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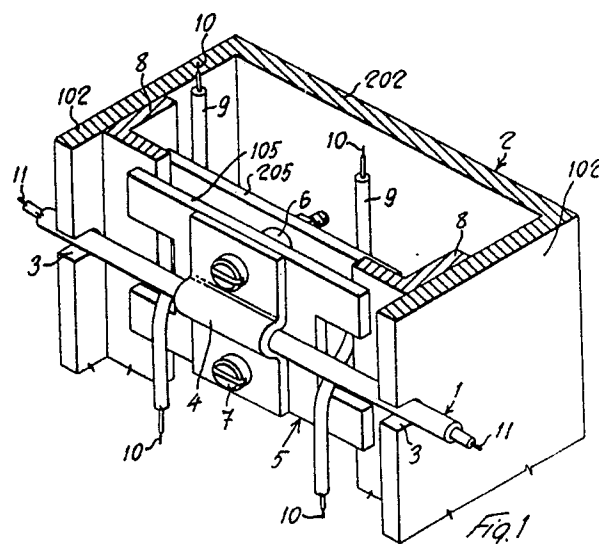
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I-44010 Montesanto(IT)(54) **Intrusion-warning wire fence.**

(57) This invention relates to an intrusion-warning wire fence formed, at least partly, by a plurality of barrier or fence wires (1), substantially parallel to each other and stretched taut between two supports, for example two poles (2). The distance between two adjacent barrier wires (1) is smaller than that which is required for permitting a person to pass therethrough. The invention provides one or more sensor wires (9) each comprising at least one optical conductor (10) connected to a warning and/or alarm system which is activated when said optical conductor (10) is either broken or compressed. Said sensor wires (9) are associated with at least part of said barrier wires (1) and with at least one back-pressure edge (8, 13) so as to be compressed against said back-pressure edge (8, 13) as a result of an increase in the tension of the associated barrier wire (1) above the initial tension of installation, and to such an extent as to activate the warning and/or alarm system. Therefore, this system is activated when two adjacent barrier wires (1) are spread apart so as to form an opening for the passage of a person.



EP 0 308 737 A1

Intrusion-warning wire fence

This invention relates to an intrusion-warning wire fence formed, at least partly, by a plurality of barrier or fence wires substantially parallel to each other and stretched taut between two supports, while the distance between two adjacent wires is smaller than that required for permitting a person to pass therethrough. The barrier wires may be substantially horizontal and may be stretched, particularly, between two poles or the like, or they may be substantially vertical and may be stretched, for example, between an upper beam and a lower beam, or the like. The barrier wires, however, may also be at an angle to either the horizontal or the vertical and be stretched between two poles or two beams.

By the term "wire", according to the present invention, it is meant a wire or cable of any suitable material and of any cross sectional shape, either of single or multiple, or even tubular formation.

The invention aims to provide a fence of the type as specified above, so as to generate - by simple, reliable and economical means - a warning and/or alarm signal when two wires of the fence are intrusively spread apart, i.e. moved transversely away from each other, to obtain an opening permitting the passage of a person.

According to the invention, this problem is solved by the feature that one or more sensor wires comprising each an optical conductor (optical fibre) and connected to a warning and/or alarm system which is activated when the optical conductor is either broken or compressed, are associated with at least a part of the barrier wires and at least a back-pressure edge, so as to be compressed against said back-pressure edge as a result of an increase in the tension of the associated barrier wire above its initial tension of installation, and to such an extent as to activate the warning and/or alarm system.

In one embodiment of the invention, the sensor wire or wires are separate from the barrier wires and are passed between a stationary back-pressure edge and a movable pressure member which co-operates with the back-pressure edge and is connected either directly or indirectly to an associated barrier wire, so as to be urged against the back-pressure edge and to be caused to compress the sensor wire between the back-pressure edge and said pressure member in case of an increase in the tension of the barrier wire above its initial tension of installation.

In a particularly advantageous construction of this embodiment, the pressure member is fixed directly to the associated barrier wire and is slidably

ly guided in the longitudinal direction of the barrier wire or it is mounted so as to be pivotable around a pivot axis transverse to the barrier wire. The sensor wire or wires, or the back-pressure edges and the movable pressure member or members may be provided at only one or at both ends of the stretched barrier wires and, in case of more extensive lengths of these wires, at one or more intermediate locations on them. At the intermediate locations on the barrier wires, the respective slidable or pivotable pressure members, for example fixed directly to the associated barrier wires, co-operate preferably at both sides with a back-pressure edge, while a sensor wire is passed at each side between the respective back-pressure edge and the pressure member. The sensor wire(s), and/or the back-pressure edge(s), and the movable pressure member(s), are preferably accommodated within the supports between which the barrier wires are stretched, and/or within intermediate supports, for example within the hollow poles for the horizontal barrier wires.

In all the embodiment of the invention, wherein the sensor wires are separate from the barrier wires, the barrier wires may be constituted by any usual wires, made of any suitable material. Preferably, however, at least some of the barrier wires are constructed also as signalling wires, i.e. they comprise one or more electrical or optical conductors connected to a warning and/or alarm system which can be activated by said wire or wires being compressed. In this instance, the warning or alarm system is thus activated not only when two adjacent barrier wires are spread apart to open a passage, but also when a barrier wire is either bent or cut for the same purpose.

