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(54) **SENSOR ARRANGEMENT FOR APPLYING TO A BELT, ESPECIALLY TO A SAFETY BELT OF A MOTOR VEHICLE**

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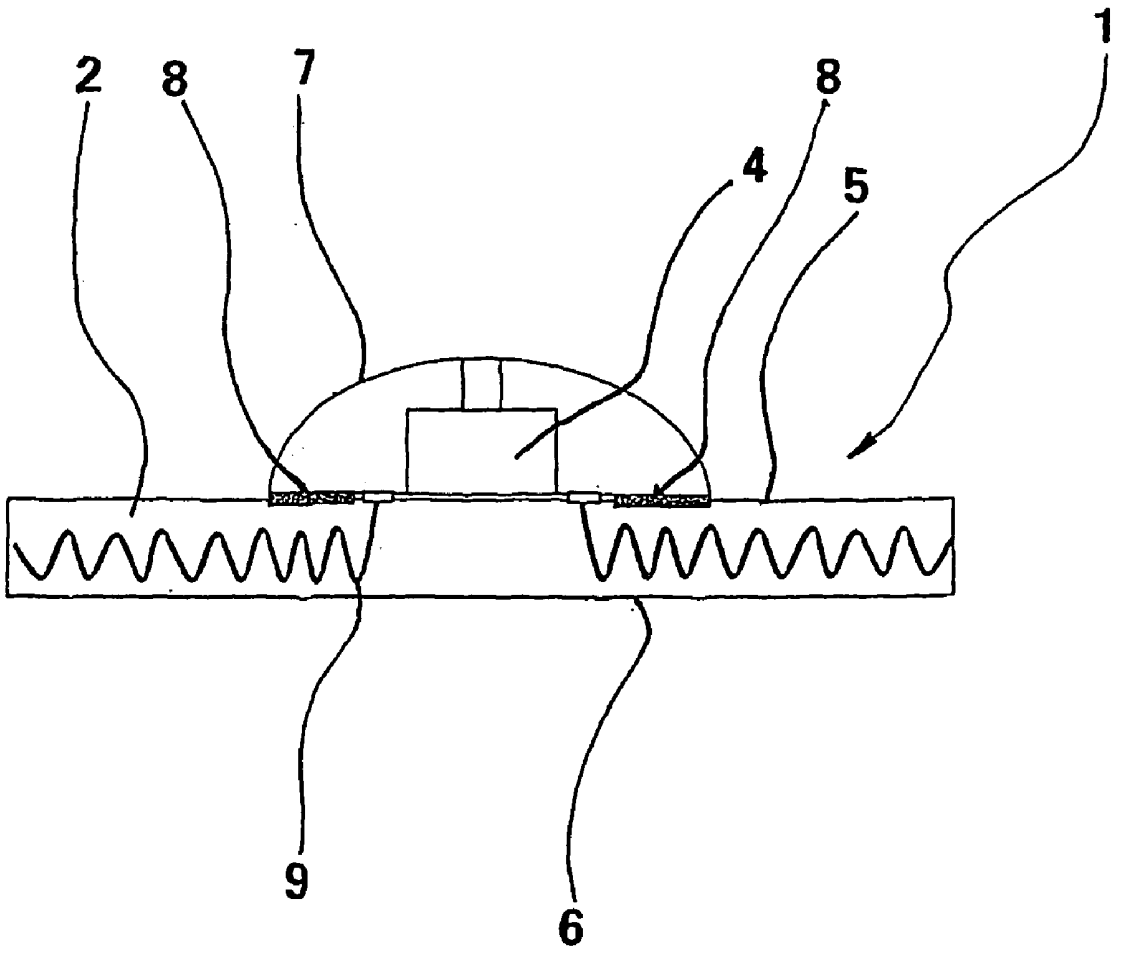
(57) **ABSTRACT**

The aim of the invention is to apply a sensor arrangement to a belt, especially a safety belt (**1**) of a motor vehicle, in such a way that the function of the safety belt is restricted as little as possible or not at all in terms of both the mechanical resistance thereof and the sliding and rolling characteristics thereof. To this end, the sensors (**4**) of the sensor arrangement are applied to the upper side (**5**) of the safety belt (**1**), which opposes the body of the passenger of the motor vehicle, the lower side (**6**) of the safety belt (**1**), facing the body of the passenger of the motor vehicle, remaining free and unchanged.



