(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 1 865 107 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
**12.12.2007 Bulletin 2007/50**

(51) Int Cl.:
***E01B 3/28*** *(2006.01)*

(21) Application number: **06425393.3**

(22) Date of filing: **09.06.2006**

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI SK TR**
Designated Extension States:
**AL BA HR MK YU**

(71) Applicant: **ALSTOM FERROVIARIA S.P.A.**
**12038 Savigliano (Cuneo) (IT)**

(72) Inventors:
- **Chiaretti, Massimo**
  **Sasso Marconi (BO) (IT)**
- **Cavalli, Silvano**
  **40030 Creda (BO) (IT)**

(74) Representative: **Karaghiosoff, Giorgio Alessandro et al**
**Studio Karaghiosoff e Frizzi s.r.l.**
**Via Pecorile 25**
**17015 Celle Ligure (SV) (IT)**

# (54) Sleeper for railways

(57) Sleeper for railway tracks, having at least a first (3) and a second (3') coupling area for a first (4) and a second (4') rail respectively, said areas (3, 3') being provided each one with coupling means (103, 103') for the corresponding rail, wherein said sleeper (1) further comprises at least an housing recess (2) for housing devices such as mechanisms and/or electromechanisms and/or electric circuits.

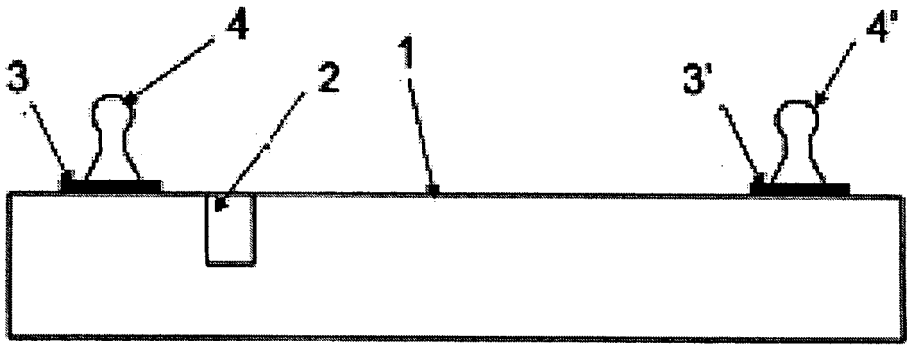



Fig.1

EP 1 865 107 A1

## Description

**[0001]** The present invention relates to a sleeper for railway tracks, particularly for high-speed lines.

**[0002]** Such devices are well known and widely used, while they satisfactorily serve their function, they still suffer from certain drawbacks.

**[0003]** At present on railway lines, made of at least a track, having at least two rails, one or more devices for controlling/commanding the line are provided along the line. Particularly in modern lines one or more mechanisms, or electromechanisms or electric or electronic circuits are provided for controlling and/or monitoring the line and/or the traveling train, and/or conditions of railway traffic along the line.

**[0004]** Such mechanisms, or electromechanisms, or electric or electronic circuits for commanding/controlling the line, for brevity reasons called "users", are at present placed along the line, at housings fastened laterally of the track.

**[0005]** However such housings for users have certain drawbacks: first since housings are on the outside they are more open to possible accidental damages, for example the passage of a train can cause an object to be thrown or fallen therefrom and it can seriously affect the housing safety.

**[0006]** Moreover said housings are subjected to bad weather and to climatic changes, often for long time periods, thus resulting in a nedd for a frequent maintenance, since in the case of a malfunction of the user contained in the prior art housing , safety measures provides also an interruption of railway traffic. Thus in order to avoid false alarms prior art housings are subjected to frequent examinations by operators, leading to an increase of operating cost of the line.

**[0007]** A further drawback is the fact that said housings can be subjected to openings or breakings by people not allowed to, since they can be easily reached by anybody even if when the line is operating with train passage. In the case of certain users there is provided the necessity to be connected by suitable conductors to one or both track rails. Obviously since the housing is placed on one or on the other one side of the track, it can be readily understood that one of the two conductors starting from the rail to the housing must necessarily makes an outdoor path at least equal to the one corresponding to the track length, so to pass through it and to reach the housing placed on the opposite side of the track. This leads conductors to have suitable lengths, to be electrically insulated and to be kept, since they can be damaged due to bad weather.

**[0008]** A specific user or railway equipment that needs the arrangement of functional members along the track ism the so called track circuit. The aim of such equipment is to verify the presence of a train on a section of the railway line. The latter is divided in subsequent sections galvanically insulated one with respect to the other and on each one of them the presence of a train is checked. Since the signaling is caused by the fact that train axles generate an electric bridge between the two rails and so a detecting signal is modified, in a predetermined way when the train is in one of said sections, it is necessary for the circuit generated between ends of each track section (called also block) and so for the two rails and train axle or axles to be electrically matched with the signal.

**[0009]** To this end, at regular distances it is necessary to provide between the two tracks a matching condenser connected to each one of them. Such condensers must be housed in watertight boxes protecting it.

**[0010]** The non operating condition of said condensers leads to a wrong operation of the track block and so to an error signaling and to take the most restrictive condition as it is a custom and usage in railway systems. It is also clear that along a railway line there is provided a great number of said condenser and so housing boxes, so it is very important for these boxes to be inexpensive, very long lasting and reliable and safe, and to allow an easy installation and replacement of ciondensers and connecting cables.

**[0011]** The present invention aim is to overcome the above drawbacks related to conventional user housings.

**[0012]** The invention achieves said aims by providing a sleeper for railway tracks, having at least a first and a second coupling area for a first and a second rail respectively, each one of said areas being provided with coupling means for the corresponding rail and wherein said sleeper comprises in addition at least a housing recess for housing mechanisms and/or electromechanisms and/or electric circuits or more generally -users.

**[0013]** Prior art drawbacks are overcome by providing the sleeper according to the present invention. The fact of housing users directly inside the sleeper that is a part of the track, and fastening together two rails has considerable advantages.