According to a further embodiment of the invention, the sensor wires are coupled with at least some of the barrier wires and are constituted, for example, by one or more optical conductors incorporated in the barrier wires or arranged on the outer side thereof and stretched together with the same, while the barrier wires are passed with the respective sensor wires through holes provided in the hollow supports, and follow, within said supports, such a path that they are compressed against the hole edges acting as back-pressure edges, by the action of a transverse component of the tractive force exerted on the barrier wires.

These and other features of the invention and the advantages arising therefrom will appear in more detail from the following description made with reference to the accompanying drawings, wherein:

Fig. 1 is a perspective view of a first embodiment of the invention.

Fig. 2 is a perspective view of a detail of Fig. 1.

Fig. 3 is a partial front elevational view with parts in vertical section of the embodiment according to Figures 1 and 2.

Fig. 4 is a front elevational view with parts in section of a modification of the embodiment according to Figures 1 to 3.

Fig. 5 is a horizontal cross sectional view of this modification, taken on line V - V in Fig. 4.

Fig. 6 is a vertical sectional view of this modification, taken on line VI - VI of Fig. 4.

Fig. 7 is a perspective view of a further detail of the embodiment according to Figures 1 to 3.

Fig. 8 is a perspective view of a further modification of the embodiment according to Figures 1 to 3.

Fig. 9 is a diagrammatic front elevational view with parts in section of a further embodiment of the invention.

With reference to Figures 1 to 3, the intrusion-warning wire fence according to the invention consists of a plurality of horizontal barrier or fence wires 1, which are vertically spaced apart the one from the other and stretched between two end supports or poles (not shown). Between said end supports or poles, the barrier wires 1 are passed through at least one intermediate box-type support or pole 2, by being caused to get into and out of aligned holes 3 provided in the side walls 102 of the intermediate pole 2. Within the pole 2, each barrier wire 1 is fixed by means of a bracket 4 to a pressure member 5 formed by two vertical platelets 105 and 205, which are spaced apart from each other by suitable spacers 6 and are connected by means of screws 7.

The two side ends of each pressure member 5, i.e. of both platelets 105, 205 composing it, have a fork-like configuration. Each pressure member 5 is slidably guided horizontally in the longitudinal direction of the respective barrier wire 1, by means of two vertical L-shaped profiles 8 which by one of their flanges are fixed each to the inner face of a side wall of pole 2, while by their other flange they are inserted between said two platelets 105, 205 of the slidable member 5, at the fork-like ends thereof.

Arranged within each pole 2 are two sensor wires 9 comprising at least one optical conductor 10 (optical fibre) and connected to any suitable warning and/or alarm system (not shown) which is activated when one of the optical conductors 10 is either broken or compressed (squeezed) to such an extent as to reduce its conductivity below a given limit. Each of these sensor wires 9 extends

substantially vertically and is led - in proximity of each barrier wire 1 - from one side of the respective pressure member 5 to the opposite side thereof, by being passed between the two arms of the respective fork-like end of the pressure member and between the bottom of said fork and the edge of the flange of the respective L-shaped guide profile 8, that is inserted between the two platelets 105, 205 of the pressure member 5. The construction and the arrangement are such as to obtain the following operation. When the barrier wires are stretched normally, i.e. when they have the original tension of installation or assembling, the pressure member 5 connected to each barrier wire 1 within the intermediate pole 2 is in an intermediate position wherein both sensor wires 9 are not compressed between said pressure member 5 and the respective back-pressure edge constituted by the inner free edge of the corresponding L-shaped guide profile 8, or they are not compressed with such a force as to cause the activation of the warning or alarm system. The barrier wires 1 are so spaced apart the one from the other as to prevent the passage of a person. When two adjacent barrier wires 1 are spread apart, i.e. they are moved away from each other at an intermediate spot of their length, so as to form such an opening as to allow the passage of a person, the tension of these barrier wires 1 is then increased and the respective pressure members 5 are displaced or urged towards the back-pressure edge of one or the other L-shaped guide profile 8, thus compressing the optical conductor 10 in the respective sensor wire 9 to such an extent as to reduce the conductivity of said optical conductor 10 down to below the limit of activation of the warning and/or alarm system which, therefore, is activated and immediately signals the attempt of intrusion through the fence. Upon ceasing of the spread apart displacement, and therefore of the additional tension of the two barrier wires 1, the assembly reverts to the rest condition, with no damage to the fence and to the sensor members thereof.

The barrier or fence wires 1 may be constituted by any normal wire or they may also contain at least one optical or electrical signalling conductor 11, connected as well to the warning and/or alarm system, which is activated when at least one of the barrier wires 1 is cut together with the respective signalling conductor 11. In one preferred embodiment, the sensor wires 9 and possibly also the barrier wires 1 may be constituted by suitable optical conductors.

The embodiment according to Figures 4, 5 and 6 substantially corresponds to that of Figures 1 to 3, and like or equivalent parts being indicated by the same reference numerals. However, in the embodiment according to Figures 4 to 6, the pressure

members 5' connected to a pair of adjacent barrier wires 1, rather than being slidable in the longitudinal direction of these wires 1, are pivotably mounted on the front wall 302 of the pole 2 about a horizontal pivot 12 disposed transversely to the pair of barrier wires 1 at the center therebetween. In the illustrated exemplary embodiment, one of the pressure members 5' is fulcrumed about the pivot 12 by means of an extension of its front platelet 105, while the other pressure member 5' is fulcrumed about the same pivot 12 by means of an extension of its rear platelet 205', so as to obtain a symmetrical and balanced construction, as shown in Fig. 6.

