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(54) **Highway protection barrier**

(57) The barrier is formed by a solid body of soft material (1, 1') with, embedded within, a series of elastic elements (2, 2', 4, 5) that can be embedded directly in the body (V) or embedded within elements (3, 3') of a soft material like that of the body (1, 1'), forming a type of bollard inside said body (1, 1'). The internal elastic elements may be constituted by helical springs (2, 2'), bands (4) or rods (5) and, in any event, the body (1) is capable of being bent over, following the same bend as the internal elastic elements (2-3', 4-3' and 5-3')

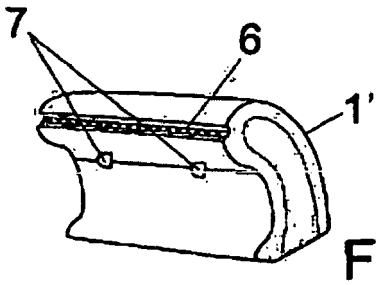


FIG. 10

EP 2 460 937 A2

## Description

### Object of the Invention

**[0001]** The present invention relates to a highway protection barrier, of the type called vehicle restraint barriers, such as safety barriers, parapets, impact attenuators, terminals and transitions, the barrier being made of a soft material, such as rubber or any other elastomeric material, and internally provided with elastic elements which in addition to providing the suitable rigidity to the barrier or fence being formed, allow twisting and damping in vehicle impacts.

**[0002]** As is evident, the highway protection barrier is provided for being located at the side or as a median of a road, or even as a means for demarcating areas to which access is prohibited, all of this for attenuating the consequences of accidents or impacts of vehicles which, by oversight or any other circumstance, uncontrollably go off the road.

**[0003]** The object of the invention is to provide a highway protection barrier in which the restraint in the impact of a vehicle is based on damping by buckling, thereby preventing abrupt impacts, which gives rise to a minimization of injuries for the occupants of the impacting vehicle itself as well as a minimization of damages of the vehicle itself.

### Background of the Invention

**[0004]** Vehicle restraint systems, such as protection barriers or fences known as "guardrails", usually are made up of rigid elements which, upon receiving an impact, become permanently deformed, such that the impact *per se* is abrupt, due precisely to the rigidity of the fence or barrier, which not only entails serious damage to the vehicle, but also important injuries for the occupants of the vehicle itself.

**[0005]** Additionally, sometimes it is necessary for the driver of a vehicle to be warned that he/she has impacted against the barrier, since, for example, if the latter is made of independent elements or bollards, which are completely flexible, an impact because of an oversight or because of not seeing those barrier elements, it can damage the vehicle itself, and even permanently damage the elements or bollards because the latter are provided so that once the impact has stopped, they recover their original position of vertically, but if the driver does not realize it, he/she can drag the bollard with the vehicle, permanently damaging it, etc.

### Description of the Invention

**[0006]** The highway protection barrier proposed herein has been designed to solve the aforementioned drawbacks, being based on a simple but effective solution.

**[0007]** More specifically, the barrier of the invention, is **characterized in that** it is made up of a soft body, such as rubber or any elastomeric material, preferably based on recycled tires, incorporating a plurality of elastic elements embedded within the body of the fence itself, which can be cylindrically configured bollards made of the same material as the body of the fence, such that those elastic elements internally include springs which, together with the element in which they are integrated, provide sufficient rigidity to the fence and additionally elasticity due to the nature of the material from which the whole assembly is made, whereby the impact against the mentioned fence not only absorbs the blow of the vehicle, but the inner and elastic elements (springs or bollards which these springs are part of) also become deformed, giving way in order to attenuate or catapult the vehicle impacting against the fence.

**[0008]** In an embodiment variant the barrier has the particularity of having a curved profile, the concavity of which is oriented inwardly, that curved profile equally affecting the inner elastic elements making up the damping means on impact against the fence or barrier.

**[0009]** That curved configuration of the body of the barrier provides a greater ability of absorbing the impact than when the body of the barrier and the inner elastic elements themselves are straight.

**[0010]** In said curved configuration of the barrier, the elastic elements can be formed by cylindrical bodies forming bollards and, embedded in the latter, helical springs, which can be interconnected by means of horizontal sheets thereby achieving an inner reinforcement of the assembly.