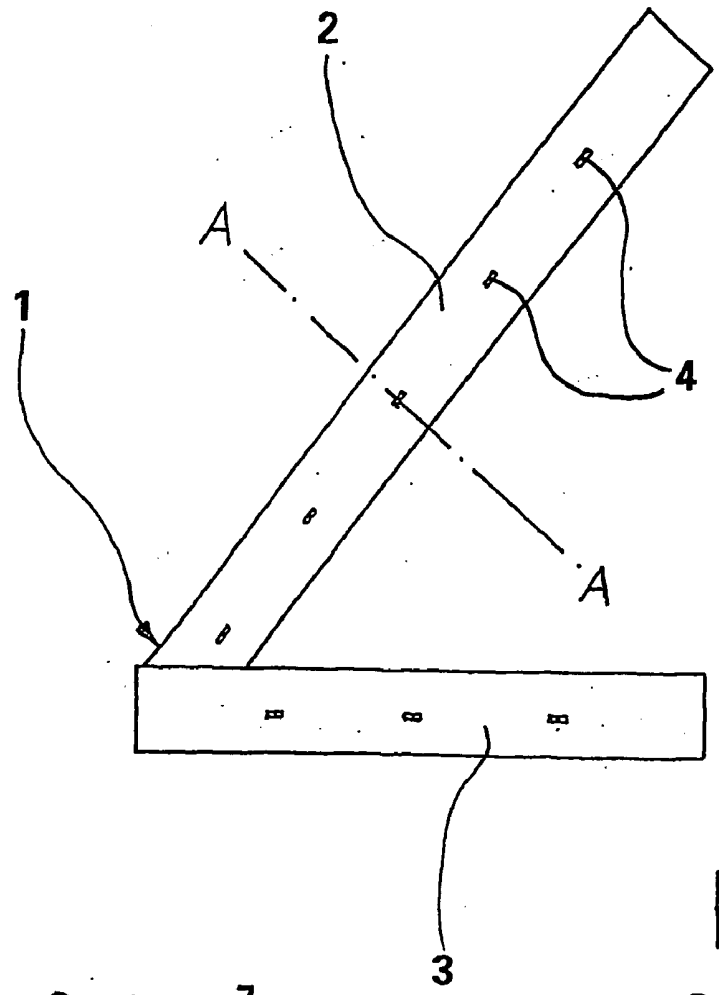


Fig.1

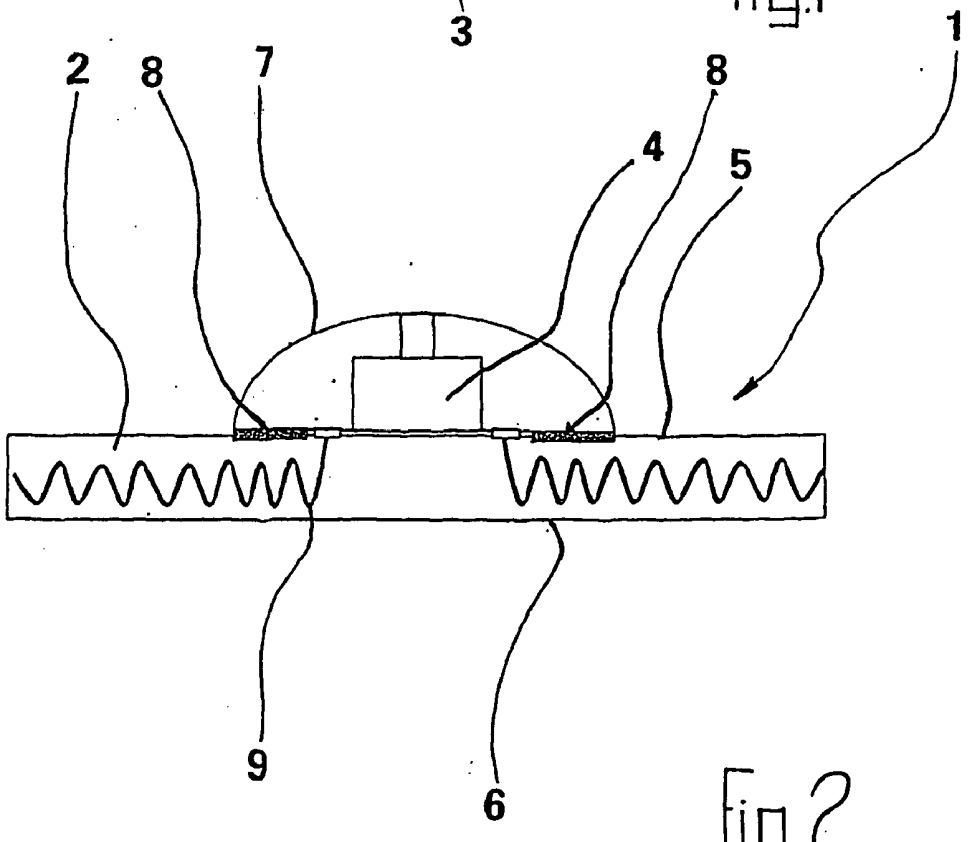


Fig.2

SENSOR ARRANGEMENT FOR APPLYING TO A BELT, ESPECIALLY TO A SAFETY BELT OF A MOTOR VEHICLE

[0001] The invention relates to a sensor arrangement for attaching to a belt, in particular to a motor vehicle safety belt.

[0002] With such sensor arrangements know from the prior art the sensors of same are arranged on the safety belt or respectively attached thereto, in that for example fittings penetrating the safety belt or the like are provided; common to all known fittings or respectively attachments of the sensors on the safety belt is that on the one hand the mechanical properties of the belt are impaired, whereby furthermore the support properties of the safety belt are changed negatively insofar as the smooth structure of the underside of the belt facing the occupants of the vehicle is disturbed by elements of the fittings or respectively attachments projecting on the underside of the safety belt. This smooth structure of the underside of the belt is however of major significance to ensure the necessary easy-running gliding of the safety belt over the deflection contrivances of the safety belt arrangements and the body of the vehicle occupants. The result of any impairment to these glide properties of the safety belt can be that the safety belt is no longer tightened optimally on the body of the vehicle occupants by the retractors of the safety belt arrangement following movements of the occupants of the vehicle.

[0003] In the event of a possible accident or the like the safety belt would thus deploy its protective function, inadequately only, if at all.

[0004] The object of the invention is to provide a sensor arrangement for applying to a belt, in particular on a safety belt of a motor vehicle, which results in no or respectively little impairing of the glide properties on the underside of same essential for the protective function of the safety belt.