The embodiment according to Fig. 8 also substantially corresponds to the embodiment according to Figures 1 to 3, like or equivalent parts being designated by the same reference numerals. The sensor wires 9, however, are not passed from the one to the other side of the slidable pressure member 5, but they extend vertically between the two platelets 105 and 205 thereof and are passed between a back-pressure edge 13 integral with the respective guide profile 8 and a pressure edge 14 integral with the pressure member 5. The two edges 13 and 14 are opposite to each other and substantially horizontal and transverse to the corresponding sensor wire 9. The two edges may be constructed as cutting edges, such as to even cause the severance of the sensor wire 9 when the tension in the respective barrier wire 1 increases beyond a predetermined limit. Preferably, however, the two opposite pressure edge 14 and back-pressure edge 13 are suitably rounded so as to only cause a corresponding compression of the sensor wire 9.

The construction shown in Fig. 7 may be applied at will to the three embodiments as described with reference to Figures 1 to 3, 4 to 6, and 8. According to this construction, the box-type pole 2 is provided with a cap-like cover 15 fitted on the top end of said pole 2. Said cover 15, however, does not rest on the top edge of the pole 2 but is provided with a depending extension 16 which extends into the interior of the pole 2 and is formed with holes or slots 17 through which is passed a barrier wire 1 provided with at least one signalling optical conductor 11. Said cover 15 rests on said wire 1 by means of the top edge of the holes or slots 17 of its depending extension 16. As a result, when a person attempting to step over the intrusion-warning fence leans from above on the cover 15, the latter is urged downwards and its depending extension 16 squeezes the optical signalling conductor 11 of the barrier wire 1 so as to activate the warning or alarm system, to which said conductor 11 is connected.

In the embodiment according to Fig. 9, the fence is formed by a plurality of barrier wires 1

each provided with an optical conductor 11 and formed, for example, by optical cables, as described previously with reference to Fig. 1. These barrier wires 1 are stretched horizontally between two end supports (not shown) and are passed through intermediate box-like poles 2 formed with corresponding holes 3 through their side walls 102. Within each pole 2, the wires 1 are passed around stationary turnround members 18 so as to follow a path with stretches at an angle with respect to the side walls 102 of the pole 2. In the embodiment according to Fig. 9, the edges of the holes 3 in the sidewalls 102 of a pole 2 constitute the back-pressure edges co-operating with the barrier wires 1 and the optical conductors 11 incorporated therein. The wires 1, 11 constitute simultaneously both the barrier wires proper and the sensor wires. In fact, when two adjacent barrier wires 1 are vertically spread apart to form an opening to pass through the fence, the optical conductors 11 of these wires 1 are pressed against either the lower or the upper edge of the respective holes 3, so as to activate the warning and/or alarm system.

Of course, what previously described in connection with the intermediate poles 2 of an intrusion-warning fence according to the invention, applies as well to the so-called end supports or poles (not shown) to which the barrier wires 1 are anchored to be stretched taut. It is also apparent that the warning and/or alarm system associated with the intrusion-warning wire fence according to the invention is activated also when only one of the wires of the fence is moved away from an adjacent wire to form an opening permitting the passage of a person.

Claims

1. An intrusion-warning wire fence constituted at least partly by a plurality of barrier or fence wires (1) substantially parallel to each other and stretched taut between two supports, while the distance between two adjacent barrier wires (1) is smaller than that required for permitting a person to pass therethrough, characterized in that one or more sensor wires (9) each comprising at least one optical conductor (optical fibre 10) and connected to a warning and/or alarm system which can be activated upon rupture or compression of the optical conductor (10), are associated with at least a part of the barrier wires (1) and with at least one back-pressure edge (8, 13) so as to be compressed against said back-pressure edge as a result of an increase in the tension of the associated barrier wire (1) above its initial tension of installation, and to such an extent as to activate the warning and/or alarm system.

2. A fence according to Claim 1, characterized in that the sensor wires (9) are separate from the barrier wires (1) and are passed between a stationary back-pressure edge (8, 13) and a movable pressure member (5, 5') co-operating with said back-pressure member (8, 13) and connected either directly or indirectly to an associated barrier wire (1), so as to be urged toward the back-pressure edge (8, 13) and as to cause the compression of the sensor wire (9) between the back-pressure edge (8, 13) and said pressure member (5, 5') in case of an increase in the tension of the barrier wire (1) above its initial tension of installation.

3. A fence according to Claim 2, characterized in that the pressure member (5) is secured preferably directly to the associated barrier wire (1) and is slidably guided in the longitudinal direction of said barrier wire (1).

4. A fence according to Claim 2, characterized in that the pressure member (5') is secured preferably directly to the associated barrier wire (1) and is mounted as to be pivotable about a pivot (12) disposed transversely to said barrier wire (1).

5. A fence according to Claims 2 to 4, characterized in that each pressure member (5, 5') has at least at one of its side ends a fork-like configuration and an end groove extending in the same plane as the fork-like member and normally to the arms thereof, said end groove of the pressure member (5, 5') having engaged therein a back-pressure and guide edge or flange (8) which is transversal and normal to the associated barrier wire (1), while the sensor wire (9) extends substantially parallel to the back-pressure and guide edge (8) and is led from one side to the other of the pressure member (5, 5') by being passed through the fork-like formation between the back-pressure and guide edge (8) and the bottom of said fork.

