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(54) **ANTI-BURGLARY SYSTEM FOR CABLE HOLDER AND/OR DUCT HOLDER AND RELATED INDUSTRIAL MANUFACTURING AND ASSEMBLY PROCEDURE**

(57) The present invention is an anti-burglary system (1) for cable-holder and/or duct-holder channels (2) and the related industrial manufacturing and assembly process, the latter greatly simplifying and facilitating the operations known up to now in the field. The present system (1) includes a plurality of duct-holder channels (2), individually constituted by a base (B) and the relative cover (C), where the latter is characterized by the fact that it is further equipped with at least one pipe (3) holding cables or gas (pressurized or depressurized), configured to detect opening of the cover by sensing electromagnetic or pressure changes. An alarm is sent to a central station.

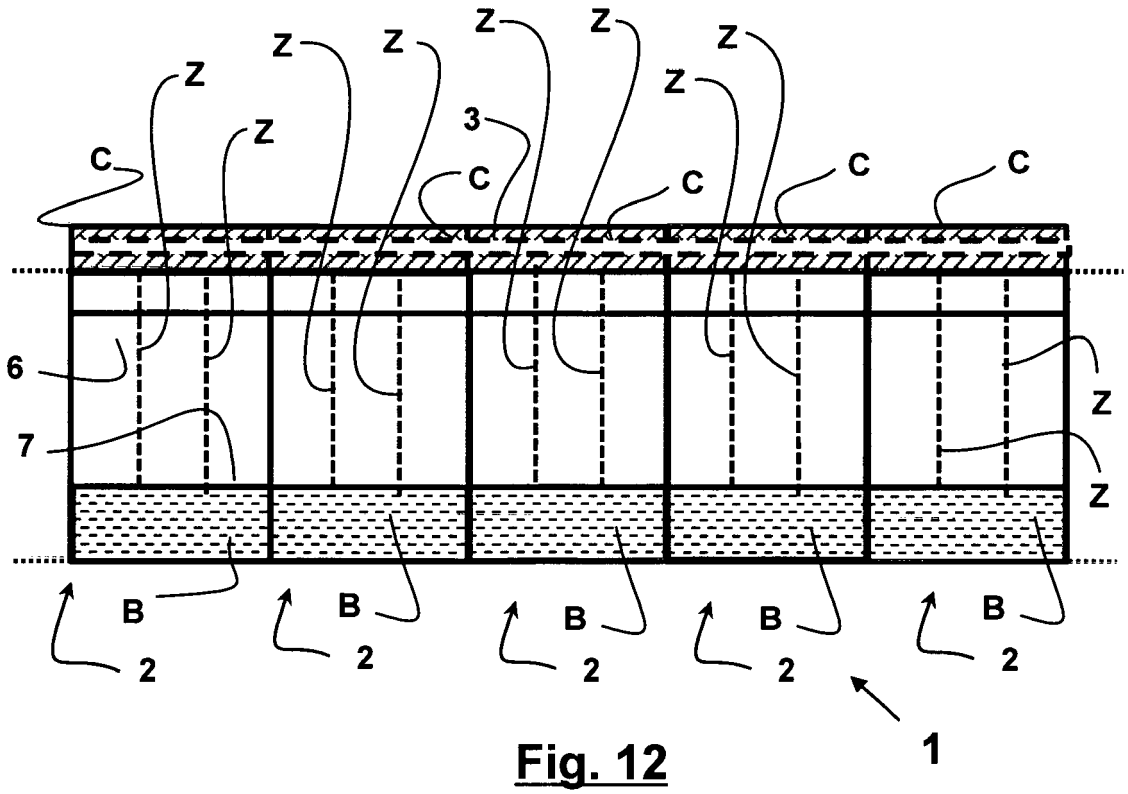

Fig. 12

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Description

[0001] The present invention is an anti-burglary system (1) for cable-holder and/or duct-holder channels (2) and the related industrial manufacturing and assembly process, the latter greatly simplifying and facilitating the operations known up to now in the field. The present system (1) includes a plurality of duct-holder channels (2), individually constituted by a base (B) and the relative cover (C), where the latter is characterized by the fact that it is further equipped with at least one pipe (3) burglarproof mini-cable holder (4). The latter, in other preferred solutions, can be replaced by fluids under pressure or depression. Said anti-burglary means (4) can also be inserted between the base (B) and the cover (C) to guarantee anti-burglary monitoring of the channel (2) even in the event of failure of said means (4) installed in the pipes (3) of the same coverage (C).

FIELD OF THE INVENTION

[0002] The present invention concerns an anti-burglary system for cable-holder channels and/or duct holders and the related industrial manufacturing and on-site assembly process, the latter greatly simplifying and facilitating the operations known up to now.

[0003] The present invention is completely innovative, as to date there are no cable-holder channels and/or duct holders equipped with a similar anti-burglary system and it is also inventive, since with the application of said innovative anti-burglary system the following are solved in a very simple, not expansive, brilliant way respect to the current problems and disadvantages presented by the prior art.

TECHNICAL BACKGROUND

[0004] Some definitions currently used in the prior art are introduced below:

> Ducting system is a set of straight or curved elements and accessories necessary to install the "cable ways" or ducts in all the foreseen ways.

> Walkways mean products made up of straight elements with perforated or non-perforated base and related accessories, installed without covers; if some sections of the route require the use of covers (e.g. for the fall of water or other), these do not actually transform the walkway into a canal.

> Cable channels or ducts mean products made up of straight elements with a perforated (IP 20, with IP that is International Protection Rating) or non-perforated (IP 40) base and related accessories, installed with a cover; the absence of a cover, even for short stretches, compromises the IP protection degree of the ducting for the entire installation.

> T.U.A. (Theoretical Usable Area) means the "Theoretical Usable Area" or geometric section, understood as the area delimited by the internal walls of the "cable route" or duct which, for example for channels, can characterize the maximum quantity of cables that can be contained or section of the containable pipeline.

> The fundamental function of a cable channel or duct or of a ducting system in general is to support, contain and possibly protect the cables and/or ducts over time.

[0005] The factors that guarantee the most satisfactory technicaleconomic result are based on the careful selection of the "channeling product" based on:

I. Quality, quantity and dimensions of the cables or conduit to contain.
II. Geometry and type of structure of the prefabricated channel that will contain them.
III. Environmental conditions and expected duration.

[0006] The quality, quantities, dimensions of the cables, in turn, depend on:

a. Type of ducting, whether walkway (perforated, non-perforated, with crosspieces, grilled) for ventilation or duct for their protection.
b. Size of the canalizations.
c. Height of the edge to contain the cable or bundle of cables or the duct of maximum diameter and from the width sufficient to lay a few layers of cables, all with an adequate section (with the caveat of using a filling coefficient less than 50% of the useful section of the cable route).
d. Radius of curvature of the ducting accessories, such as not to cause the cables to bend too much during installation (with the warning to check that the average radius of curves, "T" elements, slopes, etc., is at least equal to six-eight times the external diameter of the cable with the largest diameter.
e. Mechanical resistance of the ducting, which must have an adequate capacity to support the weight of the cables contained and possibly that of the person laying them, making sure, however, what the declared flow rates are and to respect them.
f. Geometry and type of ducting, which can be achieved both with a few accessories and with many accessories, in correlation with the length and complexity of the route.
g. Size of the ducting, whether narrow with a high edge for long spans or wide with a low edge to arrange the cables well in a few layers, with due consideration as to whether it is better to simplify the assembly of the ducting or the laying of the cables.
h. Ducting accessories, providing for the complete ducting of all the accessories, with the due evaluation of whether the entire route is already planned in every detail or whether it will be identified during assembly.

i. Mechanical resistance of the ducting, which can be robust to reduce the number of supports or light if equipped with a plurality of fixing points.
j. Type and quality of the canalization supports.
k. Environmental conditions, on which the following in turn depend:

> Type of ducting (whether closed or drilled to avoid any external contact and protect the cables from any accidental events.
> Whether the cable ways can be drilled.
> If it is necessary IP protection degrees.
> Mechanical resistance of the ducting, against any actions of wind, rain, snow, etc.
≻ Corrosion protection of the pipeline, for example if "Sendzimir" galvanized steel, or hot dip galvanized after processing, or INOX to guarantee sufficient durability in relation to environmental corrosivity.