**[0011]** In another embodiment variant of the barrier with a curved configuration, the inner elements of the elastic elements are made up of metal strips, meshes or sheets, being able to have a rough surface for improving the grip of the elastomeric material, as well as the helical springs themselves, while in an embodiment alternative the inner elements are made up of vertical or horizontal rods, and always with the common factor that both the body of the barrier and the elastic damping elements have a curved profile for achieving greater absorption of the impacts.

**[0012]** Therefore, the described highway protection barrier, especially in its curved configuration, not only absorbs the blow of the vehicle upon impact against it because the latter is made of an elastic material such as rubber, but the inner elastic elements experience deformation, giving way together with the body of the barrier, achieving an attenuation-absorption of the vehicle impacting with the barrier, thereby preventing abrupt impacts, which in part attenuates injuries to the occupants of the impacted vehicle, even minimizing the damages to the vehicle itself.

**[0013]** The barrier is able to incorporate impact detection means for activating acoustic and/or light signaling elements.

**[0014]** In an embodiment variant, the body of the barrier can be formed by independent elements like bollards, within which there is incorporated a circuit to which impact

detection means are associated through which means the warning signal is triggered, which can be made up of a pressure sensor or a device for detecting the change in inclination of the bollard, or any other similar conventional device, such that when contact of the vehicle with the circuit is detected, a warning signal is generated, being emitted through one or more speakers or similar elements, also being able to activate the turning on of light indicators suitably arranged on the fence in question and/or even in the same device in the event that the latter is long enough to enable being seen from the driver's position.

**[0015]** In this embodiment variant, the acoustic/light signaling circuit does not have to be integrated in the bollard itself, but it can be arranged outside the latter, such that only a single acoustic/light signaling circuit is necessary for a group of bollards near each other, for which purpose it has been provided that the circuit associated with the impact detection means arranged in each bollard can be associated with a radio frequency emitting device of any type emitting an activation signal to activate the acoustic/light signaling circuit, in which case said circuit will incorporate the corresponding radio frequency receiver module through which the corresponding signal will be activated.

**[0016]** A system is thus achieved which allows automatically and unequivocally warning drivers of the possible collision of their vehicle against a bollard, preventing damages to both the vehicle and the bollard.

Description of the Drawings

**[0017]** To complement the description that will be provided below and for the purpose of aiding to better understand the features of the invention according to a preferred practical embodiment thereof, a set of drawings is attached as an integral part of said description in which the following has been depicted with an illustrative and non-limiting character:

Figure 1 shows a general perspective view of a highway protection barrier in a preferred embodiment of the invention.

Figure 2 shows a sectional view of the barrier depicted in the previous figure, accordingly depicted with one of the inner elastic elements.

Figure 3 shows another sectional view of the barrier depicted in the previous figure, showing the deformation that said barrier experiences and the corresponding inner elastic element, after the impact, with recovery after this latter.

Figure 4 shows a depiction corresponding to a side perspective view of a portion of protection barrier object of the invention in an embodiment variant in which the body of the barrier and the inner elastic element are integral.

Figure 5 shows a cross-sectional view of the barrier part depicted in the previous figure.

Figure 6 shows a perspective view like that of Figure 4, where the inner elements of the elastic elements are sheets.

Figure 7 shows a longitudinal sectional view of the barrier portion or sector depicted in the previous figure.

Figure 8 shows a perspective view of the same barrier with a curved configuration depicted in Figures 4 and 6, but in this case with the inner elements of the elastic elements made up of rods.

Figure 9 shows a longitudinal sectional view of the sector of barrier depicted in the previous figure.

Figure 10 shows a perspective view of a barrier sector or portion incorporating a string of LED type lights inserted in its projecting longitudinal part.

Figure 11 shows a block diagram of the circuit for the highway protection barrier object of protection, and specifically in a bollard when said barrier is formed by independent elements or bollards *per se*.

Figure 12 shows an embodiment variant of the circuit shown in the previous figure, in which the circuit generating acoustics/light signals is independent of the impact detection circuit, allowing the use of a single circuit generating acoustic/light signals for several independent barrier elements located close to each other.