6. A fence according to Claims 2 to 4, characterized in that the sensor wire (9) is passed between a pressure edge (14) provided on the pressure member (5, 5') and a back-pressure edge (13), both of these edges being disposed transversely to said sensor wire (9).

7. A fence according to any one or more of the preceding Claims, characterized in that the sensor wire or wires (9) and the back-pressure edge or edges (8, 13) and the movable pressure members (5, 5') are provided only at one or at both ends of the stretched barrier wires (1) and/or at one or more intermediate spots, preferably within hollow supports (poles 2) or the like.

8. A fence according to Claim 7, characterized in that at the intermediate spots of the barrier wires (1), the members (5, 5') co-operate at both sides with a back-pressure edge (8, 13), while at each

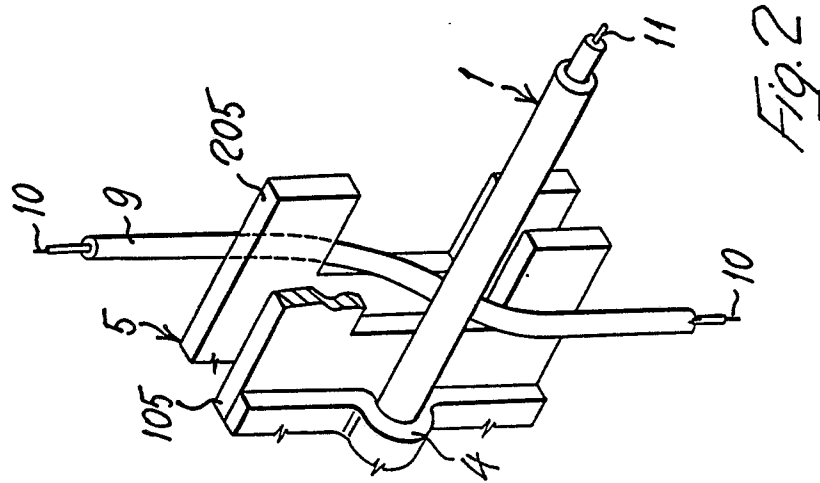
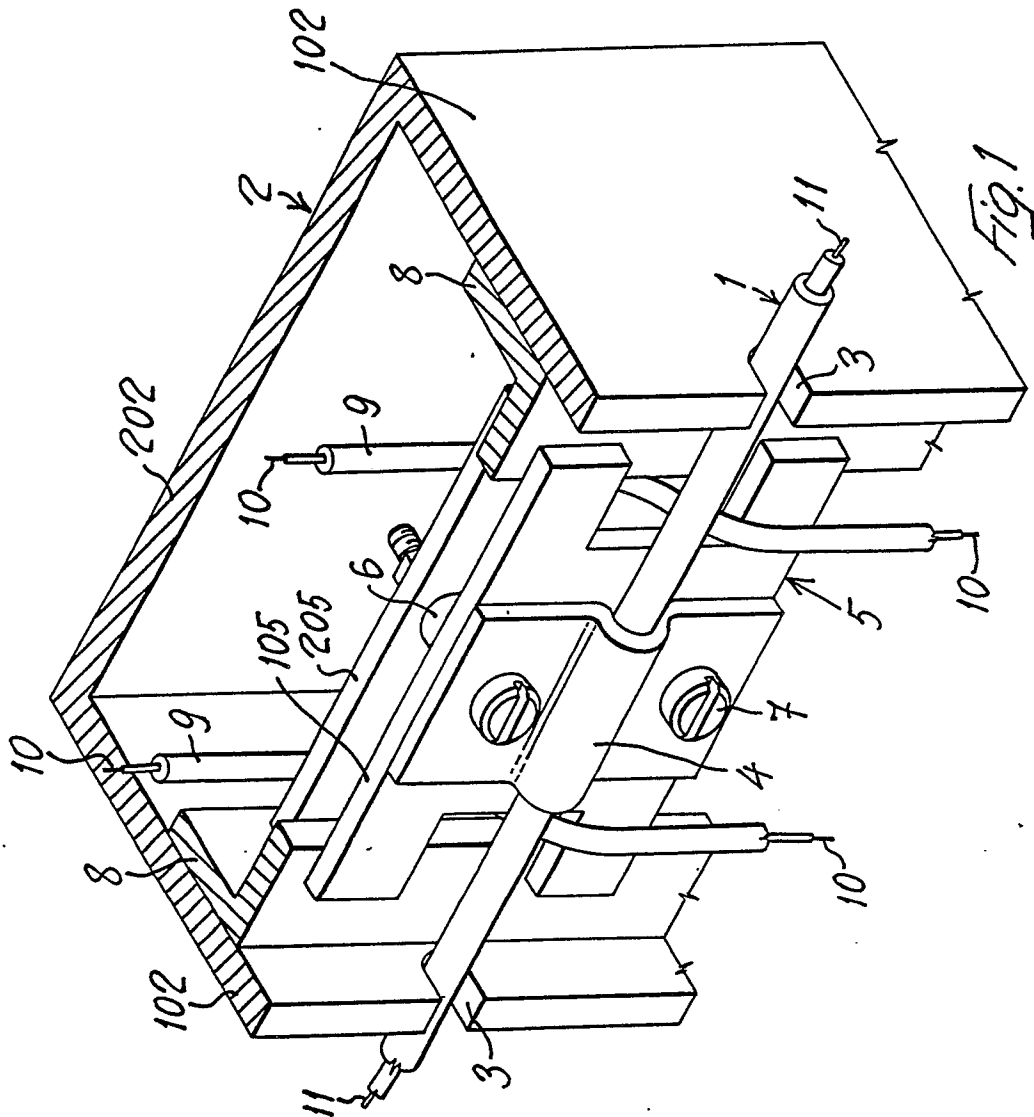
side a sensor wire (9) is passed between the respective back-pressure edge (8, 13) and the pressure member (5, 5').