[0005] This task is solved according to the present invention by at least one, preferably each sensor of the sensor arrangement being arranged on the top side of the safety belt facing away from the body of the vehicle occupants, whereby the underside of the safety belt facing the body of the vehicle occupants remains free and unchanged.

[0006] Such applying or respectively fixing of the sensors of the sensor arrangement on the belt can be achieved if at least one sensor is taken up on a fitting or respectively in a housing, which can be fastened on the top side of the safety belt.

[0007] The housing can be made advantageously from plastic.

[0008] The housing can be attached to the top side of the safety belt by welding with the material forming the top side of the safety belt or by adhesion on the top side of the safety belt.

[0009] It is also possible to sew the housing of at least one sensor on the top side of the safety belt.

[0010] To prevent the safety belt from being partly weakened in those areas where the sensors of the sensor arrangement are provided, it is appropriate to reinforce the safety belt in these areas by weaving in additional threads.

[0011] Alternatively, the belt can be reinforced in the areas with the sensors of the sensor arrangement of the safety belt by adding in threads in these areas with better mechanical properties, e.g. increased breaking load and/or elasticity, for physically forming the safety belt.

[0012] The sensors of the sensor arrangement can be designed e.g. as microphones. It is then possible, without the interference of hand grips, which might hinder proper control of the vehicle, to comfortably make a selection.