Preferred Embodiment of the Invention

**[0018]** As can be seen in the mentioned figures, in and specifically in relation with Figures 1, 2 and 3, the barrier of the invention is made up of a body (1) of soft material, such as rubber from recycled tires or other materials, incorporating within a plurality of elastic elements (2) which can be made up of cylindrical bollards, also made of soft material, i.e. rubber or the like, where damping (4) elastic (2) elements will be embedded within that cylindrical bollard or body, such that the fence is fixed, i.e., the body (1) forming it, by any suitable system on the ground, when it receives the impact of an automotive vehicle, an elastic deformation of the body (1) of the barrier itself, and therefore of the corresponding elastic elements (2-3), will occur, as seen in Figure 3, which corresponds to the deformation which the barrier with the elastic element housed within the body thereof experiences once a vehicle impacts it.

**[0019]** Due to the nature of the materials, the barrier is not permanently deformed given vehicle impacts, just as the elastic elements (2) with the cylindrical body (3) in which they are housed, but they recover their initial position when the blows are not too strong, further absorbing the impact and attenuating the blow.

**[0020]** Therefore, the barrier in question is formed by a body (1) which is solid and made of a soft material, i.e., elastomeric, such as rubber or the like, preferably obtained from the reuse or recycling of tires, and where the cylindrical elements (3) like bollards, incorporating the elastic elements (2) embedded within, will also be solid,

together forming a barrier that is initially rigid but deformable in vehicle impacts, with the particularity that those elastic elements (2) can be embedded directly in the body (1) of the barrier, without needing the cylindrical bodies (3).

**[0021]** Figures 4 to 10 inclusive show an embodiment variant in which the body (1') of soft material making up the barrier has a bent over configuration, with the concavity oriented inwardly, incorporating within the corresponding elastic elements (2') housed in a body (3') embedded within the body of soft material (1'), as in the previous cases, what happens in this case is the elastic elements (2'-3') are also curved according to the trajectory of the body (1') of the barrier.

**[0022]** Instead of springs (2') as is depicted in Figures 4 and 5, such inner elastic elements can be made up of sheets (4) like strips or leaf springs, also with the same curved profile, making up, as in all the previous cases, damping means for a vehicle impact.

**[0023]** In another embodiment variant, the elastic elements are made up of rods (5) as shown in Figures 8 and 9, also with the curved configuration of the body (1') of the barrier, according to the curvature of the latter.

**[0024]** In another embodiment variant shown in Figure 10, the barrier or body (1') thereof, is able to incorporate within motion sensors (7) which, after an impact, emit a warning by radio frequency or cable to LED type lights (6) incorporated in the same body of the barrier (1'), warning of an impact.

**[0025]** Likewise, the described highway safety barrier, in any of its embodiments, can serve to support conventional safety barriers, replacing the rigid metal posts holding the protective metal sheets or profiles.

**[0026]** Instead of being a body with an indefinite length, as depicted in the previously mentioned figures, the barrier can be formed by independent elements and in each of them an elastic element, forming a type of bollard in each case of the type used in urban areas to serve as a barrier preventing or warning that the established line of bollards cannot be trespassed.

**[0027]** In any case, those independent elements include a control circuit (8) associated with a power source (9), preferably connected to the power grid, although it could be supported by a rechargeable battery associated with a photovoltaic solar panel or any other conventional independent power solution.

**[0028]** An impact detection device (10) is associated with said control circuit, through which device (10) a warning signal is triggered, said impact detection device being able to consist of a pressure sensor such as that mentioned for Figure 10, or such as, for example, by means of a pendulum (11) shown in Figures 11 and 12, which forms an electric conductor element remaining isolated from the corresponding contacts (12) in the upright or vertical position of the elastic element or bollard in question, whereas when this latter changes position, i.e., it is inclined due to an impact or the pressure of the body of a vehicle thereon, the pendulum (11) tends to be arranged in the vertical position due to the effect of gravity, coming into contact with one of the contacts, closing the electric control circuit and the latter generating an acoustic warning signal through one or more speakers (13) or light indicators (14) which would be equivalent to the LEDs (6) provided in the embodiment shown in Figure 10.

**[0029]** The control circuit assembly with all the mentioned components can be integrated within the casing or body of the protection barrier, or bollard *per se*, as depicted in Figure 11, or the acoustic and/or light signaling elements could be arranged externally and independently to save in costs, such as for example in a post or integrated in any urban fixture element , being able to be used for the acoustic signaling due to the impact of multiple elements or bollards forming the barrier and having reference numbers (15, 15' and 15"), the number of the latter being able to be greater.