**[0014]** First users are kept inside the recess inside the sleeper, preferably placed between the two areas coupling to rails, and thus users are less subjected to and more protected from accidental collisions, that can cause the housing and users to be damaged.

**[0015]** Moreover according to an advantageous embodiment the recess provides a top, like a cover, sealingly with the sleeper. In such first embodiment the user housing is made in a recess obtained inside the sleeper, upon which recess a cover is sealingly fastened. Thus a user housing is obtained in a not expensive way and in a strong way having also the advantage of being a watertight one, thus allowing also to house electric or electronic type users.

**[0016]** According to an advantageous structural characteristic the recess may be provided with at least one, preferably more than one passageways for entrance/exit of at least a conductor or a raceway bearing conductors or conductor wiring for command/control signals preferably from and to rails. Entrance/exit passageways or openings of the recess can advantageously communicate with at least an entrance/exit channerl, made inside

the sleeper. Thus electrical conductors that are in case present can run inside the sleeper, without being subjected to bad weather and advantageously extending the average life of the conductor.

**[0017]** Moreover conductors are safe from possible damages that can lead to a malfunction of users.

**[0018]** The greater mechanical protection and the protection from atmospheric and environmental agents avoid to use oversized insulations, since conductor insulation is not subjected to wear or attack by atmospheric agents.

**[0019]** According to an improvement it is possible to provide the recess to pass through all the height of the sleeper and to have for example two tops, i.e. preferably to made the recess as a dead hole, a indentation, a gap or hole inside the sleeper.

**[0020]** Moreover it is possible to provide the dead hole to have at least an opening for discharging possible humidity or water that can be stored or introduced inside it. In this case it is possible to provide the discharging opening to lead towards the outside, or for example towards a storing chamber.

**[0021]** The presence of an escape for the water inside the recess of humidity that has been stored allows the recess to house also complex or delicate electronic type users, such as for example condensers for matching the track circuit, that are very important for safety reasons.

**[0022]** According to a second preferred embodiment there is provided in combination with the recess a container for users, intended to be mounted inside the recess. Such container is made prevalently of plastics and it has an opening for entry/exit of wirings, like the one of the recess.

**[0023]** Moreover at the sleeper face upon which said container comes out it is possible for the container to have an abutting flange overlapping the edge of the opening of the recess where it is housed. Such abutting flange is intended to be fastened on the surface of the corresponding sleeper face preferably by interposing a seal, in order to sealingly close the recess opening.

**[0024]** On the open side for entrance the container ends with sealingly mechanical engaging profile for plug-like top. The plug is sealingly movably fastened, preferably by a screw engagement. Thus the container and the plug make a sealing effect for users placed inside the container, which is further placed inside the recess.

**[0025]** The fact of having the abutting flange provided with a further seal between it and the sleeper gives also the recess a sealing effect, and so users inside the container are doubly protected from water, first it is because the recess has a watertight effect, and second it is because also the container is made with a watertight effect.

**[0026]** Advantageously the container can have sealing passage means for cables and/or sheats for said cables electrically connecting users.

**[0027]** According to a particularly inexpensive solution it is possible to provide fearlead sheats or other type of conductors for cables that are sloped such that when the sleeper is operating, conduits or wirings or cables have such a slope that water does not drip along the conduit.

**[0028]** The invention relates also to a process for making a sleeper as the one described above.

**[0029]** The process for making such sleeper according to the present invention provides following steps:

**[0030]** Providing at least a form for concrete or the like having the shape and size of the sleeper

**[0031]** Providing at least a mold for making the recess

**[0032]** Positioning said mold in the form keeping it in the predetermined position

**[0033]** Casting concrete or the like in the form.

**[0034]** It is possible to provide the mold for making the recess to be a throwaway one or to be re-used. In the first case the mold will be left in the concrete, while in the second case it will be taken away at the right time.

**[0035]** Moreover it is possible to provide a further step, i.e. the one of arranging in the form one or more conduits or sheats for electrical cables or wirings, or even of providing electrical cables embedded directly in the concrete which will be necessary without any type of passage conduits. In such latter case the making is advantageously also more inexpensive.

**[0036]** Obviously the concrete type, processing modes and composition thereof, as well as possible processings like compaction or pre-loading or even the presence of a falsework can be provided according to current or future techniques for making said sleeper.

**[0037]** These and other characteristics and advantages of the present invention will be more clear from the following description of some embodiments shown in annexed drawings wherein:

Fig. 1 is a side section of a sleeper according to the present invention wherein the recess is like a dead hole;

Fig.2 is a side section of a sleeper according to the present invention wherein the recess is like a through hole;

Fig.3 is a top view of a sleeper according to the present invention having a recess;

Fig.4 is a top view of a sleeper according to the present invention having two recesses;

Fig.5 is a section view of a recess according to the present invention;

Fig.6 is a section view of a recess and of a user according to the present invention;

Fig.7 is a section view of a recess having a cover and of a user according to the present invention;

Fig.8 is a section view of a first embodiment of the sleeper according to the present invention;

Fig.9 is a section view of a second embodiment of the sleeper according to the present invention;

Fig.10 is a plan view of the flange according to the present invention

Fig. 11 is a plan view of a top or plug according to the present invention;

Fig.12 is a plan view of the flange and of a top or

plug according to the present invention.

