might be 2:1 or higher.

[0035] The second amplitude A2 might range between 2 mm and 5 mm. The second frequency f2 might range between 2 mm and 5 mm.

[0036] The wire 12 can have a diameter of 0,1 mm to 0,2 mm. Preferably, the wire 12 is made of a conductive alloy, preferably of copper alloy. According to an embodiment, the wire 12 comprises several filaments, for example three to five filaments (not shown). The wire 12 can comprise an insulation layer, the insulation layer preferably being a painted layer.

[0037] In Figure 3 a device 20 for attaching the heating element 10, 10' to the textile 30 for an interior part according to an embodiment of the invention is shown by means of a principle sketch. The device 20 comprises a zigzag-forming device 21 comprising two toothed wheels 22a, 22b being meshingly engaged. Both toothed wheels 22a, 22b are arranged rotatably. At least one of the toothed wheels 22a, 22b can be driven by a motor (not shown). The rotation axes of the two toothed wheels 22a, 22b are position at such a distance that the two toothed wheels 22a, 22b are able to engage meshingly. The wire 12 is formed as a zigzag wire when passing through the wheels 22a, 22b. The wire 12 can be delivered to the zigzag-forming device 21 for example from a coil 24 which might be driven.

[0038] The device 20 further comprises a stitching device 25 for attaching the zigzag wire 12 to the textile 30 with a thread 27 (see figure 4). Therefore, the stitching device 25 is being arranged following the zigzag-forming device 21, especially nearby. Especially, the wire 12 is attached to the textile directly after forming the zigzag, because the zigzag wire 12 is not easy to store.

[0039] In an embodiment, the toothed wheels 22a, 22b turn with a first speed, and the stitching device 25 stitches with a second speed, the first speed and the second speed being adjusted to each other. Such an adjustment

avoids deformation of the formed zigzag wire 12 before being attached to the textile 30.

[0040] The textile 30 in an embodiment is used for an interior part of a means of passenger transport, especially as a cover, the interior part for example being an armrest or a seat. The means of passenger transport is embodied in particular as a vehicle, but can also be a ship, an aircraft, a train or the like.

10 Reference list

[0041]

10, 10'	heating element
12	wire
15	energy supply
20	device
21	zigzag-forming device
22a	toothed wheel
22b	toothed wheel
24	coil
25	stitching device
27	thread
30	textile
25 A1	first amplitude
f1	first frequency
A2	second amplitude
f2	second frequency
A3	third amplitude
30 f3	third frequency

Claims

1. Heating element (10, 10') for a textile (30) of an interior part of a means of passenger transport, in particular a vehicle, the heating element (10, 10') comprising a resistive element in form of wire (12) being arranged in a sinusoid-shape fashion with a first amplitude (A1) and/or a first frequency (f1), the wire (12) being a zigzag wire with a second amplitude (A2) and a second frequency (f2), the second amplitude (A2) being smaller than the first amplitude (A1) and/or the second frequency (f2) being smaller than the first frequency (f1).
2. Heating element (10, 10') according to claim 1, **characterized in that** the ratio of the first amplitude (A1) to the second amplitude (A2) is 4:1 or higher.
3. Heating element (10, 10') according to one of the preceding claims, **characterized in that** the ratio of the first frequency (f1) to the second frequency (f2) is 2:1 or higher.
4. Heating element (10, 10') according to one of the preceding claims, **characterized in that** the second amplitude (A2) is

between 2 mm and 5 mm.

claims 1 to 9 or a textile (30) according to claim 12.

5. Heating element (10, 10') according to one of the preceding claims,
characterized in that the second frequency (f₂) is between 2 mm and 5 mm. 5
6. Heating element (10, 10') according to one of the preceding claims,
characterized in that the wire (12) has a diameter of 0,1 mm to 0,2 mm. 10
7. Heating element (10, 10') according to one of the preceding claims,
characterized in that the wire (12) is made of a conductive alloy, preferably of copper alloy. 15
8. Heating element (10, 10') according to one of the preceding claims,
characterized in that the wire (12) comprises several filaments, for example three to five filaments. 20
9. Heating element (10, 10') according to one of the preceding claims,
characterized in that the wire (12) comprises an insulation layer, the insulation layer preferably being a painted layer. 25
10. Device (20) for attaching a heating element (10, 10') comprising a resistive element in form a wire (12) to a textile (30) of an interior part, the device (20) comprising
 - a zigzag-forming device (21) comprising two toothed wheels (22a, 22b) being meshingly engaged, the wire (12) being formed as a zigzag wire (12) when passing through the wheels (22a, 22b), 35
 - a stitching device (25) for attaching the zigzag wire (12) to the textile (30) with a thread (27), 40

the stitching device (25) being arranged following the zigzag-forming device (21).
11. Device according to claim 10,
characterized in that the toothed wheels (22a, 22b) turn with a first speed, and the stitching device (21) stitches with a second speed, the first speed and the second speed being adjusted to each other. 45
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12. Textile (30) of an interior part of a means of passenger transport, in particular a vehicle, the textile (30) comprising a heating element (10, 10') according to one of the claims 1 to 9. 55
13. Interior part of a means of passenger transport, in particular a vehicle, the interior part comprising a heating element (10, 10') according to one of the

14. Interior part according to claim 13,
the interior part being an armrest or a seat.
15. Means of passenger transport, in particular a vehicle, comprising an interior part according to one of the claims 13 to 14.