[0007] From the above it is easy to understand how taking into account all those variables are not at all simple, just as it is difficult to extricate oneself from mainly mechanical and structural problems, which are also related to shape, dimensions, thicknesses, load capacities, mechanical resistance and bending, assembly, characteristics of the materials and relative protection against corrosion, predictable durability.

[0008] In addition to these problems related to design, we must now also consider the increasingly serious and relevant phenomenon of the theft of copper cables from cable ducts or ducts, which are growing and cause considerable damage, especially to public bodies (in Italy, for example, State Railways first and foremost), but also for those traveling by train, forced to suffer delays and cancellations, as well as private individuals, due to the unexpected stoppage of the railway line, in order to restore its new functionality.

[0009] For protection purposes only, we would like to remind that to date it is still not easy to estimate the phenomenon, even if since 2013 there has been greater attention on this crime in Italy by the National Observatory on Copper Theft, which aims to encourage synergies between Forces of the Order, Customs Agency, companies most exposed to the phenomenon of theft. For purely informative purposes, in Italy, State Railways, TIM, Enel and Federation of Electrical and Electronic Companies, given that in 2020 the numbers relating to the results of the activities to combat this phenomenon, according to this table of jobs were impressive: 4'163 copper deposits checked, 191'703 kg of stolen material recovered, 802 people investigated, of which 171 arrested.

[0010] And this is only the tip of the iceberg (from the website: https://www.g4vigilanza.it/furti-di-rame-perche-sono-cosi-diffusi/), because copper thefts are many times carried out on a small scale and it is rarely possible to trace those responsible.

[0011] In addition to the problems of inefficiencies and repair costs, copper theft is now increasingly a real problem, less and less confined to public services alone.

[0012] Obviously, said problems entails a significant increase in the current costs of managing the channels, as well as an extension of production times, further presenting the following obvious and unwanted disadvantages:

> Problems still unresolved today and present both in the design phase and in the construction phase of the current cable ducts and ducting systems in general due to the considerable lengths of the sections to be monitored.
> High extraordinary maintenance costs, unpredictable and not always easily quantifiable *ex ante,* even if the latter are mainly related to the impact of the dissuasive protections adopted subsequently to the thefts themselves.
> Difficulty in visually inspecting the same channels internally, to check for possible theft of copper cables, which is why it is often necessary to use probes to inspect the same channels from the outside.
> Further difficulties related to the difficulty of inspecting the internal surfaces of the canals or of promptly identifying the area or precise point in which the break-in is taking place or has taken place shortly before.

SUMMARY OF THE INVENTION

[0013] The main purpose of the invention is to resolve said disadvantages and limitations of the current known technique.

[0014] One aspect of the invention is therefore proposing to find a definitive solution to the problem of breaking into cable ducts and ducting systems in general, for the purposes of constituting a valid deterrent against the theft of copper cables.

[0015] According to another embodiment of the invention, an object of the invention is to create an anti-burglary system for cable ducts and ducting systems in general that can be adopted on any type of cable duct, oil pipelines, etc., to be built on site or prefabricated, such as to be able to alarm the surveillance personnel regarding attempts to break into a duct or cable duct even times before it is sabotaged.

[0016] Another embodiment of the invention is providing an anti-burglary system for all cable ducts and ducting systems which is easy to produce and install, minimizing both production and transport costs.

[0017] These objectives are achieved by creating an anti-burglary system for cable ducts and ducting systems in general, as described and claimed below.

DESCRIPTION OF THE FIGURES

[0018] In the following the invention is described in more detail in reference to the attached figures and draw-

ings. Similar or corresponding details in the figures are marked with the same reference numerals, as specific legend that is at the bottom of the description.

➢ **Fig.1** shows a schematic view of an anti-burglary system 1 for cable-holder channels 2 and/or duct holders and ducting systems in general 2 according to the present invention, shown in cross-section, from which it is possible to deduce its main component parts, consisting of a base B of the channel 2 and the relative covering element C, enclosing within them one or more cavities or compartments 5 with a bottom 7, even if only a pair of cavities 5 is schematically represented in the figure; said cavities 5 are created thanks to the presence of one or more axial baffles 6; with said lid or covering element C further equipped inside with several highly hermetic sealing pipes 3, constituting the first peculiar characteristic of the present anti-burglary system 1 for cable-holder channels 2.

➢ **Fig.2** shows the view of Section A-A of the burglar-proof system 1 for cable holder channels 2 traced in Fig.1, from which it is possible to deduce the longitudinal development of the single modular element of channel 2, consisting of the base element or base B and the relative cover C, with said cover or covering element C further equipped inside with a double line of pipes 3, the latter connected to the base B.

➢ **Fig.3** shows a two-dimensional schematic view of the longitudinal section of the present system 1 from which it is possible to deduce the configuration of a section of the cablecarrying channel line 2 according to the present system 1, consisting of a plurality of basic elements or bases B with the relative covers C placed in series one after the other and connected to each other; with said channel elements 2, connected in series to each other, it is possible to cover the kilometric distances necessary to create the line of cablecarrying channels 2, with said lid or covering element C further equipped inside it with a double line of pipes 3 equipped with anti-burglary means 4, such as copper mini-cables.

> **Fig.4** shows a schematic view of the same Fig.3, where the break-in of a cover C, present along said line of cable channels 2, has been represented, for the purposes of making it clear how, through the present system 1, it's possible to solve the problem of carrying out instant monitoring of the precise location where the theft of copper cables is taking place.

> **Fia.5** shows a two-dimensional schematic view of the longitudinal section of the line of cable-holder channels 2, according to the present invention, from which it is possible to deduce the procedure and the relative methods of sequential connection of the covers C, with said covers C further equipped internally with a double line of pipes 3.

➢ **Fig.6** shows a two-dimensional schematic view of the cross-section of the pipe 3, in which said control means 4 is inserted, the presence of continuity of which causes instant alerting of the break-in of the cover C; the control means 4 in this case is made up of copper mini-cables 4 or fibre 4, or other solid means 4 capable of creating, with its interruption, via a sensor 8, an instant signal of break-in of the cover C.

➢ **Fig.7** shows a two-dimensional schematic view of the cross-section of the pipe 3, in which said control means 4 is inserted which in this case is constituted by a fluid medium 4, such as compressed air or another type of liquid or gaseous fluid, under pressure or depression, and capable of creating, with its pressure variation, via a sensor 8, an instant signal of break-in of the covering C.

➢ **Fig.8** shaws a two-dimensional and enlarged schematic view of the assembly detail P of the pipe 3 carrying the fluid solution 4 shown in the previous Fig.5, where the joining means 9 equipped with special quick-fit seals 10 for facilitate and speed up the assembly of the pipes 3, pre-installed in pairs in the individual covers C.

➢ **Fig.9** shows a two-dimensional schematic view of a top view of a rectilinear and exemplifying configuration of the present system 1 from which it is easy to deduce how it comprises a channel consisting of a plurality of channels 2 installed in series, one adjacent to the other, along an axis 12 and equipped with their relative special covering elements C and said sensors 8, suitable for instantly and wirelessly transmitting any alarm of a break-in to the transmitting radio stations 11, located along the same line as cable trunking 2 or nearby.

> **Fig.10** shows a two-dimensional schematic view of another preferred solution for assembling covers C (highlighted by detail Q) equipped with pipe 3 with copper mini-cables 4, as shown in the previous Fig.5.

➢ **Fig.11A** shows an enlargement of said detail Q of Fig.10, from which it is better possible to deduce the reciprocal assembly method of the covers C, for the purpose of creating another advantageous burglar-proof connection of the solid copper conductors 4, the latter now constituted thanks to the M-F male-female insertion of a pair of M-F conductive elements coupling together with a removable and cushioned interlocking one inside the other, said male element being equipped with a piston M1 cushioned by means of an elastic means M2; the double arrow indicates the direction of mutual insertion and disconnection of said F-M coupling.