**[0038]** Figs. 1 and 2 show a first embodiment of a sleeper for railway tracks, having a first 3 and a second 3' coupling area for a first 4 and a second 4' rail respectively, and wherein it is possible to note the sleeper 1 additionally comprising at least an housing recess 2 for housing mechanisms and/or electromechanisms and/or electric circuits, more generally for any type of devices to be associated to the track and which devices for brevity reasons are defined as users. Essentially it is a sleeper placed under rails, in order to be integral and so to make the track, in which sleeper a recess 2, substantially an hole, an hollow, a groove or the like is obtained in the sleeper thickness. Alternately the recess may be a through one such as the one shown in fig.2 or may be a dead hole, as shown in fig.1 Preferably the recess 2 is positioned between the first 3 and the second 3' coupling area for the first 4 and the second 4' rail, such as shown also in figs. 3 and 4. Particularly in fig.4 two recesses one near the other are made in the sleeper, for example for containing different users or in all cases when it is necessary to place in the sleeper according to the present invention more than one user, each one having large overall dimensions. In all cases when it is necessary to use the sleeper according to the present invention for users having large overall dimensions, it is possible to provide the making of two holes having smaller diameters in order not to weaken the sleeper since the making of an hole with a large diameter in the sleeper may reduce the strength of the sleeper.

**[0039]** In figs. 1 to 4 sleepers wherein the recess or hole for housing users is obtained between the two rails is shown, in order to be in a position safe from breakings and to be protected from possible accidental collisions.

**[0040]** In the case when the recess 2 is provided to receive users of electrical type, such as for example condensers for matching the track circuit, it is possible to provide the recess with a top, like a plug or the like, that preferably sealingly closes the recess. The sealing effect can be obtained for example by at least a seal alternately or in combination placed on edges of said recess and/or on edges of said top in the coupling area of said edges.

**[0041]** Preferably, in order to improve the sealing effect and in order to make the sleeper less expensive the sealing top 402 can have plan shape that substantially coincides with the plan shape of the mouth of said recess 2, obviously with greater extensions to overlap the edge of the mouth.

**[0042]** Moreover the recess is provided to have at least a discharging channel or opening 202 for discharging water and/or humidity and/or vapour and/or the like, said discharging opening 202 being in communication with the outer environment by a discharging channel and/or said discharging opening being a dead one and being completely inside said sleeper.

**[0043]** Thus in the case of a filtration of water or humidity inside the recess 2, they can be voided by the discharging opening.

**[0044]** Therefore according to the first embodiment the sleeper provides a simple recess, preferably provided with a plug-like top, in which recess users are housed, and preferably the recess has at least one, preferably more than one means 502 for fastening said top to said sleeper and/or said recess.

**[0045]** The threaded fastening means 502' is intended to be engaged in a corresponding engaging means 502" made on said sleeper and/or on the mouth of said recess.

**[0046]** Moreover according to an advantageous characteristic the recess 2 comprises at least a entry/exit channel 102 for the entry/exit of at least a means 5 conducting command/control signals and/or for the entry/exit of a sheath, a pipe or a raceway of conductors for command/control signals and/or for the entry/exit of one or more electric conductors for command/control signals.

**[0047]** Thus a considerable advantage is obtained, since the conductor for signals for users passes inside or at last partially inside the sleeper, thus being safe from bad weather or from possible accidental collisions.

**[0048]** So the first preferred embodiment essentially provides a sleeper provide with a recess upon which a plug-like top preferably with a sealingly effect is provided.

**[0049]** An alternative embodiment of the first embodiment is shown in fig.8 wherein it is possible to note the recess 2, the sleeper 1, and a movable closing member comprising a threaded mouth 90 provided with a threaded fastening flange secured to the sleeper by fastening means 602, such as for example bolts, screws or the like, and with a cover-like plug 402 intended to be screwed on the threaded mouth. Thus a further advantage is obtained related to the fact that the closing member has a cover that can be easily fitted/unfitted by screwing/unscrewing it. In this case it is possible to provide the sleeper as it follows: making the recess in the sleeper, applying the closing member due to the flange 90 by means of fastening means 602 and screwing the cover 402 on the threaded mouth of the closing member.

**[0050]** Moreover a seal 11 extending along the perimetral edge of the flange can be provided between the flange and the sleeper surface in order to obtained a tight seal.

**[0051]** A second embodiment of the sleeper according to the present invention provides the recess 2 to comprise also a case 60 integral with the sleeper 1. The case 60 may be made for example like a covering or a shell of side and/or bottom walls of said recess 2. Particularly it is possible to provide the application of the case 60 to recess walls when making the recess, by putting the case, that substantially is a tube as a preferred shape, in the concrete form and subsequently by making the concrete casting in the form.

**[0052]** The case is shown in fig.5 and the case may be composed of metal materials or the like or plastics.

**[0053]** If the shell-like case 60 is provided in combination with a dead hole or if the case 60 has a bottom wall

it is provided for the case 60 to have at least a discharging opening 61 for discharging water and/or humidity and/or vapour and/or the like, the discharging opening 61 communicating with the outer environment and/or with the sleeper. The case 60 substantially accomplishes the task of further strengthening the sleeper structure.

**[0054]** According to a preferred embodiment the case 60 preferably has but it is not limited to a circular section and a cylindrical development, and it ends at the ends or entrance of the recess leading on the corresponding sleeper face, flush with said sleeper face.

**[0055]** When conducting means 5 such as electrical cables or the like for control/command signals directed to or coming from users are provided it is possible to provide the case having at least an inlet/outlet 62 for entry/exit of at least a conducting means 5 for control/command signals and/or for entry/exit of a raceway, sheath, pipe or a guide of command/control signal conductors and/or entry/exit of one or more electrical conductors for command/control signals.

**[0056]** Conductors of command/control signals may be provided as simple electrical cables, electrical or electromechanical conductors or the like, or as a wiring of conductors, comprising various conductors associated one with the other, for example by clamps or the like, or various conductors may be associated one with the other by raceways or hollow pipes, usually of the corrugated type, containing various conductors.

**[0057]** During process for making the sleeper in these cases it is possible to provide various preferably corrugated conductors, wirings, raceways, sheaths or pipes to be directly embedded in the concrete in the position they will have in the finished sleeper. Thus a very inexpensive process is obtained wherein conductors and electrical cables are in addition safe from bad weather since passing inside the sleeper at least for the path portion coinciding with the sleeper.