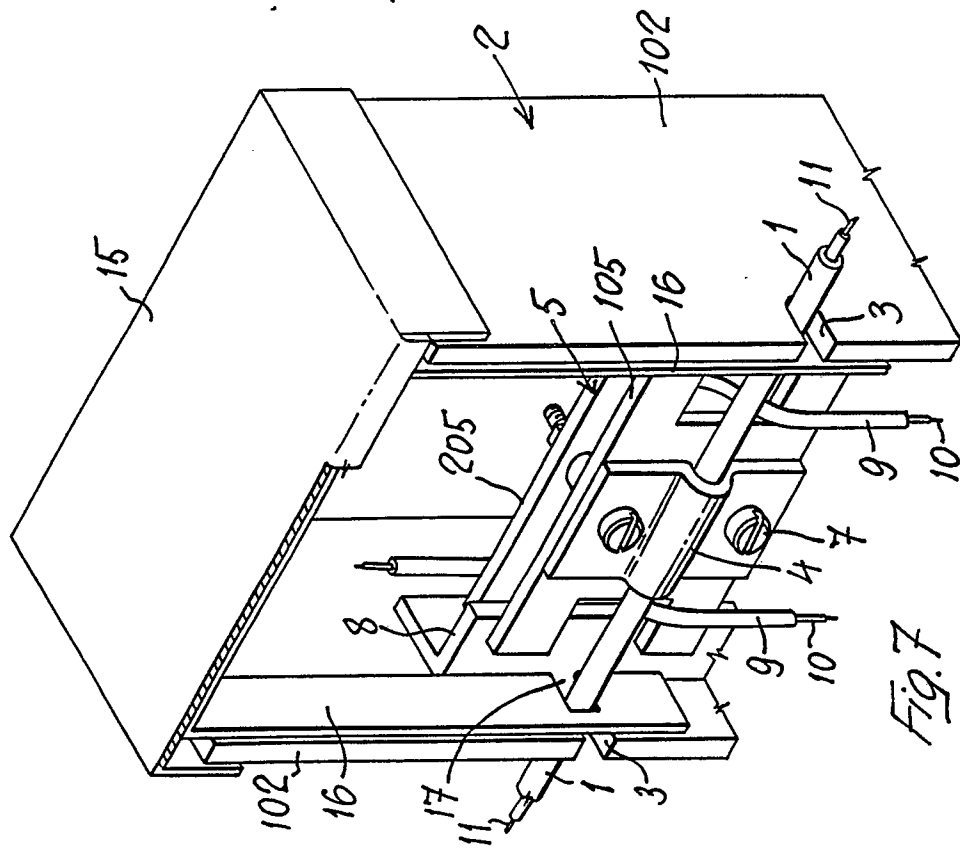
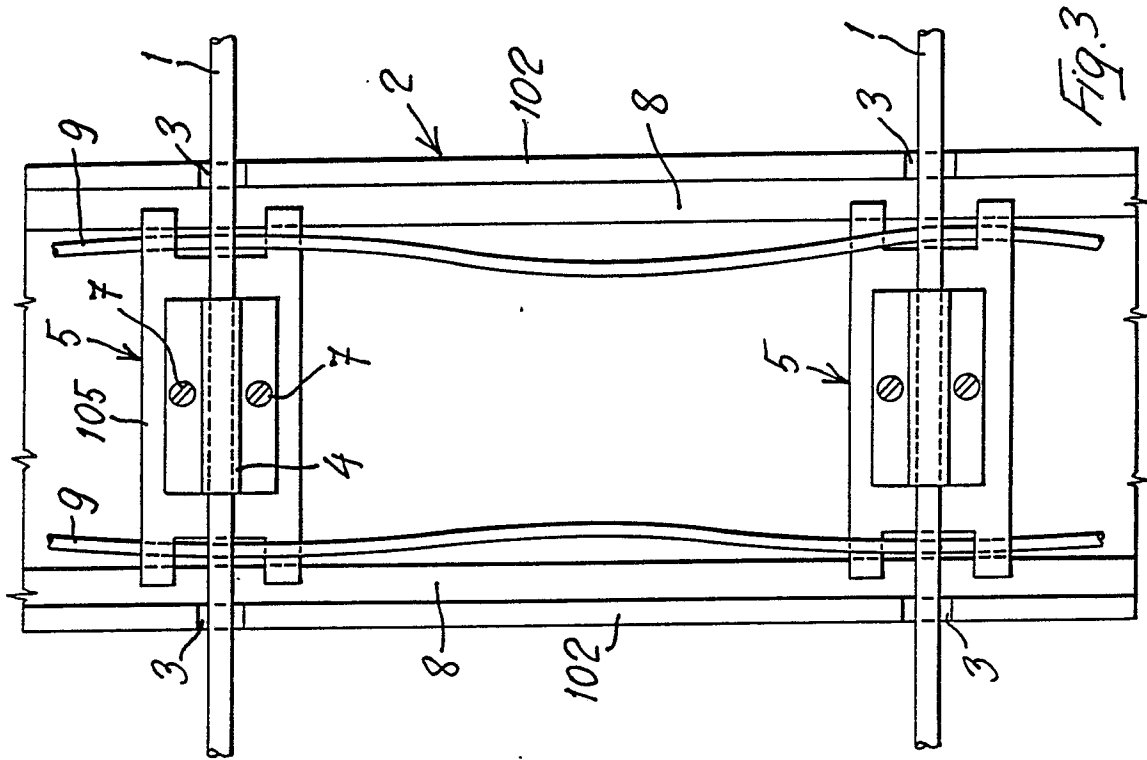
9. A fence according to any one or more of the preceding Claims, characterized in that the barrier wires (1) comprise one or more optical or electrical conductors (11) connected to a warning and/or alarm system which can be activated upon rupture or compression of said conductor or conductors (11).