➢ **Fig.11B** shows again said anti-burglary connection referred to in the previous Fig.11A, from which it is now possible to deduce how, finally, the F-M male-female coupling of said pair of copper conductive elements 4 appears, coupling to interlocking one inside the other and how said male element (equipped with piston M1 cushioned by the spring

M2) is suitable to facilitate the reciprocal assembly in series of the covers C, as well as to guarantee, by cushioning their reciprocal insertion, the simultaneous connection of the mini - anti-burglary cable 4.

> **Fig.12** shows a two-dimensional schematic view of another preferred solution of the present burglar-proof system 1 of the cable-holder channel 2, now achieved through a continuous and reciprocal connection by means of a plurality of mini-conductor cables Z of the covers C, whether it is or not equipped with said anti-burglary solutions, directly with the bases B of the cable holder channels 2.

DETAILED DESCRIPTION OF THE INVENTION

[0019] The following paragraphs will describe various embodiments of the invention. For exemplary purposes only, most of the embodiments are outlined in relation to the figures previously described and attached below.

[0020] A skilled person easily understands, by viewing the attached figures, that the present anti-burglary system 1 for cable-holder channels 2 and/or duct holders and ducting means in general 2, in the particular preferred solution reported therein, includes a plurality of cable-holder channels 2, individually constituted by a base B and the relative cover C, where said cover C is characterized by the fact that it is further equipped with a pair of mini-cable-holder pipes 3 or other solid and fluid means 4 designed with their interruption or pressure variation, through further sensor means 8 and transmission 11, to instantly localize the place where the break-in of the cable-holder channel 2 was committed (as showed in Fig.1, Fig.2, Fig.3, Fig.4, Fig.5, Fig.9 and Fig.12), in order to guarantee a prompt intervention by the competent bodies.

[0021] In the present preferred solution, designed to be installed, by way of example, but not by way of limitation, on railway sections and/or photovoltaic fields, the present anti-burglary system 1 for cable ducts 2 and ducting systems in general 2 is practically implemented with a pair of pipes 3, each equipped with a mini-copper conductor cable 4 and installed inside the cover C of the channel or cable duct 2, which can be made on site or prefabricated in concrete, metal or any other material equivalent, simply by connecting the same covers C in series, placing them so as to complete the cable-holder channel 2, after installing the elements constituting the base B (as showed in Fig.1, Fig.2, Fig.3, Fig.4, Fig.5).

[0022] Another embodiment of the invention is providing, within said covers C, in the event that they are made of concrete or glued, bracketed or screwed, such as those made of sheet metal or other equivalent material, it is always possible with the present system 1 position longitudinally or transversally one or more hermetically sealed pipes 3 for the passage of fluids under pressure or depression, replacing and/or supplementing, as an anti-burglary means, said mini-conductor cables.

[0023] In the preferred solution conceived, in said pipes 3 it is possible to insert copper mini-cables 4 or other means conductive to electromagnetic signals 4 (as showed in Fig.5, Fig.6, Fig.9), so that, in the event in which an attempt is made to break in on cover C of cable channel 2, with the interruption of the electromagnetic signal, the anti-burglary alarm is instantly activated, so as to promptly signal, via sensors 8, the precise position in which it is the interruption of the electromagnetic circuit occurred and, therefore, the precise location of the break-in. In this preferred solution with alarm via electromagnetic signal with copper cables, said sensors 8 (of solid type burglar-proof means 4) are made up of relays, spaced as desired, depending on the length and distance visibility of the cable duct 2 (as showed in Fig.9).

[0024] In another preferred solution conceived, in said pipes 3 it is possible to insert fibre optic cables 4 or other means conducting similar signals, so that, in the event that an attempt is made to break in on the cover C of the cable-holder channel 2, with the interruption of the signal conducted by the optical fibres, the anti-burglary alarm is instantly activated, so as to promptly signal, via photocells 8, the precise position in which the interruption of the electromagnetic circuit has occurred and, therefore, the location of the break-in. In this preferred solution with alarm via optical fibres, said sensors 8 can also be made up of mini-testers 8, suitable for reading the signal transmitted by the optical fibres, also 5 spaced as desired, depending on the length and distance visibility of the cable duct 2 (as showed in Fig.9).

[0025] In a further preferred solution, but not for this reason limiting, for said pipes 3 present in the covering C the solution of putting the same pipe 3 under pressure or depression is adopted, so that, in the event that an attempted break-in is made of the cover C of the cable-holder channel 2, with the interruption of the pressure signal which necessarily occurs in at least one of the two pipes 3, the anti-burglary alarm is instantly activated, so as to promptly signal, via sensors 8, the position specifies where the interruption of the pressor and/or depressor circuit occurred and, therefore, the place of the break-in (as showed in Fig.7, 8, 9). In said preferred solution with alarm via pressure variations, said sensors 8 are made up of pressure probes 8 suitable for reading the pressure variations as well as also spaced as desired, mainly depending on the length and distance visibility of the cable duct 2 (as showed in Fig.9).

[0026] If the alternative is to opt for this last solution which includes pressure probes 8, it is necessary to install a plurality of connection fittings 9, designed to hermetically, quickly join, together each pair of covering panels C, crossed by called pipes 3 (as showed in Fig.5, Fig.7, Fig.8).

[0027] In another preferred solution, the pipe 3 is a pipe for compressed air and as connection fittings 9, special quick fittings for compressed air are provided, equipped with suitable sealing gaskets 10, designed to hermetically and quickly join each pair together adjacent to covering elements C (as showed in Fig.5, Fig.7, Fig.8).

[0028] The industrial manufacturing process of the present anti-burglary system 1 for cable-holder and/or duct-holder channels 2 involves the manufacture of both the base B of the channel 2 and its cover C, both said base B and said cover C to be made, in a preferred, but not restrictive, solution in concrete according to the attached drawings.

[0029] In particular, the covering C is advantageously made with said pair of pipes 3, necessary to insert the various anti-burglary alarm means 4, already prefabricated and/or inserted into the cement prefabricated during the production phase of the covering C itself. wish to minimize the costs of roofing C, the solution is also envisaged which involves the prefabrication of a single pipe 3 within roofing C, replacing the pair of pipes 3.

[0030] The assembly of said covers C equipped with said pipes 3 takes place after the installation of the bases B of the cable-holder channels 2, as shown in Fig.9, relative to a rectilinear and exemplary configuration of the present system 1. From said Fig. 9 it is easy for a skilled person to comprehend how the present system 1 includes a plurality of channels 2 installed in series, one adjacent to the other, along an axis 12 and equipped with their relative special covering elements C and said sensors 8, suitable for instantly and wirelessly transmit any alarm of a break-in to the transmitting radio stations 11, located along the same line as the cable duct 2 or nearby or even directly to the remote management, monitoring and control means of the entire system 1.

[0031] In a further preferred solution for assembling the covers C equipped with pipe 3 with copper mini-cables 4, as highlighted in detail Q of Fig.10 and in Fig.11A and Fig.11B, it is possible to deduce the advantageous reciprocal assembly method of the covers C, so as to create a different and less expensive burglar-proof connection with mini-cables 4 of the pipe 3 always made up of solid copper conductors 4; in said preferred solution the reciprocal assembly in succession of the covers C is also facilitated and speeded up, given that an innovative male-female insertion M-F is provided for each pair of terminal conductive elements present downstream and upstream of each cover C coupling together to removable joint (male M and female F). The coupling between the female ends F and the male ends M of the two copper conductors 4 is cushioned during the movement and settling of the concrete covers C to be mutually joined together, given that said "male" end M is equipped with a piston internal M1, in turn cushioned by means of an elastic means or spring M2, thus protected from dust and direct contact (Fig.10, Fig.11A and Fig.11B); the double arrow depicted in both Fig.11A and Fig.11B indicates the direction of mutual insertion and disconnection of said male M - female F coupling of the ends of said copper conductors 4.