[0013] Alternatively or additionally, sensors designed as heart frequency, body temperature meters or the like can be provided. In the event of a signal from a heart frequency meter, which displays the driving incompetence of the vehicle driver, operating the vehicle can be interfered with for example such that as far as possible no or respectively minimal damage will result.

[0014] The sensors of the sensor arrangement are appropriately connected to conductors integrated in the safety belt, into which or respectively from which the required operating energy of the sensor arrangement and signals of the sensors can be inductively coupled or respectively uncoupled. The sensors of the sensor arrangement can be attached in different topologies. This depends on the structural type of the sensors. Sensors, which deliver an adequate signal value, are contacted individually or with a common reference conductor. Sensors with low signal value frequently require a separate voltage supply. Integrated sensors can de connected together to a common bus.

[0015] The operating energy and the signals can advantageously be coupled or respectively uncoupled in the region of one of two retractors or a belt lock of the safety belt arrangement.

[0016] With respect to their breaking and expansion behaviour the conductors woven into the safety belt have particularly advantageous properties, if the conductors are spun onto an original weaving thread of the safety belt. The rise and distance of the conductor during spinning then determine the expansion behaviour. In addition, the conductors in this advantageous embodiment of the invention are not visible from outside.

[0017] The connection between the sensors on the one hand and the conductors integrated into the safety belt on the other hand can advantageously be effected by means of flexiconductors or conductive gums.

[0018] In order to determine the sensor of the sensor arrangement best positioned for the respective purpose, it is advantageous if a selection device is provided, by means of which the sensor of the sensor arrangement best positioned for the signal quality can be determined, whereby the signal of this sensor can then be selected for forwarding.

[0019] To further improve the output signal the selection device should select the two sensors of the sensor arrangement best positioned for signal quality, e.g. the first sensor arranged above and the first sensor arranged below the signal source, and should compile the output signal of the sensor arrangement from the signals of both these sensors.

[0020] The signals of the sensors can be prepared, with strengthening and standardising of the signals, but also linearising and filtering of the signals contributing. The best positioned sensor or respectively the best-positioned sensor

group can be selected by signal evaluation without consideration for the belt length or the seated position by means of the selection device. The output signal of the selected sensor or respectively selected sensor group including the signals of the other sensors of the sensor arrangement can be processed preferably according to any mathematical method, with the possibility for example of filtering out wind noise, e.g. in a convertible, from a microphone signal.

[0021] The selection device can operate in view of the output signals from a seated position sensor and/or a sensor for the weight of occupants of the vehicle and/or a safety belt length of stretch sensor, and independently make the selection of the best-positioned sensors.

[0022] The invention will now be explained in greater detail hereinbelow by means of an embodiment with reference to the diagram, in which:

[0023] **FIG. 1** is a principal illustration of a safety belt, fitted with a sensor arrangement according to the present invention, and

[0024] **FIG. 2** illustrates the section A-A in **FIG. 1**.

[0025] A safety belt **1** shown in a principal illustration in **FIG. 1** divides into a shoulder belt part **2** running obliquely upwards and a lap belt part **3** running approximately horizontally.

[0026] A sensor arrangement is provided on the front side of the safety belt **1** visible in **FIG. 1** and averted from the body of a person protected by the safety belt **1**, to which a plurality of sensors **4** belongs. In the illustrated embodiment the sensors **4** of the sensor arrangement are arranged at approximately the same distance in a longitudinal direction both of the shoulder belt part **2** and also of the lap belt part **3**.

[0027] As already explained, the sensors **4** sit on the top side **5** of the safety belt **1** facing away from the vehicle occupants.

[0028] The underside **6** of the safety belt **1** is not impaired by the sensors **4** of the sensor arrangement and is fully undisturbed. The run of the safety belt **1** in deflection contrivances and the like is thus not hindered by the sensors **4** of the sensor arrangement.

[0029] In the illustrated embodiment each sensor **4** of the sensor arrangement has a housing **7**, in which it is received and by means of which it is mounted on the top side **5** of the safety belt **1**. Depending on the physical form of the sensor **4** it is also possible to arrange the latter not by means of a housing **7** but by means of another kind of fitting on the top side **5** of the safety belt **1**.