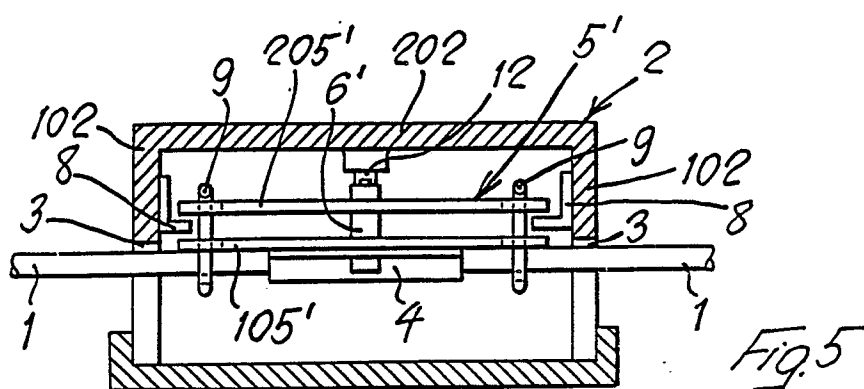
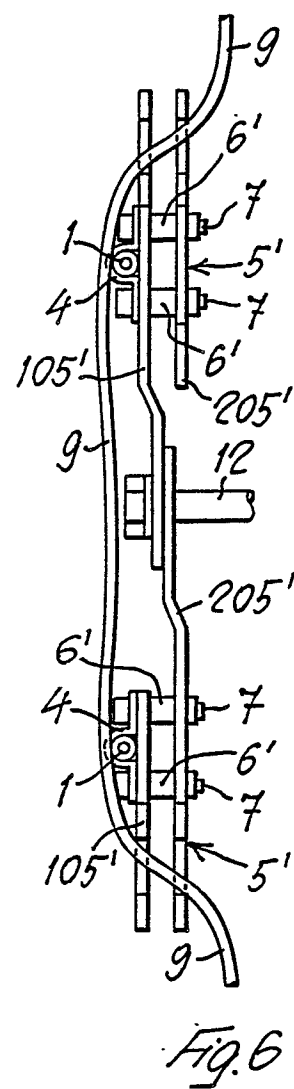
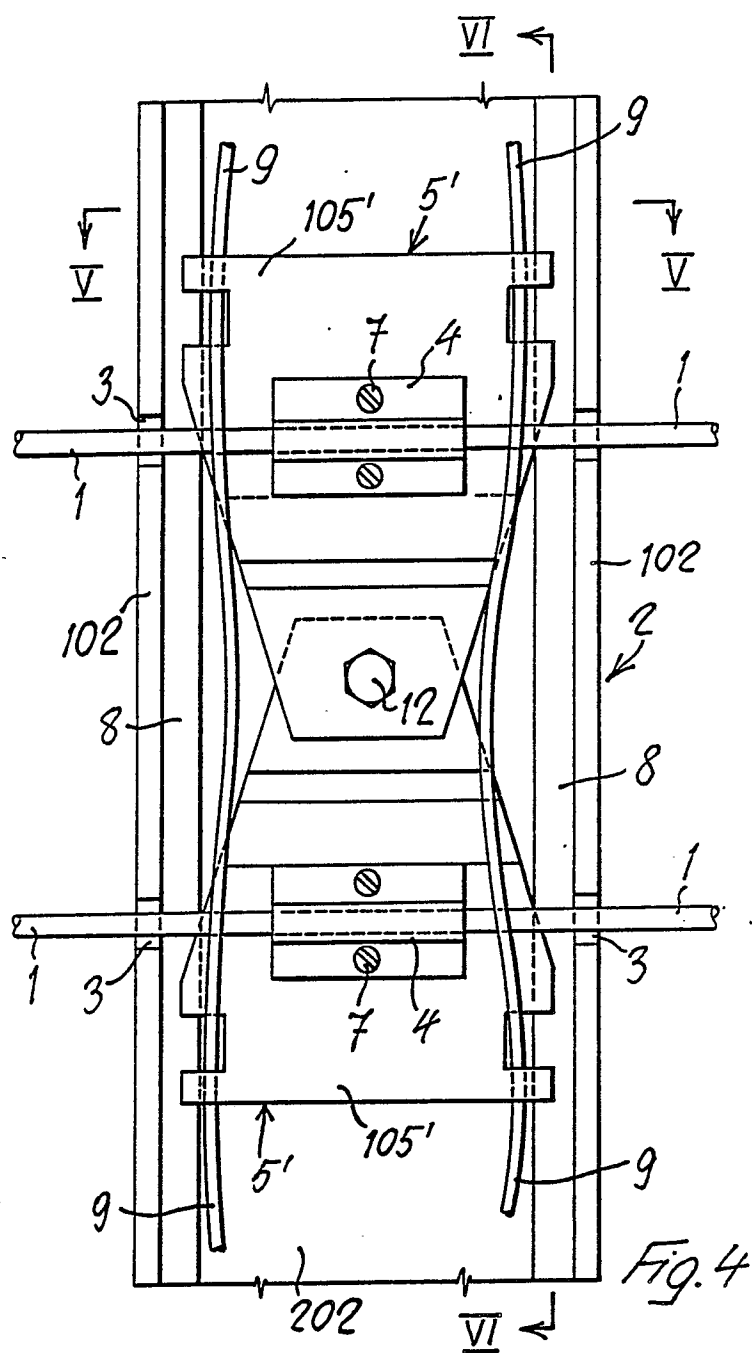
10. A fence according to Claim 1, characterized in that the sensor wires are coupled with at least some of the barrier wires (1) and are formed by one or more optical conductors (11) either incorporated in the barrier wires (1) or provided on the outside thereof and stretched together with them, while the barrier wires are installed together with the respective sensor wires, on stationary back-pressure edges.