[0032] With this solution, all the difficulties that may exist with the mutual serial assembly of the covers C are considerably facilitated, as well as the simultaneous connections, single and/or in pairs, of the mutual male M - female F ends of the covers are guaranteed, by cushioning their mutual insertion. 4 anti-burglary mini cables coming out of each individual cover C, when they are pre-inserted and/or prefabricated.

[0033] In another preferred, but not restrictive, solution, not represented in the attached figures, said spring M2 with relative piston M1 can be located below and inside the female seat F, in such a way to act as an equivalent shock-absorbing solution compared to the previous one.

[0034] In another preferred solution, said female seat F does not have a hollow shape, but is flat, so that unwanted clogging due to dust and/or sludge in the seat previously provided as a hollow can be avoided.

[0035] In a further preferred solution, said covers C also provide further pipes with mini-cables Z (Fig.12), with the latter insertable or not into said specific further pipes; said mini-cables Z, whether or not equipped with said additional pipes, are positioned in such a way as to be practically orthogonal to the axis 12 of the cover C, so as to connect the same cover elements C with said bases B and, in any case, alarm system 1 in the event that the break-in does not involve the breaking or interruption of the covering in the section of the pipes 3, but is likely to cause the lateral demolition of the latter without causing interruptions in the anti-burglary means 4 present in the same pipes 3 of the cover C. In said preferred solution of the present anti-burglary system 1 of the cable-holder channel 2, represented in Fig.12, a continuous and reciprocal connection of the said covers C with the said bases B is envisaged through at least a pair of mini - cables Z or other anti-burglary means 4 (equivalent to the previous and already mentioned anti-burglary means 4) for each pair of base B - cover C of the cable-holder channel 2.

[0036] The assembly of the present anti-burglary system 1 requires that, once a section of tens, hundreds or even thousands of meters of base B of the cable-holder or duct-holder channel 2 has been completed, said alerting means are positioned at distances preestablished by the project. 11 can be activated via each sensor8 (as showed in Fig.9).

[0037] Advantageously, in the preferred solution designed for the fluid means 4 under pressure in the pipes 3, the pressure sensors 8 along the duct-holder channels 2 are connected in such a way as to precisely indicate the location of the break-in.

[0038] In a preferred solution, the construction material of the pipes 3, as well as of said connection means 9 of the sections of the pipes 3 present in the covers C and crossed by the fluid 4 under pressure or depression, can be made with any type of material capable of resist the fluid pressure to which it will be subjected and which, at the same time, guarantees its breakage in the event of a break-in of the cover C, causing an instant reduction in the pressure of the fluid 4 in the pipe 3, even in the case of partial lifting of a piece of cover C of the channel or duct or cable duct 2.

[0039] In said case of break-in, the detector sensor 8 closest to the place of the break-in will send the anti-burglary alarm signal and, in cascade, with the pressure drop also felt by the other sensors 8 further away, their further signals will also follow alarm, both upstream and downstream from the break-in point (as showed in Fig.9).

[0040] Through the first signal received from the first alarmed sensor 8 and followed by that of the others symmetrically opposite to the first, it is easy to identify instantly and with high precision the place of the attempted break-in and/or tampering with the cable holder channel 2, thus guaranteeing an immediate intervention by the police and/or security personnel.

[0041] Advantageously, the system 1 thus conceived guarantees the expected result by brilliantly solving the anti-burglary problem of the cable holder channels 2.

[0042] In a further preferred solution, the present system 1 manages to solve said problem of the known art also by installing a single pipe 3 in the cover C connected to the cable channel 2, although in any case, the choice of a pair of pipes 3 guarantees, in unequivocally, the possibility that any false alarms will not occur which can still occur with the most economical choice of the single pipe 3. In fact, the strategic positioning of a pair of pipes 3 inside the cover C and connected to the cable holder channel 2, it is such as to make the loss of pressure of the fluid medium 4 on both pipes 3 unmistakable, at the exact moment in which the cover C itself is removed to access the inside of the cable holder channel 2, in the event of theft of copper cables.

[0043] One of the main advantages of the present anti-burglary system 1 for cable trays 2 and ducting systems in general 2 described previously is inherent in the fact that it can be industrially produced both industrially in series and on site to order, speeding up production times in both cases. assembly and production.

[0044] Further advantages of this anti-burglary system 1 for cable trays 2 and ducting systems in general 2, no less important than the previous one, are:

> Maximization of the deterrent action already upon installation of this anti-theft and anti-burglary system.
> Possibility of easily and quickly installing the sensors 8 and the transmission means 11 of the anti-burglary alarm, also creating and/or installing them in a combined way, in such a way to make them less visible and maximize their anti-burglary protection.
> Minimization, if not even elimination, of the current anti-burglary control and inspection costs of cable ducts, duct holders and ducting systems in general.

[0045] The advantages deriving from the use of the present invention are innumerable and indisputable and derive fundamentally from having designed an anti-burglary system for cable ducts and ducting systems in general, capable of completely solving the previously mentioned problems of the prior art.

[0046] It should be further noted that the individual features of the different embodiments of the invention may individually or in arbitrary combination be subject matter to another invention.

[0047] It would be appreciated by a person skilled in the art that numerous variations and/or modifications may be made to the present invention as shown in the specific embodiments without departing from the spirit or scope of the invention as broadly described. The present embodiments are, therefore, to be considered in all respects to be illustrative and not restrictive, with referment to the legend below.

LEGEND OF THE REFERENCE NUMERALS

[0048]

1. Anti-burglar system for cable ducts and/or conduit holder or ducting systems in general, with relevant industrial manufacturing and assembly procedure.
2. Channel or duct or cable or cable holder or duct holder or ducting systems in general.
3. Additional mini-cable or fluid holder pipes to those already carried by system 1 and located either in cover C of cable holder 2 or within spaces 5 of channel 2, inside Z pipes installed in such manner to connect cover C to base B and *vice versa*.
4. Solid or fluid anti-burglar means (liquid or gaseous) inserted inside the pair of pipes 3 mini-cable holder; the presence of continuity solutions causes instantaneous alerting of the hacking of covering C; said anti-burglar means consists of mini copper and/or optical fibre cables or consists of compressed or rarefied air or other type of equivalent liquid or gaseous fluid, under pressure or depression, or other solid or fluid means suitable for creating, with their interruption or variation in pressure, through a sensor 8 and a transmitter 11, an instantaneous signal of breaking into cover C and/or cable holder channel 2.
5. Cavities or spaces with one or more separates with which the channels 2 cable holder are usually equipped.
6. Septum or septa that separate(s) the cavities or multiple cavities 5 of the canal 2 cable holder.
7. Internal surface of the channel base 2 cable holder.
8. Means of detection and transmission of the signal of a burglarbreak-in or sensors, suitable for alerting in a precise way the place where the burglar-breaker is occurring, following the interruption of the electromagnetic and/or pressure and/or volumical alert of the anti-burglary means 4.
9. Quick connection means of pipelines 3 fluid conveyors or quick connection fittings for fluid means 4.
10. Seals for fluid means 4 of the quick connection type for pipes 3 for fluids under pressure or depression.
11. Transmitter and/or alerting means 11 of the exact place where the burglar attempt reported by the sen-

sor 8 is occurring.
12.Axis indicating the longitudinal development of the cable holder 2 channel, with that axis straight or curved.

B Base (or base element) of cable holder 2 channel.
C Cover or lid or closing means of the base B, constituting together with the latter the channel 2 cable holder of the system.
F Female coupling of one end of the burglar-proof mini-cable 4 in copper (or others metallic conductor) inserted in the pipe 3.
M Male coupling of one end of the copper anti-burglar mini-cable 4 (or others metallic conductor 10) inserted in the pipe 3.
M1 Piston cushioned by an elastic means able to resist the impact actions due to thrust and compression of cover C during its assembly and in any way facilitate its insertion in series with the continuity of the connection of the anti-burglar means 4.
M2 elastic means or spring exercising the action of cushioning the otherwise rigid impact of the cover "c" during its assembly.
P Detail showed in Fig.5 and enlarged in Fig.8.
Q Detail showed in Fig.10 and enlarged in Fig.11.
Z Mini-cables that can be inserted or not in special and additional pipes, almost orthogonal in the direction of those 4 present in the pipes 3 of the covers C and suitable for alarming the system 1 in the event where the break-in does not involve the breakage or interruption of the coverage C in the section of the pipes 3, but is otherwise able to cause the lateral winding of the latter without also involving continuity solutions of the anti-burglary measures 4 present in the same pipes 3, consists of mini copper and/or optical fibre cables or consists of compressed or rarefied air.