[0030] As best evident from **FIG. 2**, the housing **7** taking up the sensor **4** by means of a connection **8** is connected solidly to the material forming the top side **5** of the safety belt **1**. The connection **8** can be a weld joint, an adhesive joint and also a seam or the like.

[0031] The safety belt **1** can be strengthened by means of woven-in threads at those points, at which the sensors **4** of the sensor arrangement are provided, to balance out any possible weaknesses of the safety belt **1**, occurring sue to applying the sensors **4**.

[0032] The sensors **4** illustrated in FIGS. **1** or respectively **2** can be for example microphones, by means of which it is possible for the occupant of the vehicle to make a selection, without having to manipulate any distracting hand grips impairing his concentration on controlling the vehicle. Of course, the sensor arrangement formed by the sensors **4** can be provided on every safety belt inside the vehicle.

[0033] Alternatively or in addition to this, sensors **4** designed as heart frequency and body temperature sensors or the like can be provided.

[0034] In the embodiment illustrated in the figures conductors **9** are integrated in the safety belt **1** for power supply and for signal connection of the sensors **4**. The required operating energy can be fed to the sensors **4** by means of these conductors **9**, whereby the signal output from the sensors **4** can take place by means of the conductors **9** also.

[0035] Both coupling of the operating energy required for operating the sensors **4** and also uncoupling the signals from the sensors **4** can be carried out inductively, whereby one of two retractors of the safety belt **1** can serve as coupling or respectively uncoupling point.

[0036] The conductors **9** integrated in the safety belt **1** can be spun about web thread of the safety belt **1**.

[0037] The connection between the conductors **9** on the one hand and the sensors **4** on the other hand can be realised by means of flexiconductors, conductive gums and the like.

[0038] Belonging to the sensor arrangement formed by the sensors **4** is a selection device not shown in **FIGS. 1 and 2**, which receives signals from all sensors **4** of the sensor arrangement. The signal quality of the individual sensors **4** can be established in the selection device not shown in the figures it. It is possible, by means of the selection device, to select a particular sensor or two sensors **4**, whereof the signal quality is best. As long as both sensors **4** with the best signal quality are selected, their signals can be combined into one output signal.

[0039] Also, it is possible to refine this output signal further, in that the signals of the sensors **4** not selected for combining the output signal are considered and employed for processing the output signal.

[0040] One seated position sensor and one sensor for the weight of the occupants of the vehicle can be connected to the selection device. Its output signals can e used in selection of the sensors **4** of the sensor arrangement best positioned for signal quality, whereby the output signal of a safety belt length of stretch sensor can be considered for this selection also.

1. A sensor arrangement for applying to a belt, in particular to a motor vehicle safety belt (**1**), characterised in that at least one sensor (**4**) of the sensor arrangement is arranged on the top side (**5**) of the safety belt (**1**) facing away from the body of the vehicle occupants, whereby the underside (**6**) of the safety belt (**1**) facing the body of the vehicle occupants remains free and unchanged.

2. The sensor arrangement as claimed in claim 1, which has several sensors (**4**) and wherein preferably each sensor (**4**) is arranged on the top side (**5**) of the safety belt (**1**) facing away from the body of the vehicle occupants, whereby the underside (**6**) of the safety belt (**1**) facing the body of the vehicle occupants remains free and unchanged.

3. The sensor arrangement as claimed in claim 1, wherein at least one sensor (4) is taken up on a fitting or respectively in a housing (7), which can be fastened to the top side (5) of the safety belt (1).

4. The sensor arrangement as claimed in claim 3, wherein the housing (7) of at least one sensor (4) is made of plastic.

5. The sensor arrangement as claimed in claim 3, wherein the housing (7) of at least one sensor (4) can be welded to the material forming the top side (5) of the safety belt (1).

6. The sensor arrangement as claimed in claim 3, wherein the housing (7) of at least one sensor (4) can be adhered to the material forming the top side (5) of the safety belt (1).

7. The sensor arrangement as claimed in claim 3, wherein the housing (7) of at least one sensor (4) can be sewn to the top side (5) of the safety belt (1).