**[0030]** In said case, the control circuit (8) will be associated with a radio frequency emitter (16) of any type existing on the market, which in the event of a blow to the barrier or bollard element (15) will generate a signal (17) that will be received by a radio frequency receiver module (18) which is associated with a control sub-circuit (8') supported by the corresponding power source (9') through which the warning signals through the speakers (13') and light indicators (14') are activated.

## Claims

1. A highway protection barrier provided for use as a separation median in roads or use in urban areas for separating or demarcating some areas from others, **characterized in that** it is made up of a solid body of soft material (1, 1'), within which are vertically arranged a plurality of elastic elements (2, 2', 4, 5) housed in cylindrical or similar elements (3, 3') like bollards, also made of soft material, and in which said elastic elements (2, 2', 4, 5) will be embedded; the incorporation of impact detection means (7, 10) having been provided for activating light signaling elements (6, 14) and/or acoustic signaling elements (13).

2. The highway protection barrier according to claim 1, **characterized in that** the material from which the body (1, 1') of the barrier is made is preferably rubber.

3. The highway protection barrier according to claim 1, **characterized in that** the elements (3, 3') which house and in which are embedded the corresponding elastic elements (2, 2', 4, 5) are preferably made from a rubber material.

4. The highway protection barrier according to the preceding claims, **characterized in that** the body of soft material (1') has a bent over profile with the concavity oriented inwardly, said curvature or bending

affecting the elastic elements (2'-3, 4-3' and 5-3') in the same manner.

**5.** The highway protection barrier according to the preceding claims, **characterized in that** the elastic elements (2, 2') are helical springs.

**6.** The highway protection barrier according to claims 1 to 4, **characterized in that** the elastic elements (4) housed within the elements (3') of the bent over bodies (1') of the barrier are made up of sheets or strips (4) with the same curved profile as the element (3') in which they are housed and of the body (1') of the barrier itself.

**7.** The highway protection barrier according to claims 1 to 4, **characterized in that** the elastic elements housed within the elements (3) embedded in the body (1') of the barrier are made up of rods (5) having the same curved profile as the body (1') of the barrier itself.

**8.** The highway protection barrier according to the preceding claims, **characterized in that** both the elastic elements (2, 2', 4 and 5) and the elements (3, 3') in which they are housed are optionally interconnected between each other by means of meshes or elements arranged horizontally forming an inner reinforcement of the assembly.

**9.** The highway protection barrier according to claim 1, **characterized in that** the detection elements (7) are made up of motion and/or impact sensors for sonorous, visual or telematic sending to a control center, it having been provided that the intercommunication between the sensors (7) is done by means of cable means or by radio frequency to the corresponding signaling elements (6).

**10.** The highway protection barrier according to claim 1, **characterized in that** the impact detection means (10) are made up of a pressure sensor or by a pendular element (11) for detecting the change in inclination of the element or part of the body in which it is applied.

**11.** The highway protection barrier according to claims 1 and 10, **characterized in that** optionally the acoustic and/or light signaling means (13, 14) are physically independent of the structure of the element in which the impact detection means (10) are arranged and common for two or more of the latter, in which case the corresponding control circuit (10) is associated with a radio frequency emitter (16) through which the warning signal is sent to the acoustic and/or light signaling circuit, the latter incorporating a control sub-circuit (8') associated with a radio frequency receiver module (18), as well as the corresponding speakers (13') and light indicators (14').

**12.** The highway protection barrier according to claims 1, 9 and 10, **characterized in that** the independent elements able to form the highway protection barrier are able to have any configuration.