**[0058]** Advantageously when the case is provided, the inlet/outlet 62 of the case communicates or is preferably sealingly connected to the corresponding channel 102 of said recess 2 for the entry/exit of at least a conducting means 5 for command/control signals and/or for the entry/exit of a guide or a pipe or a raceway of command/control signal conductors and/or for the entry/exit of one or more command/control signal conductors.

**[0059]** Therefore in the second preferred embodiment shown in fig.9 the sleeper according to the present invention provides a recess wherein a case is applied, preferably composed of metal materials, and wherein the case 60 is positioned like a shell or a top of side walls of the recess, said case 60 being provided with entries/exits for electrical conductors for users and at least an inlet/outlet for discharging water or humidity that can be in case in the recess.

**[0060]** Said case has one or more side inlet/outlet openings to which one or more passage or guide ducts for cables or other are connected or communicating therewith preferably but not necessarily in a sealing way.

**[0061]** Even in this second embodiment it is possible to provide the recess with a cover, made in the same way of the cover of the first embodiment: the cover-like top may be placed directly on the recess 2 provided with the case 60 by means fastening the cover, such as bolts or the like, or alternatively a closing flange 90 can be provided like a threaded ring nut fastened to the sleeper by fastening means 602, such as for example bolts, screws or the like, and the cover-like top 402 intended to be screwed on the threaded ring nut of the closing flange. Moreover according to a further improvement it is possible to provide the closing flange 90 to be made integral with said case 60.

**[0062]** According to a third embodiment shown in figs. 5, 6, 7 the sleeper 1 according to the present invention provides a container 70 for housing said mechanisms and/or electromechanisms and/or electric circuits, said container being intended to be inserted inside said recess 2. The container 70 provides at least a discharging opening 71 for discharging water and/or humidity and/or vapour and/or the like, said discharging opening 71 being in communication with the outer environment and/or with a discharging opening of the sleeper.

**[0063]** Moreover, like the second embodiment, the container 70 has at least an inlet/outlet 72 for the entry/exit of at least a means 5 conducting command/control signals and/or for entry/exit of a raceway, sheath, pipe or the like for conductors of command/control signals and/or for the entry/exit of one or more conductors of command/control signals.

**[0064]** According to a further improvement of the third embodiment, the container may be in combination with a case 60 such as the one described above, or with only a recess, and particularly the container 70 is housed at least partially inside said case 60 and/or said recess. In this case the recess and/or case have a size greater than the container, in order to provide the case to be properly positioned inside the recess and the container inside the case and/or only the recess.

**[0065]** According to a further improvement the cover-like top, plug-like cover, like what said referring to one of the preceding embodiments, may be composed of a separated member and directly fastened to the sleeper for example by a flange, said closing member may be made integral with the case or integral with the container 70.

**[0066]** In this case the container has a peripheral flange 75 abutting on the perimetral edge of the opening of the recess 2.

**[0067]** In this case the abutting flange of the container is substantially like the fastening flange of the example of fig.8 so that the flange is provided at a certain distance from the open side of the container whose ending portion, at the open side, has an engaging profile for a plug or cover 402, particularly the engaging profile 73 for said plug makes a screw engagement therewith.

**[0068]** In order to keep a tight seal it is provided for the container 70 and the plug to be sealingly engaged by seals, o-rings or the like.

**[0069]** The peripheral flange 75, as shown in fig.9, may also have at least one, preferably more than one fastening and/or engaging means 602 in order to make the container integral with the sleeper. Particularly it is provided for said fastening means 602 to be one or more screw fastening means engaging in the sleeper.

**[0070]** Moreover a further advantageous characteristic is shown in fig.7, wherein it can be noted: the recess wherein the case is inserted, and the container is held in position at a certain distance from the bottom of the recess or of the case.

**[0071]** That can be made by one or more spacing feet such as teeth, projections, ribs or by the flange fastening the container to the sleeper and/or by a combination of said means.

**[0072]** Advantageously the position of the container is defined by the fact that inlet/oulet openings thereof coincide with terminals of pipes or conduits for cables. A further advantageous characteristic provides inlet/outlet openings and terminals of pipes and conduits for cables to be sealingly coupled one with the other, for example by means of o-rings, seals or the like.

**[0073]** The sleeper according to the present invention, in the particular case, but not limitative one, wherein the recess houses as user a condenser for matching track circuits, such as shown in fig.7, has in an advantageous embodiment: the recess 2, wherein the case 60 is positioned, inside which case the container 70 is housed which container in turn houses the condenser 90. As it shall be noted the condenser 90 is raised from the bottom of the container, by using a spacing foot 790 engaged with the bottom of the condenser 90, preferably but not limitated to with a screw engagement. Thus advantageously if water enters in the container, or humidity stores inside it, they will be discharged through discharging holes 61 of the container 71 of the case, the fact of holding the condenser or more generally a user in a raised position, allows also a least partial storage of water inside the container, or the case, so the water does not contact the condenser or the user.

**[0074]** Also che container, according to an advantageous embodiment, may be provided in a raised position with respect to the case bottom, as shown, thus making possible above advantages related to storage of water on the bottom.

**[0075]** The process for making the sleeper according to the present invention provides following steps:

**[0076]** Providing at least a form for concrete or the like having the shape and size of the sleeper

**[0077]** Providing at least a mold for making the recess

**[0078]** Positioning said mold in the form holding it in the predetermined position

**[0079]** Casting the concrete or the like in the form.

**[0080]** It is possible to provide the mold for making the recess to be a throwaway one or to be re-used, in the case of the throwaway one the mold is not removed and in a preferred case it can be the case 60 described above.

**[0081]** Moreover it is possible to provide the step of arranging in the form one or more conduits or pipes for electrical cables or wirings, or wiring or individual conductor or cables, by positioning electrical wiring or electrical or electromechanical conductors in said form before casting the concrete, embedding directly said conductors in the sleeper.