11. A fence according to Claim 10, characterized in that the barrier wires (1) and the optical conductors (11) associated therewith are passed through holes in the hollow supports (poles 2) and follow within said supports such a path that they are compressed against said hole edges acting as back-pressure edges, by the action of the tractive force exerted on the barrier wires.

12. A fence comprising barrier or fence wires (11) extending between and through hollow poles (2) particularly according to any one or more of the preceding Claims, characterized in that each pole (2) is closed at its top by a cap-like cover (15) which rests by means of a depending extension (16) thereof, preferably within said pole (2), on a least one sensor wire (1) which may be formed as well by a barrier wire and is associated with an optical or electrical conductor (11), connected to a warning and/or alarm system which can be activated in response to the rupture or compression of said conductor (11).







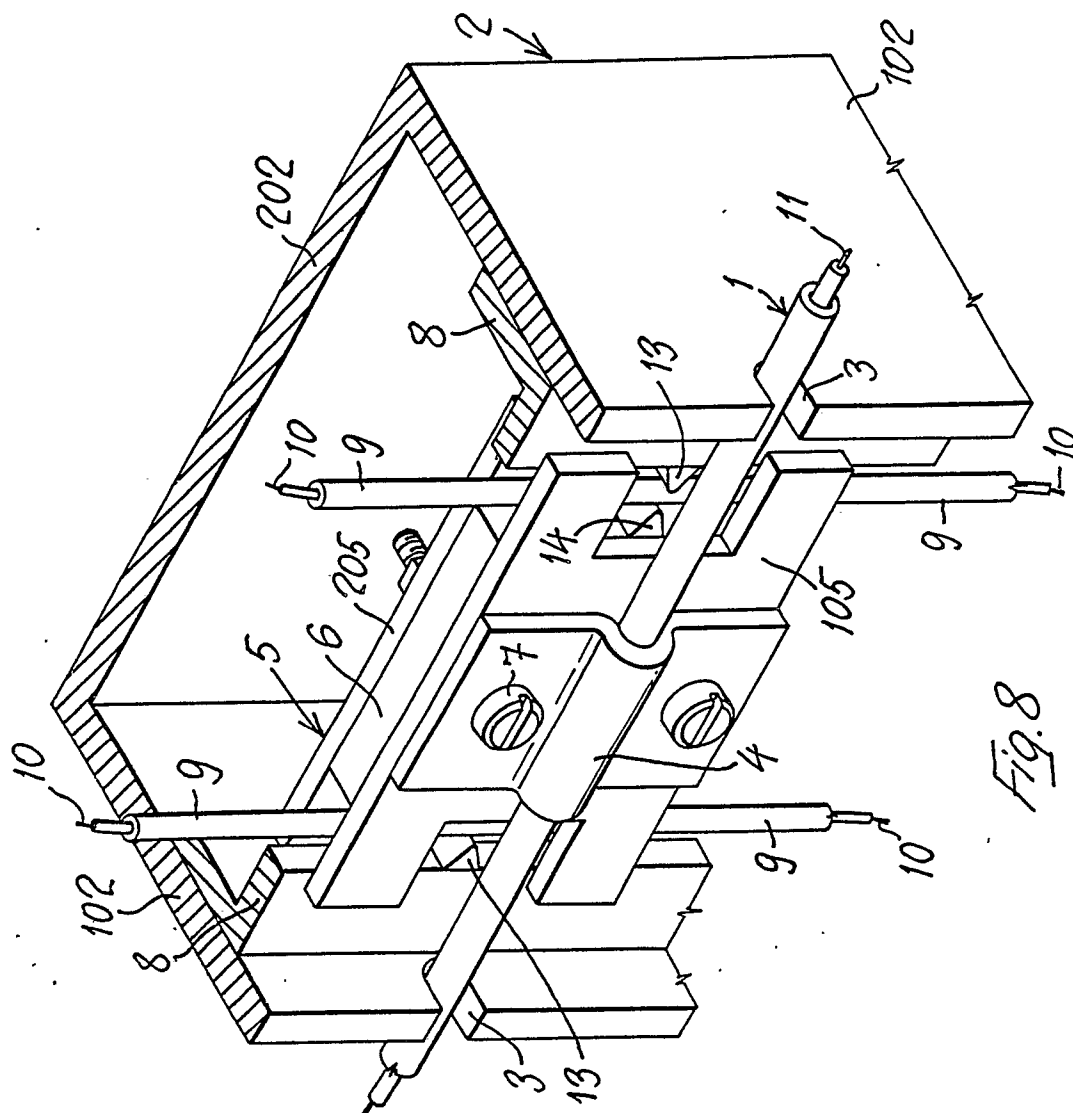


Fig. 8

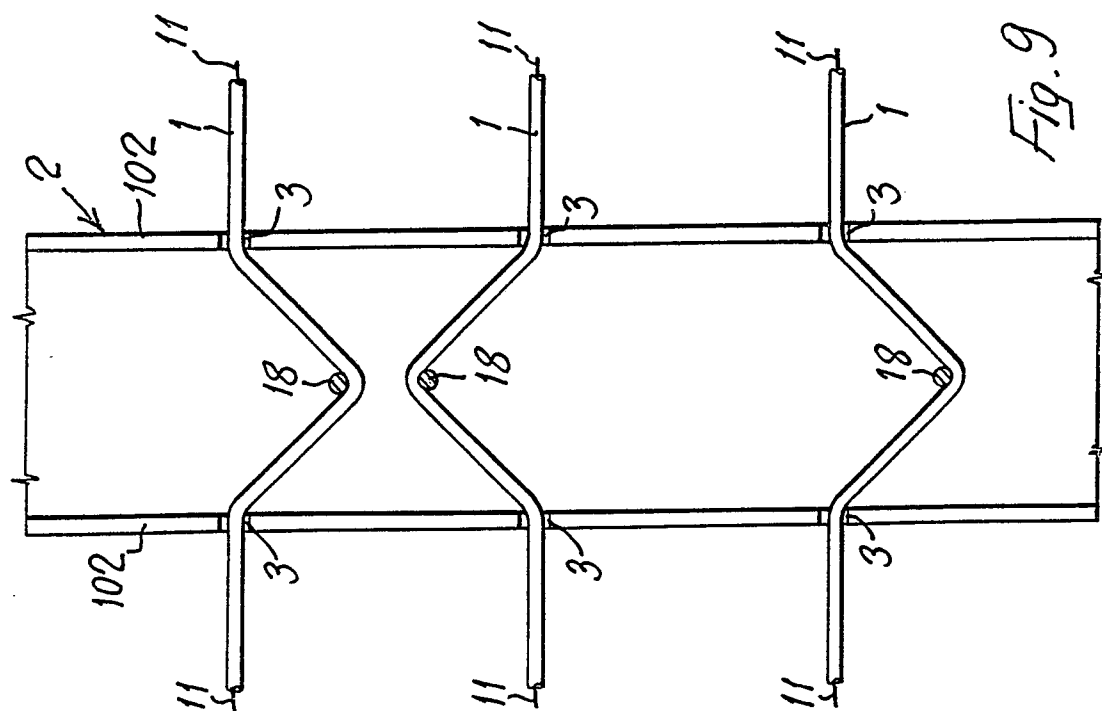


Fig. 9



EP 88 11 4716

DOCUMENTS CONSIDERED TO BE RELEVANT															
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)												
A	US-A-4 371 869 (DAVIDSON) ---	1	G 08 B 13/12												
A	EP-A-0 196 510 (CI.KA.RA. S.p.A.) ---														
P,A	EP-A-0 246 487 (MAGAL SECURITY) * Column 1, line 49 - column 2, line 36; column 5, lines 48-54 * -----														
			TECHNICAL FIELDS SEARCHED (Int. Cl.4)												
			G 08 B 13/12 G 08 B 13/18												
The present search report has been drawn up for all claims															
Place of search THE HAGUE		Date of completion of the search 13-12-1988	Examiner CRECHET P.G.M.												
<table border="0"><tr><td>CATEGORY OF CITED DOCUMENTS</td><td>T : theory or principle underlying the invention</td></tr><tr><td>X : particularly relevant if taken alone</td><td>E : earlier patent document, but published on, or after the filing date</td></tr><tr><td>Y : particularly relevant if combined with another document of the same category</td><td>D : document cited in the application</td></tr><tr><td>A : technological background</td><td>L : document cited for other reasons</td></tr><tr><td>O : non-written disclosure</td><td>.....</td></tr><tr><td>P : intermediate document</td><td>& : member of the same patent family, corresponding document</td></tr></table>				CATEGORY OF CITED DOCUMENTS	T : theory or principle underlying the invention	X : particularly relevant if taken alone	E : earlier patent document, but published on, or after the filing date	Y : particularly relevant if combined with another document of the same category	D : document cited in the application	A : technological background	L : document cited for other reasons	O : non-written disclosure		P : intermediate document	& : member of the same patent family, corresponding document
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