Claims

1. Anti-burglary system (1) for cable ducts and/or duct holders (2) comprising a plurality of cable ducts and/or duct holders (2), formed individually by a base (B) and the relative cover (C), with the latter (C) **characterized by** the fact of furthermore be equipped with at least one tube (3) containing in turn solid and/or fluid media (4), capable of causing, in the event of break-in of the cable holder channel (2) which determines their electromagnetic continuity, pressure or of volume, through the signal generated by detector means (8) close to the place where said interruption of continuity occurred, the instantaneous sending of an intrusion alarm signal via a transmission means (11) to a management point, monitoring and control, said anti-burglary means (4) being installed with or without additional specific tubes (Z) also between the base (B) and the roof (C), thus guaranteeing anti-burglary monitoring of the duct holders or channel (2) even in case of failed break-in and/or failure to signal an interruption by said means (4) installed in the pipes (3) of the same covering (C).

2. Anti-burglary system (1) for cable ducts and/or duct holders (2), according to the preceding claim, **characterized in that** said solid anti-burglary means (4) are of the mini-cable type made of copper or copper alloy or other metallic material with equally conductors.

3. Anti-burglary system (1) for cable ducts and/or duct holders (2), according to any one of the preceding claims, **characterized by** the fact that said solid anti-burglary means (4) are of the optical fibre type.

4. Anti-burglary system (1) for cable ducts and/or duct holders (2), according to any one of the preceding claims, **characterized by** the fact that said fluid anti-burglary means (4) are of a gaseous type, such as air.

5. Anti-burglary system (1) for cable ducts and/or duct holders (2), according to any one of the preceding claims, **characterized by** the fact that said fluid means (4) are under vacuum inside the tubes (3).

6. Anti-burglary system (1) for cable ducts and/or duct holders (2), according to any one of the preceding claims, **characterized by** the fact that said fluid means (4) are under overpressure inside the tubes (3).

7. Anti-burglary system (1) for cable ducts and/or duct holders (2), according to any one of the preceding claims, **characterized by** the fact that both said base (B) and said cover (C) of the cable duct (2) can be made of concrete, metallic or other equivalent material, both on site, where necessary, and industrially, in prefabricated form.

8. Anti-burglary system (1) for cable ducts and/or duct holders (2), according to any one of the preceding claims, **characterized by** the fact that its assembly involves the series connection of the covers (C), together with said anti-burglary means (4) and the related sensor means (8) and transmitters (11), immediately after the installation of the elements constituting the base (B) of the cable channel (2) and the related copper cables coming from the same system (1) thus protected.

9. Anti-burglary system (1) for cable ducts and/or duct holders (2), according to any one of the preceding claims, **characterized by** the fact that in said covers (C), if made in concrete or glued, fixed or screwed,

such as those in sheet metal or other equivalent material, it is always possible with the present system (1) to position, longitudinally or transversely, one or more hermetically sealed tubes (3) for the passage of fluid media under pressure or depression (4), the latter being a substitute, as an anti-burglary means (4), of said copper mini-conductor cables (4).

10. Anti-burglary system (1) for cable ducts and/or duct holders (2), according to any one of the preceding claims, **characterized by** the fact that said sensors (8) of the solid-type anti-burglary means (4) are made up of relays, spaced as desired, which manage visibility of the length and distance of the cable duct (2).

11. Anti-burglary system (1) for cable ducts and/or duct holders (2), according to any one of the preceding claims, **characterized by** the fact that said sensors (8) of the optical fibre anti-burglary means (4) are made up of photocells, spaced as desired, acting on the visibility of the length and distance of the cable duct (2).

12. Anti-burglary system (1) for cable ducts and/or duct holders (2), according to any one of the preceding claims, **characterized in that** said sensors (8) of the fibre optical anti-burglary means (4) are made up of fibre optical cables managed by mini testers, spaced as desired, depending on the length and visibility distance of the cable channel (2).

13. Anti-burglary system (1) for cable ducts and/or duct holders (2), according to any one of the preceding claims, **characterized by** the fact that said sensors (8) of the fluid-type anti-burglary means (4) are made up of compressed or vacuum air monitored by probes pressure plates (8), spaced as desired, depending on the length and distance visibility of the cable duct (2).

14. Anti-burglary system (1) for cable ducts and/or duct holders (2), according to any one of the preceding claims, **characterized by** the fact that said pipes (3) with anti-burglary means (4) of a fluid type and also equipped with pressure probes (8) are interconnected by a plurality of connection fittings (9), suitable for hermetically and quickly joining together each pair of adjacent covering panels (C), said fittings (9) being equipped with suitable sealing gaskets (10).

15. Anti-burglary system (1) for cable ducts and/or duct holders (2), according to any one of the preceding claims, **characterized by** the fact that said sensors (8) are capable of instantly and wirelessly transmitting any alarm of a break-in to the radio stations transmitters (11) located along the same line as the cable duct (2) or even directly to the remote management, monitoring and control point of the entire system (1), in such a way as to maximize the control power against possible break-ins.

16. Anti-burglary system (1) for cable ducts and/or duct holders (2), according to any one of the preceding claims, **characterized by** the fact that the coupling of the copper conductor (4) of the pipes (3) that is in each cover (C) is made with female (F) and male (M) terminal ends with relative cushioning means (M2), in such a way as to guarantee electrical contact and facilitate the movement and settling of the same covers (C) to be mutually joined together, given that said male terminal end (M) is equipped with an internal piston (M1), which is in turn cushioned by means of an elastic means or spring (M2), with the latter thus protected from dust and direct contact.

17. Anti-burglary system (1) for cable ducts and/or duct holders (2), according to any one of the preceding claims, **characterized by** the fact that said all sensors (8) and said transmission means (11) of the anti-burglary alarm are made and/or installed in a combined manner, so as to constitute a single sensor-transmitter means (8-11), thus maximizing the anti-burglary protection of the system (1).