**[0082]** Advantageously it is also possible to provide the step of positioning molds for discharging ducts in the form before casting the concrete, in order to obtain discharging duct or ducts in the predetermined position.

**[0083]** It is also possible to provide a falsework for the concrete that in this case can be advantageously a grid for fastening and/or supporting the case and/or pipes for cables and/or mold for discharging conduit/conduits.

**[0084]** According to a further improvement that can be applied to above embodiments, shown in fig.10, 11 and 12, the abutting or fastening flange, both integral with or separated from the container and/or the case, preferably has a plan shape that is circular one or with one or more radial fins. Particularly in the preferred and shown embodiment the flange has a circular shape, with at least one, two, or more fastening holes for fastening on the sleeper.

**[0085]** The plug or cover 402 preferably has a shape having an engaging profile by means clamping the plug, such as for example an hexagon-like profile for clamping by hexagonal wrenches, such as shown in fig.11 and in addition in a preferred solution the cover or plug has also a safety fin 13 that is peripherical with respect to the plug, and provided with a slot 14 for the engagement with corresponding safety clamping means 15 cooperating with the abutting flange. Thus first the plug is screw tightened on the engaging profile of the flange, and the safety fin is brought to take a predetermined position wherein safety clamping means movably engage in the slot and help in avoiding an accidental unscrewing of the plug 402 due for example to vibrations.

**[0086]** So the present invention relates to a sleeper for railway tracks and condenser for track circuit wherein said condenser is inserted inside said sleeper, for example placed in an hole, a recess, a box or the like. Particularly the condenser is inserted inside a container, which container is inserted inside a recess which recess is obtained inside said sleeper. According to an advantageous characteristic said container and/or said recess are sealingly made, and in addition as shown the condenser is positioned in a raised position with respect to the bottom of said container and/or said container is positioned in a raised position with respect to the bottom of said recess. In addition the sleeper comprises inside itself at least a conduit for cables or electric conductors from said condenser to said rails.

## Claims

1. Sleeper for railway tracks, having at least first (3) and a second (3') coupling area for a first (4) and a

second (4') rail, said areas (3, 3') being provided each one with coupling means (103, 103') for the corresponding rail,

**Characterized in that**

In addition said sleeper (1) comprises at least an housing recess (2) for housing devices such as mechanisms and/or electromechanisms and/or electric circuits.

**2.** Sleeper for railway tracks according to claim 1, **characterized in that** said recess (2) is provided inside said sleeper, and is like a hole, hollow or the like, said recess (2) being placed between said first (3) and said second (3') coupling area for said first (4) and said second (4') track.

**3.** Sleeper for railway tracks according to one or more of the preceding claims, **characterized in that** said recess (2) extends inside said sleeper for a length substantially smaller or at most equal to the height development of said sleeper, starting from a sleeper face, particularly starting from the upper face of said sleeper during operating or mounting position.

**4.** Sleeper for railway tracks according to one or more of the preceding claims **characterized in that** said recess (2) extends extends inside said sleeper for a length substantially smaller than the height development of said sleeper, said recess being made like a dead hole starting from the upper face of said sleeper during operating or mounting position.

**5.** Sleeper for railway tracks according to one or more of the preceding claims, **characterized in that** it has at least closing or covering member (402) like a pulg or the like for closing said recess, said closing member being placed at the end or mouth of the recess on the corresponding sleeper face, and said closing member sealingly widens to perimetral edges of said mouth.

**6.** Sleeper for railway tracks according to one or more of the preceding claims **characterized in that** said recess has at least a discharging opening (202) for discharging water and/or humidity and/or vapour and/or the like, said discharging opening (202) being in communication with the outer environment by a discharging channel.

**7.** Sleeper for railway tracks according to one or more of the preceiding claims **characterized in that** said closing member (402) of said recess is sealingly fastened or can be fastened to edges of the opening of said recess (2).

**8.** Sleeper for railway tracks according to one or more of the preceding claims, **characterized in that** the sealing effect between edges of ,the opening of said recess and the closing member (402) is obtained by at least a seal (10) placed alternatively or in combination on edges of said recess and/or on edges of said cover in the overlapping area of said edges.

**9.** Sleeper for railway tracks according to one or more of the preceding claims, **characterized in that** said at least sealing closing member (402) has a plan shape that substantially coincides with the plan shape of the mouth of said recess (2), and a size greater than said mouth.

**10.** Sleeper for railway tracks according to one or more of the preceding claims, **characterized in that** said at least one sealing closing member (402) has at least one, preferably more than one means (502), fastening it to said sleeper and/or said recess.

**11.** Sleeper for railway tracks according to one or more of the preceding claims, **characterized in that** said at least one means (502) fastening said at least one closing member (402) to said sleeper and/or said recess is composed of a threaded fastening means (502'), intended to engage a corresponding engaging means (502'') made on said sleeper and/or mouth of said recess.

**12.** Sleeper for railway tracks according to one or more of the preceding claims, **characterized in that** said recess (2) comprises at least an inlet/outlet channel (102) for the entry/exit of at least a means (5) conducting command/control signals and/or for the entry/exit of raceway, a sheath, a pipe or the like for conductors for command/control signals and/or for the entry/exit of one or more electric conductors for command/control signals.

**13.** Sleeper for railway tracks according to one or more of the preceding claims, **characterized in that** said recess (2) in adition comprises a case (60) integral with the sleeper (1).

**14.** Sleeper for railway tracks according to one or more of the preceding claims **characterized in that** said case (60) is made like a covering or a shell of side and/or bottom walls of said recess (2).

**15.** Sleeper for railway tracks according to one or more of the preceding claims **characterized in that** said case (60) is preferably composed of metal materials or the like.

**16.** Sleeper for railway tracks according to one or more of the preceding claims **characterized in that** said case (60) provides at least a discharging opening (61) for discharging water and/or humidity and/or vapour and/or the like, said discharging opening (61) communicating with the outer environment and/or

with the sleeper.