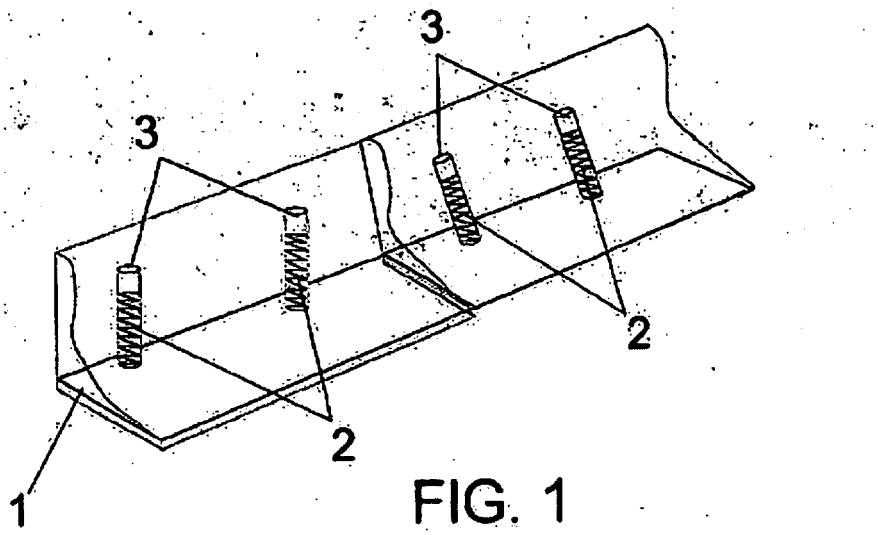


FIG. 1

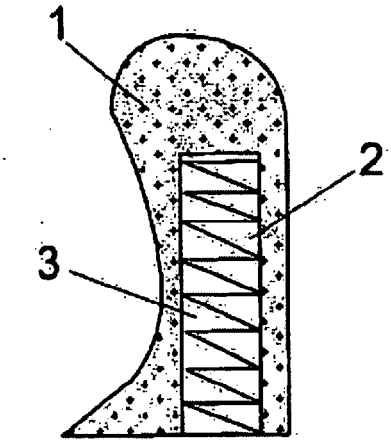


FIG. 2

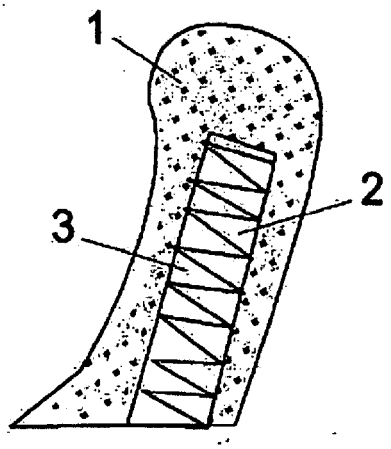


FIG. 3

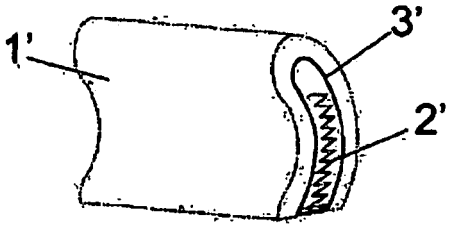


FIG. 4

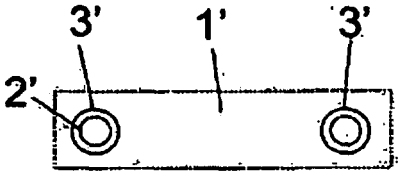


FIG. 5

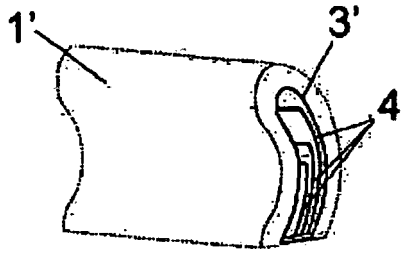


FIG. 6