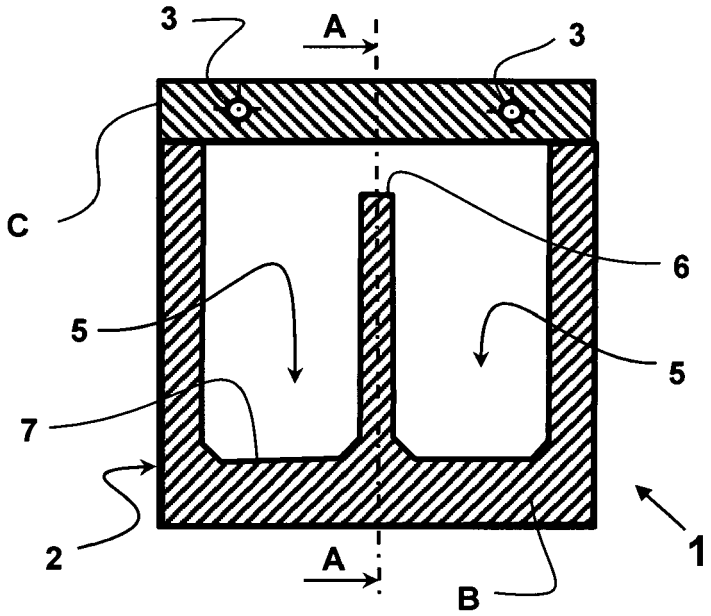

Fig. 1

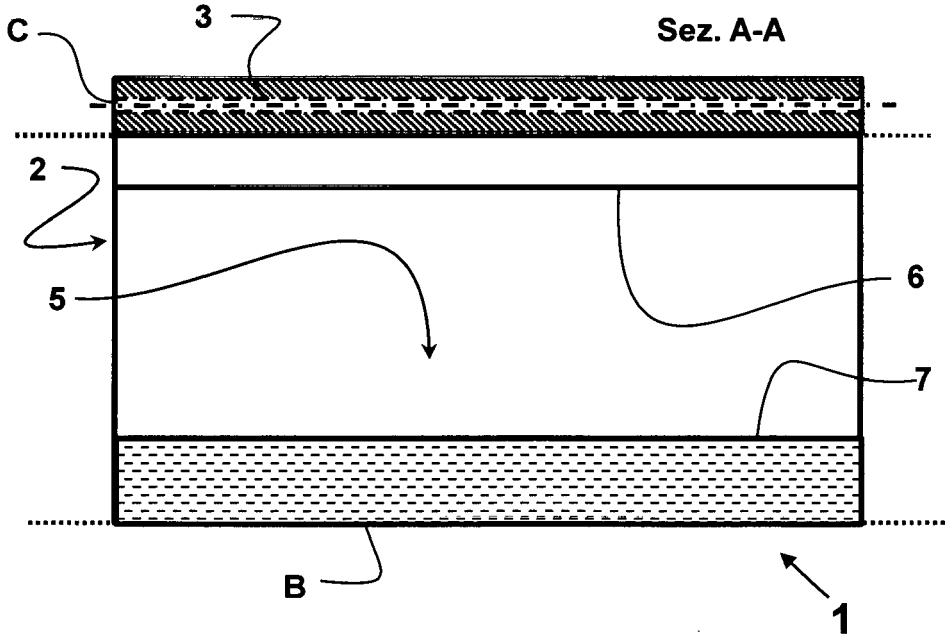

Fig. 2

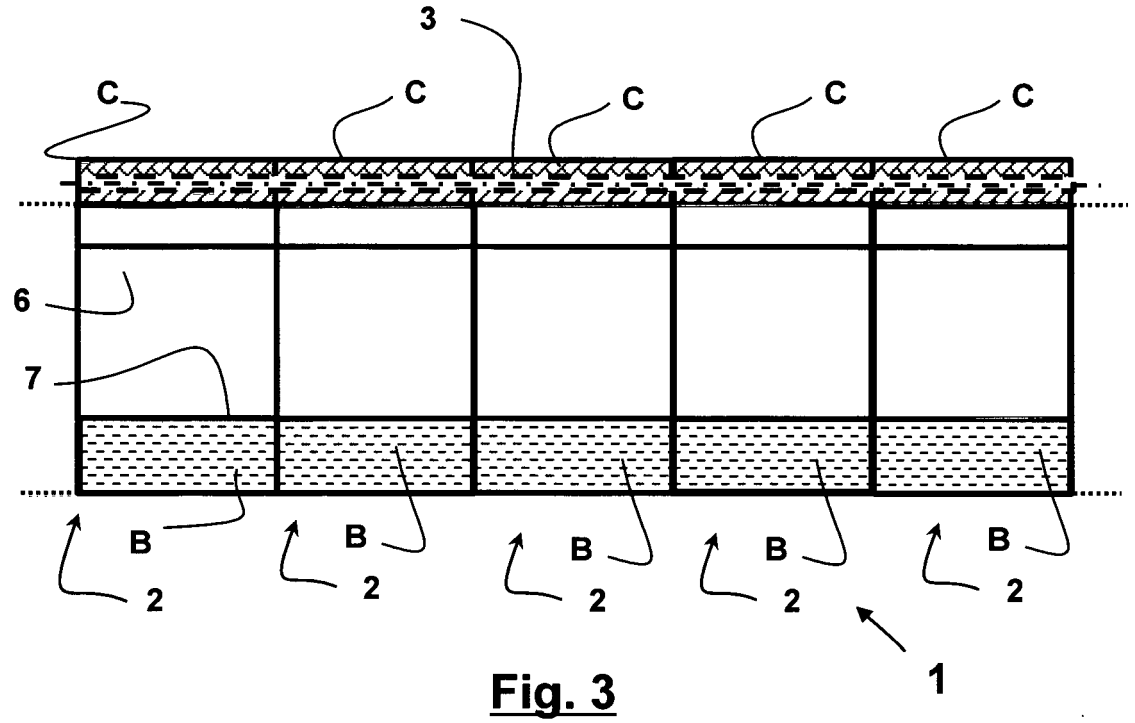

Fig. 3

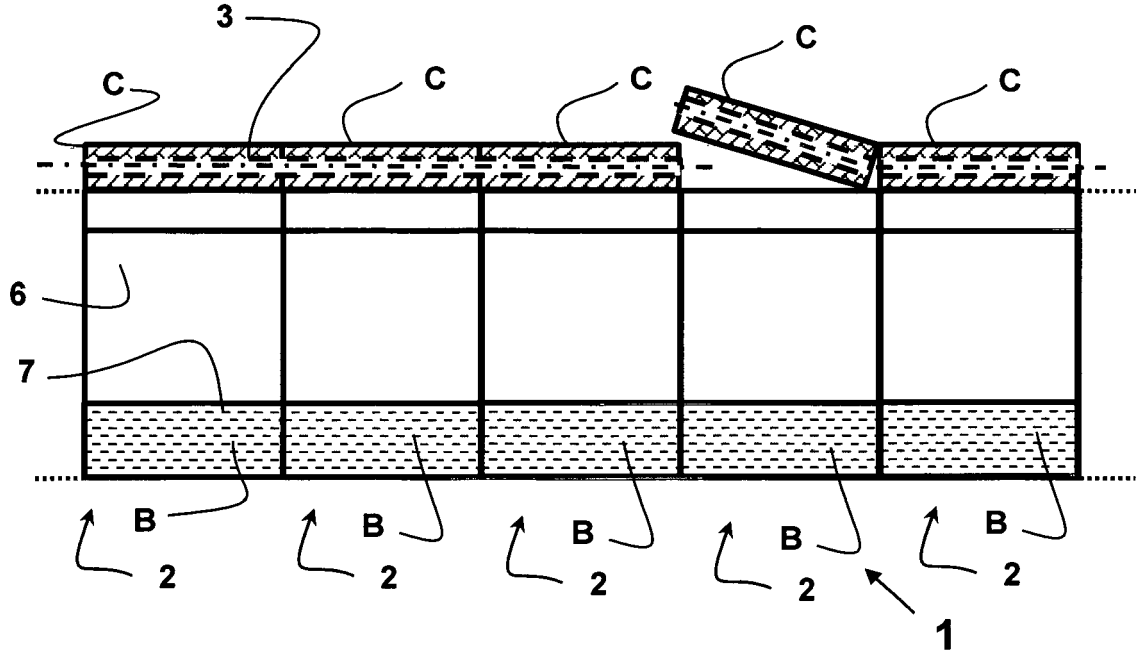

Fig. 4

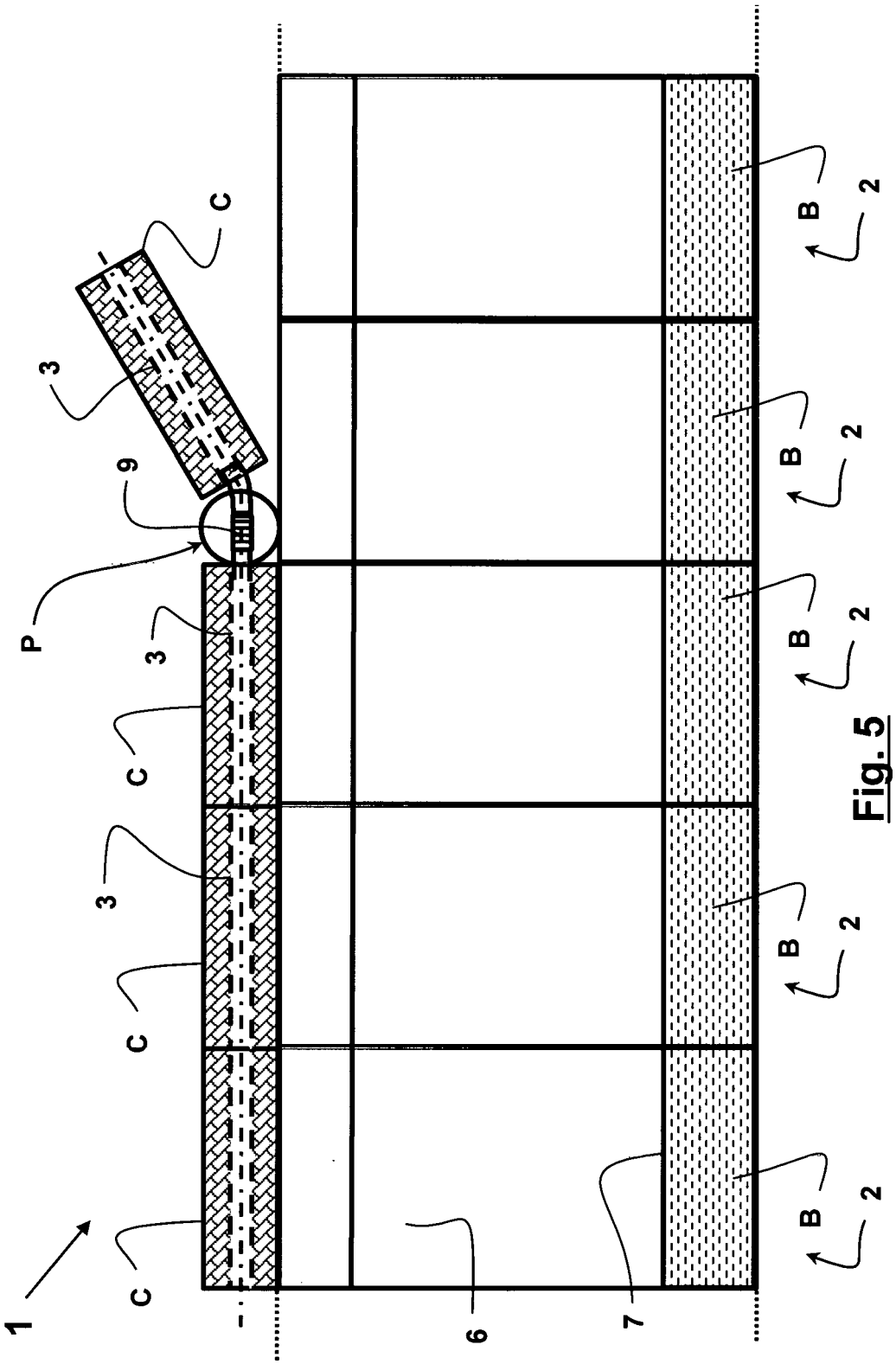

Fig. 5

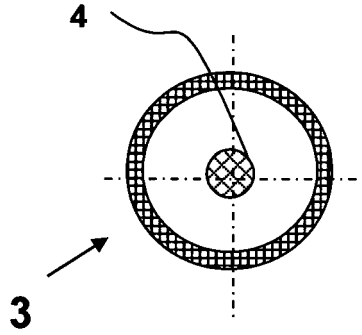

Fig. 6

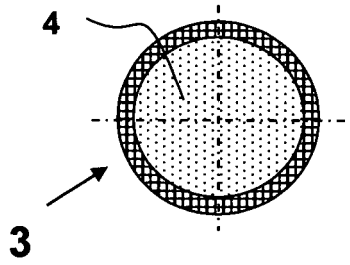

Fig. 7

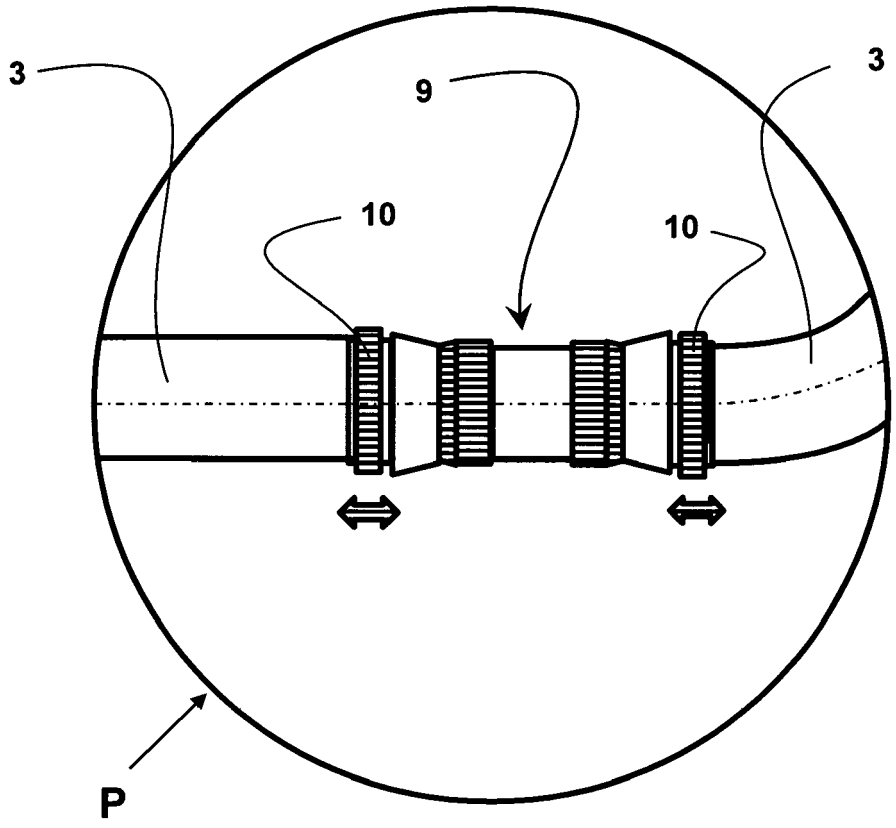

Fig. 8

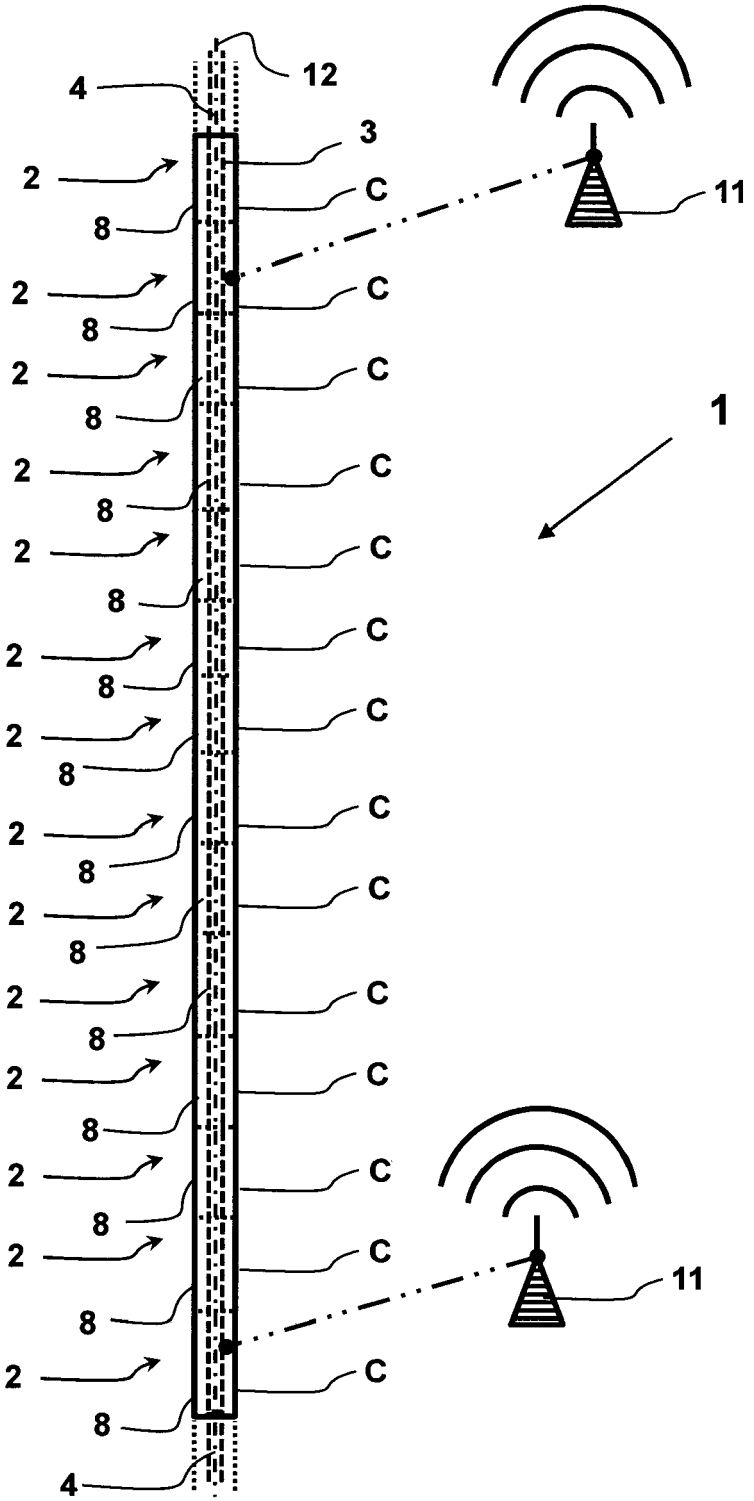

Fig. 9

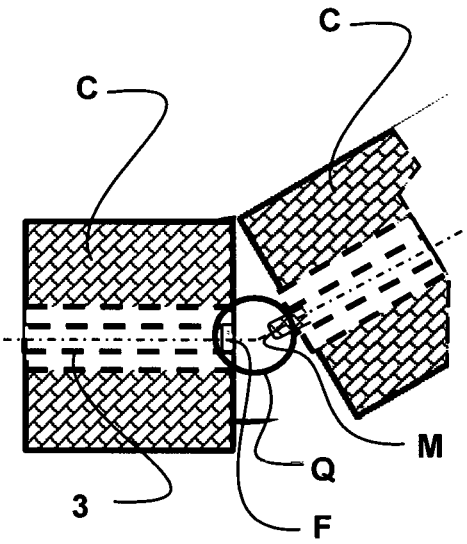

Fig. 10

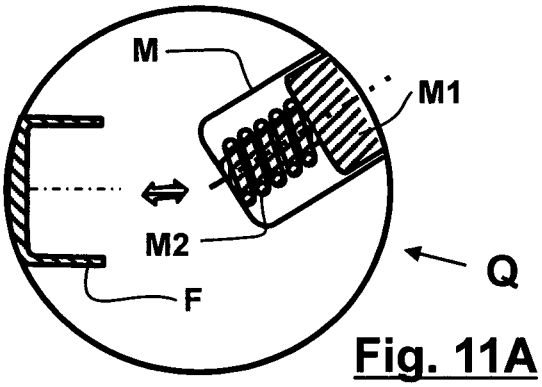

Fig. 11A

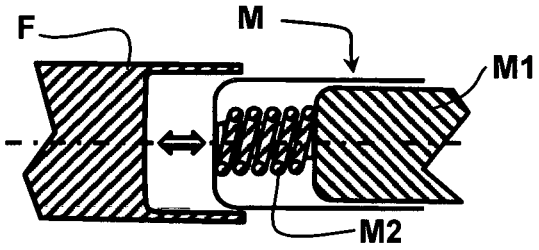

Fig. 11B

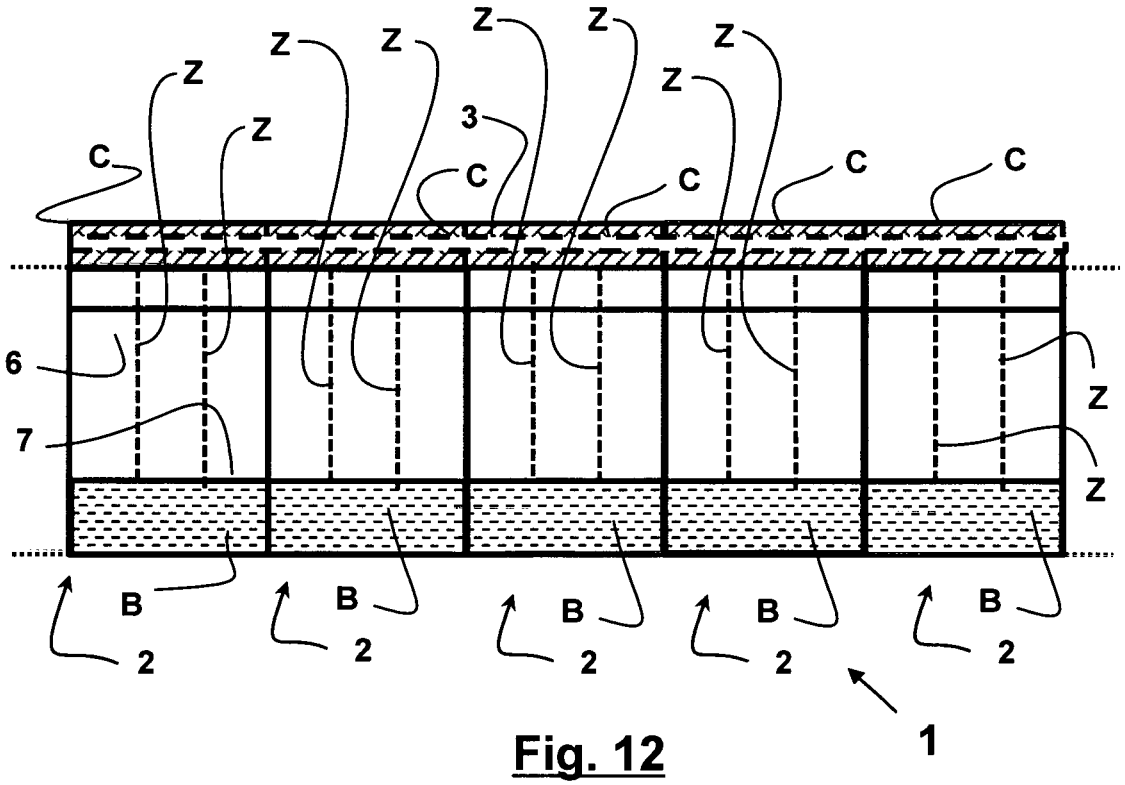