**17.** Sleeper for railway tracks according to one or more of the preceding claims, **characterized in that** said case (60) preferably has a circular section and a cylindrical development, and it ends at the ends or entrance of the recess leading on the corresponding sleeper face, flush with said sleeper face.

**18.** Sleeper for railway tracks according to one or more of the preceding claims, **characterized in that** said case has at least an inlet/outlet (62) for entry/exit of at least a conducting means (5) for control/command signals and/or for entry/exit of a raceway, sheath, pipe or the like for command/control signal conductors and/or entry/exit of one or more conductors for command/control signals.

**19.** Sleeper for railway tracks according to one or more of the preceding claims, **characterized in that** said inlet/outlet (62) of said case is faced to, communicates with or is connected to the corresponding channel (102) of said recess (2) preferably with a sealing effect for entry/exit of at least a conducting means (5) for control/command signals and/or for entry/exit of a raceway, sheath, pipe or the like for command/control signal conductors and/or entry/exit of one or more conductors for command/control signals.

**20.** Sleeper for railway tracks according to one or more of the preceding claims, **characterized in that** there is provided a container (70) for housing said devices like mechanisms and/or electromechanisms and/or electric circuits, said container being intended to be inserted inside said recess (2).

**21.** Sleeper for railway tracks according to one or more of the preceding claims **characterized in that** said container (70) provides at least a discharging opening (71) for discharging water and/or humidity and/or vapour and/or the like, said discharging opening (71) being in communication with the outer environment and/or with the sleeper.

**22.** Sleeper for railway tracks according to one or more of the preceding claims, **characterized in that** said container (70) has at an inlet/outlet (72) for entry/exit of at least a means (5) conducting command/control signals and/or for entry/exit of a raceway, sheath, pipe or the like for conductors of command/control signals and/or for the entry/exit of one or more conductors of command/control signals.

**23.** Sleeper for railway tracks acoridng to one or more of the preceding claims **characterized in that** said container (70) is housed at least partially inside said case (60).

**24.** Sleeper for railway tracks according to one or more of the preceding claims **characterized in that** at the sleeper face at which said container leads, said container (70) has a radial flange (75) that is radially enlarged.

**25.** Sleeper for railway tracks according to one or more of the preceding claims **characterized in that** said container (70) has an entrance opening at a sleeper face, preferably the upper face, which opening has movable coupling and sealing means for a plug-like closing member.

**26.** Sleeper for railway tracks according to one or more of the preceding claims **characterized in that** the closing member engages with the open end of the container by screw means.

**27.** Sleeper for railway tracks according to one or more of the preceding claims, **characterized in that** said container (70) and said closing member are sealingly engaged by seals, o-rings or the like.

**28.** Sleeper for railway tracks according to one or more of the preceding claims, **characterized in that** said enlarged peripheral flange (75) has at least one, preferably more than one fastening or engaging means for fastening said container to said sleeper, and and means for generating a sealing coupling between said sleeper and said flange.

**29.** Sleeper for railway tracks according to one or more of the preceding claims, **characterized in that** it provides at the bottom of said container a spacing foot (790) intended to be movably engaged with the user.

**30.** Sleeper for railway tracks according to one or more of the preceding claims, **characterized in that** said spacing foot (790) is movably engaged with the user by a screw engagement.

**31.** Sleeper for railway tracks according to one or more of the preceding claims, **characterized in that** said container is provided in a raised position with respect to the case bottom for example by spacers, teeth and/or projections and/or ribs and/or by the flange fastening the container to the sleeper.

**32.** Sleeper for railway tracks according to one or more of the preceding claims **characterized in that** said plug or closing member (402) has a shape having an engaging profile for means clamping the plug, such as for example an hexagon-like profile for clamping by hexagonal wrenches.

**33.** Sleeper for railway tracks according to one or more of the preceding claims **characterized in that** the abutting or fastening flange has a circular plan

shape.

**34.** Sleeper for railway tracks according to one or more of the preceding claims **characterized in that** the abutting or fastening flange has one or more radial fins.

**35.** Sleeper for railway tracks according to one or more of the preceding claims **characterized in that** the abutting or fastening flange has a circular shape, with at least one, two or more fastening holes for fastening on the sleeper, preferably four fastening holes.

**36.** Sleeper for railway tracks according to one or more of the preceding claims **characterized in that** said closing member or plug (402) has a safety fin (13) that is peripherical with respect to the plug, said fin being provided with a slot (14) for the engagement with corresponding safety clamping means (15) co-operating with the abutting flange.

**37.** Sleeper for railway tracks according to one or more of the preceding claims **characterized in that** the user is composed of a condenser for the track ciruit.

**38.** Process for making a sleeper according to one or more of the preceding claims **characterized in that** it provided following steps:

Providing at least a form for concrete or the like having the shape and size of the sleeper
Providing at least a mold for making the recess
Positioning said mold in the form keeping it in the predetermined position
Casting concrete or the like in the form.

**39.** Process for making a sleeper according the preceding claim **characterized in that** said mold for making the recess is a throwaway one or it can be re-used.

**40.** Process for making a sleeper according to one or more of the preceding claims **characterized in that** it provides one or more steps of claims 38 to 39 and it provides also the step of
arranging in the form one or more conduits for electrical cables or wirings.

**41.** Process for making a sleeper according to one or more of the preceding claims **characterized in that** it provides one or more steps of claims 38 to 40 and it provides also the step of
Positioning electric wirings or electric or electromechanic conductors in said form before making the concrete casting.

**42.** Process for making a sleeper according to one or more of the preceding claims **characterized in that** it provides one or more steps of claims 38 to 41 and it provides also the step of
Arranging a falsework for the concrete
Using said falsework as a grid for fastening and/or supporting the case and/or pipes for cables and/or mold for discharging conduit/conduits.