8. The sensor arrangement as claimed in claim 1, wherein the safety belt (1) is provided in the region of at least one, preferably each, sensor (4) of the sensor arrangement with belt reinforcing.

9. The sensor arrangement as claimed in claim 8, whereof the belt reinforcing or respectively belt reinforcings is or respectively are designed in the form of threads additionally woven into the safety belt (1).

10. The sensor arrangement as claimed in claim 8, whereof the belt reinforcing or respectively belt reinforcings is or respectively are formed by threads with better mechanical properties, e.g. increased breaking load and/or elasticity, being used in their area or respectively areas.

11. The sensor arrangement as claimed in claim 1, whereof the sensors (4) are microphones.

12. The sensor arrangement as claimed in claim 1, to the sensors (4) whereof heart frequency, body temperature meters and/or the like belong.

13. A sensor arrangement, preferably as claimed in claim 1, whereof the sensors (4) are connected to conductors (9) integrated in the safety belt (1), in which or respectively from which the required operating energy of the sensor arrangement and signals of the sensors (4) can be inductively coupled or respectively uncoupled.

14. The sensor arrangement as claimed in claim 13, wherein the operating energy and the signals can be coupled or respectively uncoupled in the region of one of two retractors or a belt lock of the safety belt arrangement.

15. The sensor arrangement as claimed in claim 13, wherein the conductors integrated in the safety belt (1) are spun around a web thread of the safety belt (1).

16. The sensor arrangement as claimed in claim 13, whereof the sensors (4) are connected by means of flexi-conductors to the conductors (9) integrated in the safety belt (1).

17. The sensor arrangement as claimed in claim 16, whereof the sensors (4) are connected by means of conductive gums to the conductors (9) integrated in the safety belt (1).

18. A sensor arrangement, preferably as claimed in claim 1, wherein a selection device is provided, by means of which the sensor (4) of the sensor arrangement best positioned for signal quality can be determined and the signal of this sensor (4) can be selected for forwarding.

19. The sensor arrangement as claimed in claim 18, wherein by means of the selection device the two sensors (4) of the sensor arrangement best positioned for signal quality, e.g. the first sensor arranged above and the first sensor arranged below the signal source sensor (4), can be determined and the signals of both these sensors (4) can be combined into one output signal.

20. The sensor arrangement as claimed in claim 18, wherein the output signal of the selected sensor (4) of the sensor arrangement or respectively the output signal of the sensor arrangement combined from the signals of two or more selected sensors (4) including the signals of the other sensors (4) of the sensor arrangement, can be processed preferably according to any mathematical method.

21. The sensor arrangement as claimed in claim 18, whereof the selection device is connected to a seated position sensor and/or a sensor for weight of the occupants of the vehicle, whereby the output signals of this or respectively of these sensors can be viewed preferably in common with an output signal of a safety belt length of stretch sensor in selection of the best-positioned sensors (4) of the sensor arrangement.

* * * * *

专利名称(译)	用于施加到皮带上的传感器装置，尤其是用于机动车辆的安全带的传感器装置		
公开(公告)号	US20060250275A1	公开(公告)日	2006-11-09
申请号	US10/556438	申请日	2004-04-26
[标]申请(专利权)人(译)	RODEMER KLAUS		
申请(专利权)人(译)	RODEMER KLAUS		
当前申请(专利权)人(译)	PARAGON AG		
[标]发明人	RODEMER KLAUS		
发明人	RODEMER, KLAUS		
IPC分类号	G01V3/00 A61B5/00 A61B5/024 A61B5/18 B60R11/00 B60R11/02 B60R22/12		
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优先权	10327753 2003-06-18 DE		
其他公开文献	US7576642		
外部链接	Espacenet USPTO		

摘要(译)

发明内容本发明的目的是将传感器装置应用于皮带，尤其是机动车辆的安全带（1），使得安全带的功能被限制为尽可能少或根本不受限制。其机械阻力及其滑动和滚动特性。为此，传感器装置的传感器（4）应用于安全带（1）的上侧（5），其与机动车辆的乘客的车身相对，下侧（6）。安全带（1），面向机动车乘客的车身，保持自由且不变。