Fig. 1

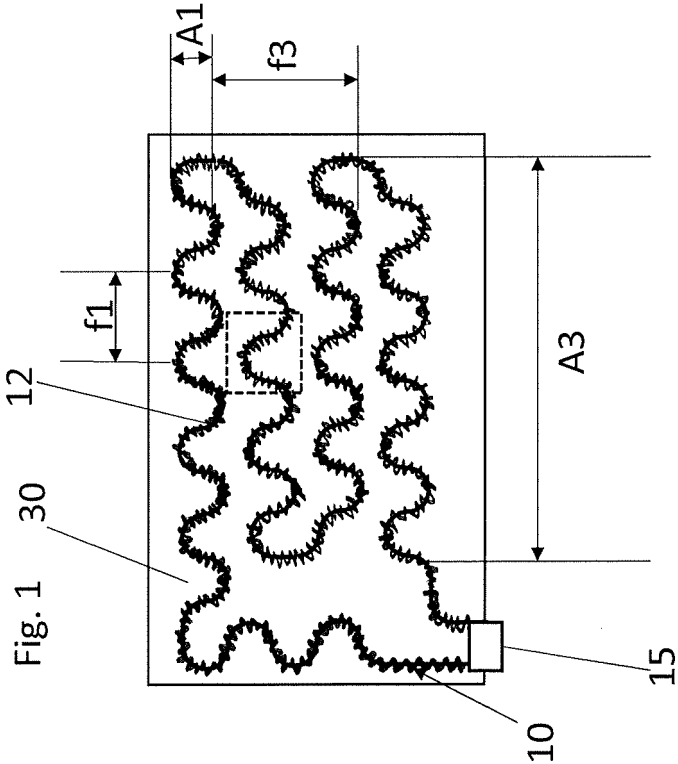
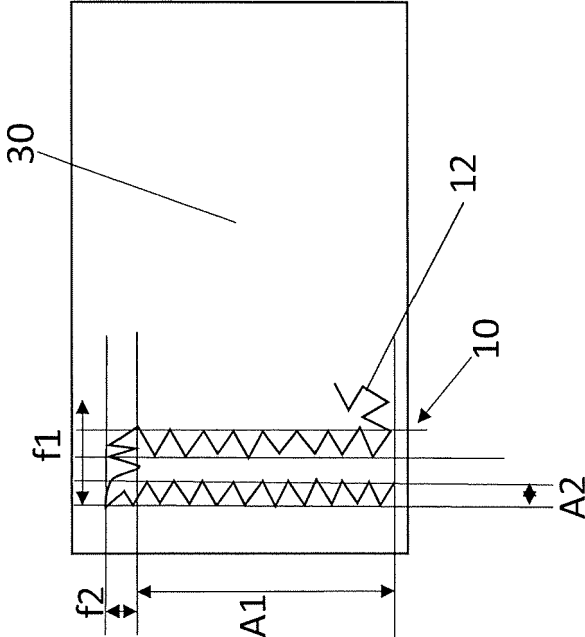


Fig. 2



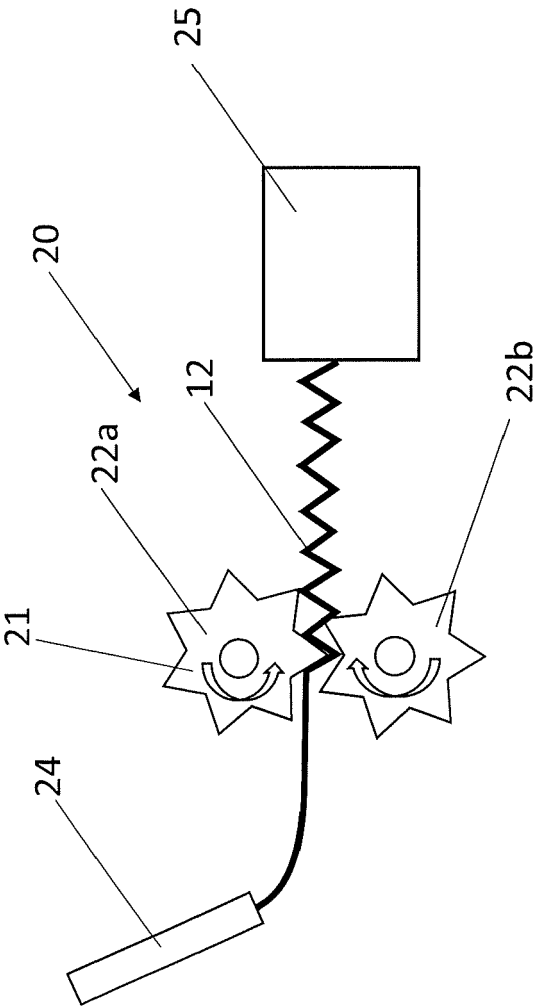


Fig. 3

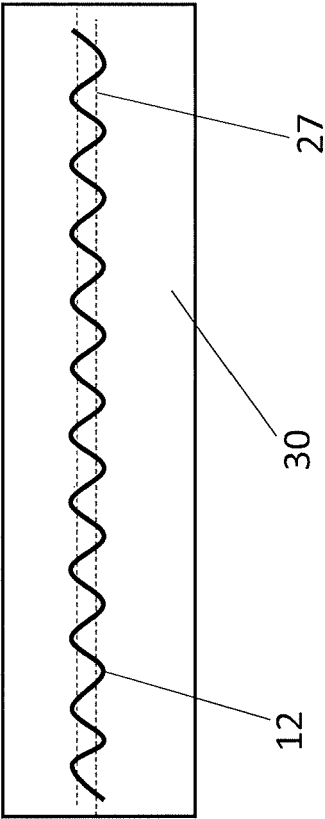


Fig. 4



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Application Number

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Place of search Munich		Date of completion of the search 21 September 2023	Examiner Aubry, Sandrine
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO.

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