**43.** Sleeper for railway tracks and condenser for track circuits
**Characterized in that**
Said condenser is inserted inside said sleeper.

**44.** Sleeper for railway tracks and condenser for track circuits according to claims 43 **characterized in that** said condenser is inserted inside said sleeper, in an hole, a recess, a box or the like.

**45.** Sleeper for railway tracks and condenser for track circuits according to claims 44 **characterized in that** said condenser is inserted inside a container, which container is inserted inside a recess, which recess is obtained inside said sleeper.

**46.** Sleeper for railway tracks and condenser for track circuits according to claims 45 **characterized in that** said container and/or said recess are made with a sealing effect.

**47.** Sleeper for railway tracks and condenser for track circuits according to claims 46 **characterized in that** said condenser is positioned in a raised position with respect to the bottom of said container and/or said container is positioned in a raised position with respect to the bottom of said recess.

**48.** Sleeper for railway tracks and condenser for track circuit according to claim 47 **characterized in that** said sleeper comprises inside itself at least a conduit for cables or electric conductors from said condenser to said tracks.

**49.** Sleeper for railway tracks and condenser for track circuits according to claim 48 **characterized in that** it comprises one or more characteristics according to one or more characteristics according to one or more claims 1 to 37.

**50.** Sleeper for railway tracks and condenser for track circuits according to claim 49 **characterized in that** it is made according to one or more of claims 38 to 42.

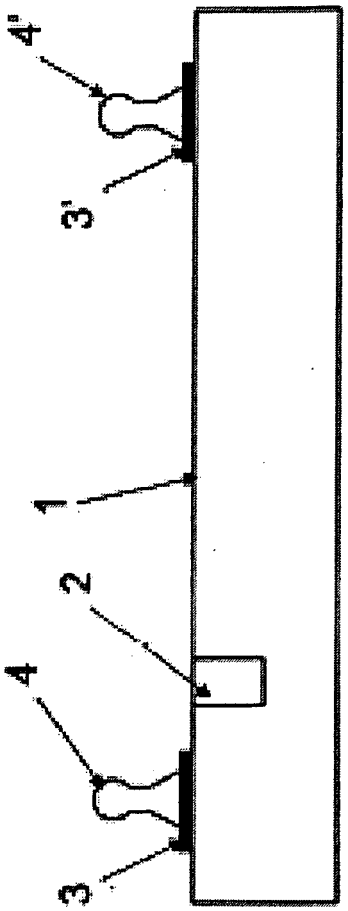



Fig.1

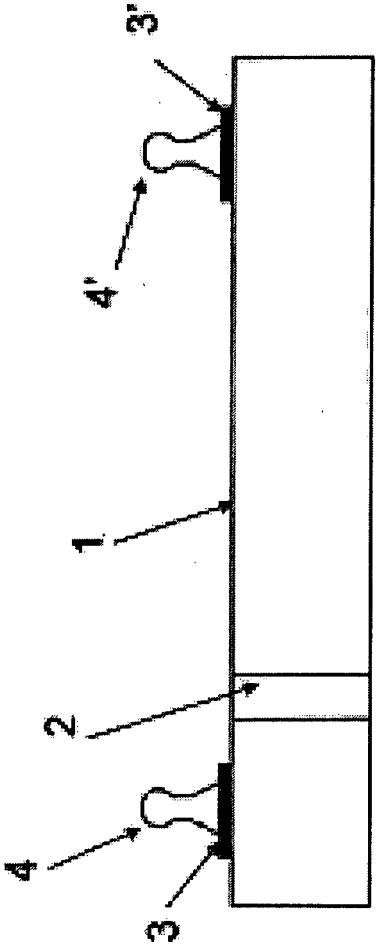



Fig.2

Fig.3

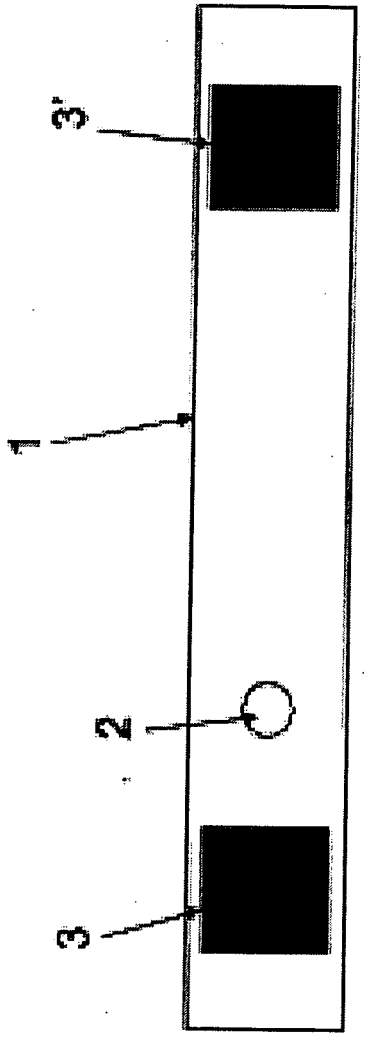
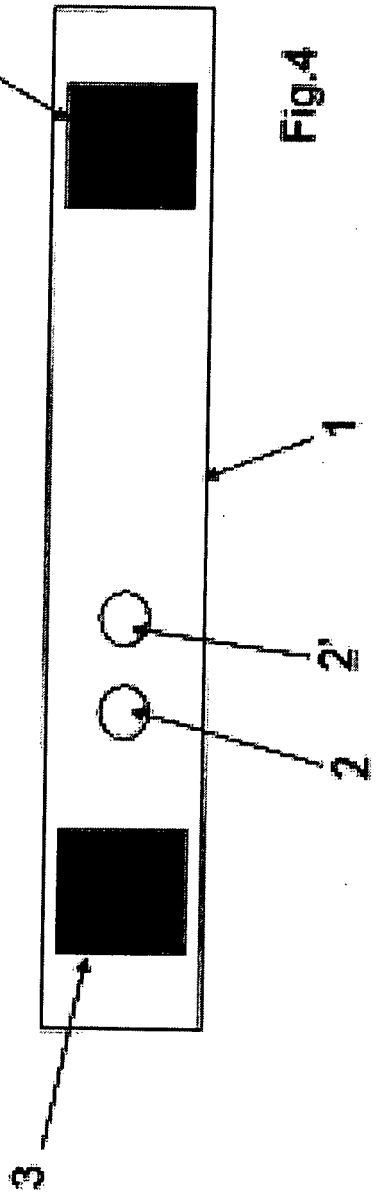