Fig. 12

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EUROPEAN SEARCH REPORT

Application Number
EP 24 00 0022

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 4 369 437 A (THOMPSON JR ROBERT E [US] ET AL) 18 January 1983 (1983-01-18) * column 1, lines 5-53 * * column 3, line 45 - column 4, line 62; figures 1,2,4,7 * * column 5, lines 33-55; figure 12 *	1-17	INV. G08B13/10 G08B13/12
A	WO 2013/124761 A2 (DEF DI R DONI S P A [IT]) 29 August 2013 (2013-08-29) * page 1, line 5 - page 2, line 24 * * page 13, line 25 - page 15, line 19; figures 1-3 * * page 19, lines 1-33; figures 4,5 * * page 20, line 33 - page 21, line 12 * * page 23, lines 8-9; figure 8 *	1-17	
A	US 2015/379837 A1 (DESALLE EDWARD [US]) 31 December 2015 (2015-12-31) * paragraphs [0001] - [0004], [0015] - [0021], [0024], [0027], [0029], [0030]; figures 1-2 *	3,11	

TECHNICAL FIELDS SEARCHED (IPC)

G08B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	3 July 2024	Russo, Michela

CATEGORY OF CITED DOCUMENTS

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L : document cited for other reasons

& : member of the same patent family, corresponding document

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03-07-2024

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82