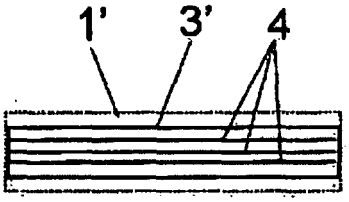


FIG. 7

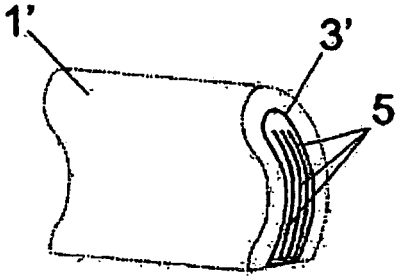


FIG. 8

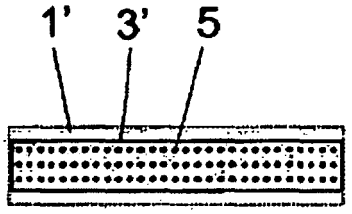


FIG. 9

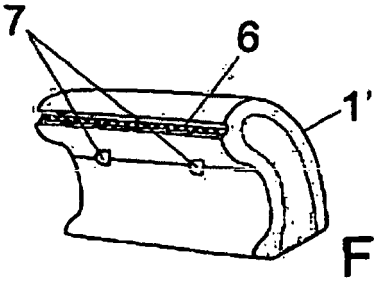


FIG. 10

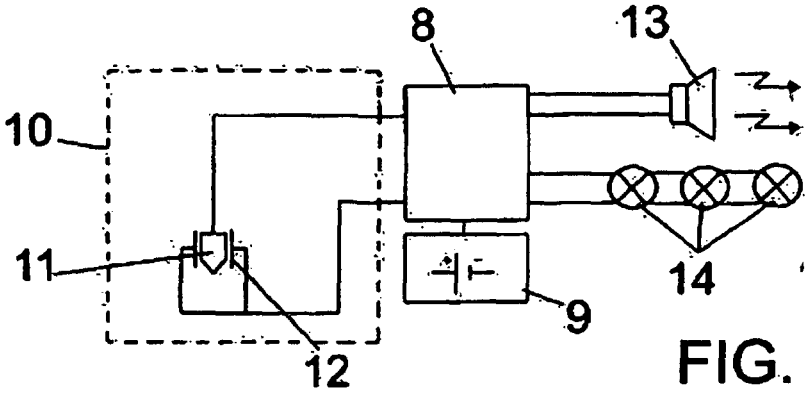


FIG. 11

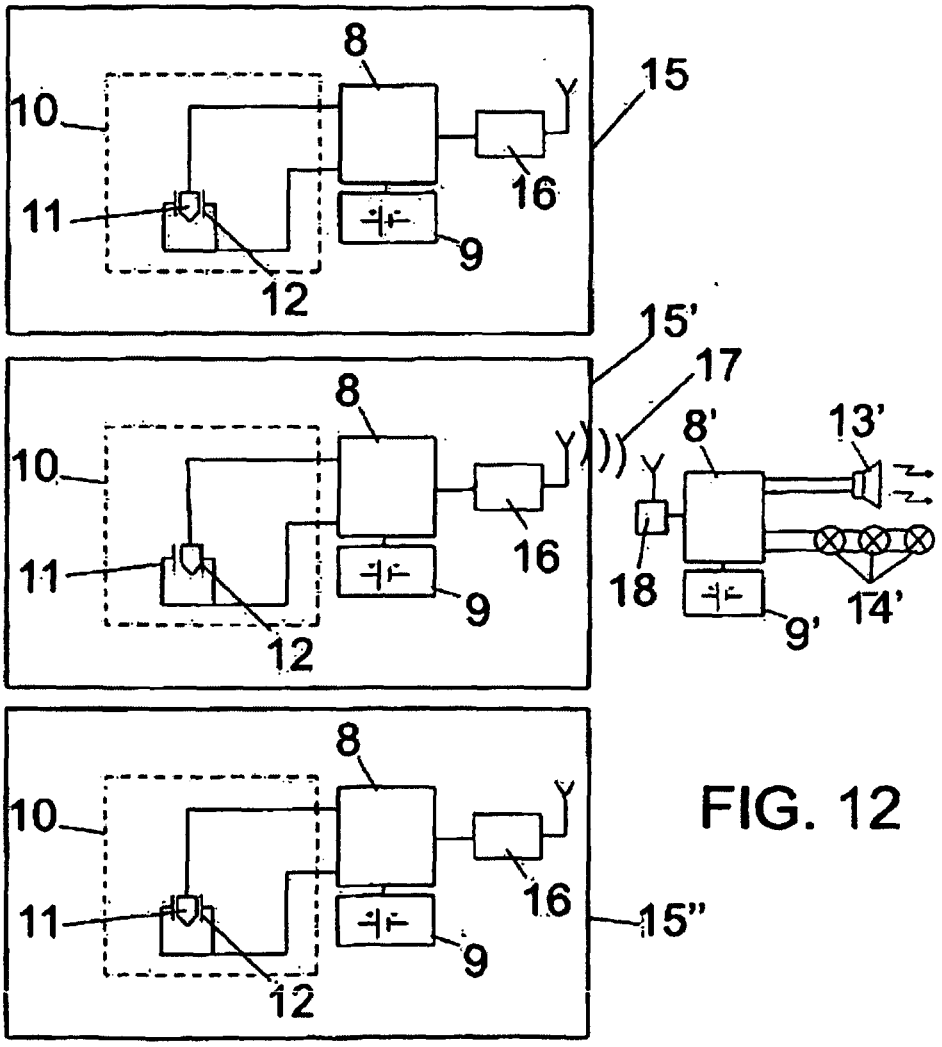


FIG. 12