Fig.4



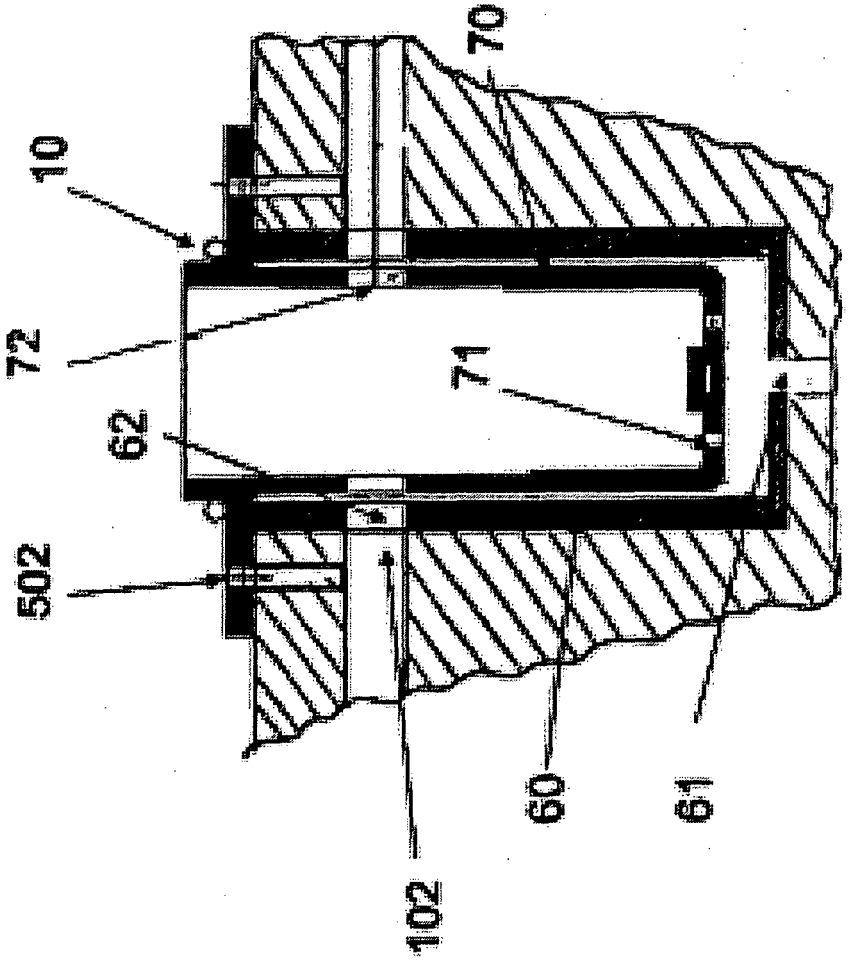



Fig.5

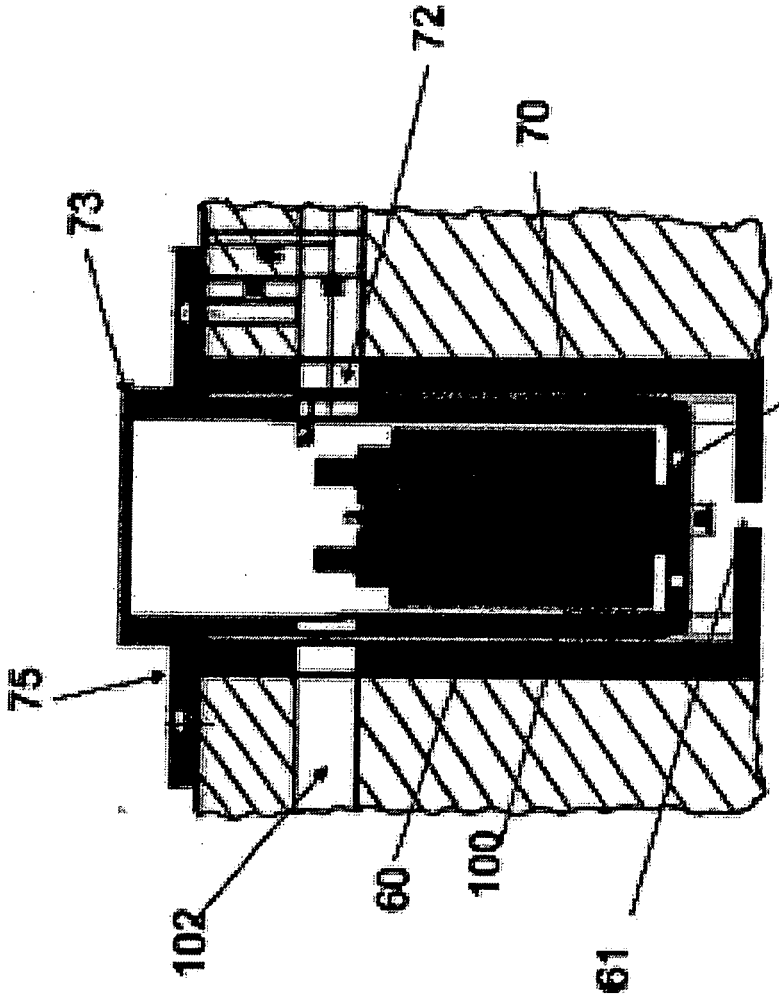



Fig.6

Third embodiment

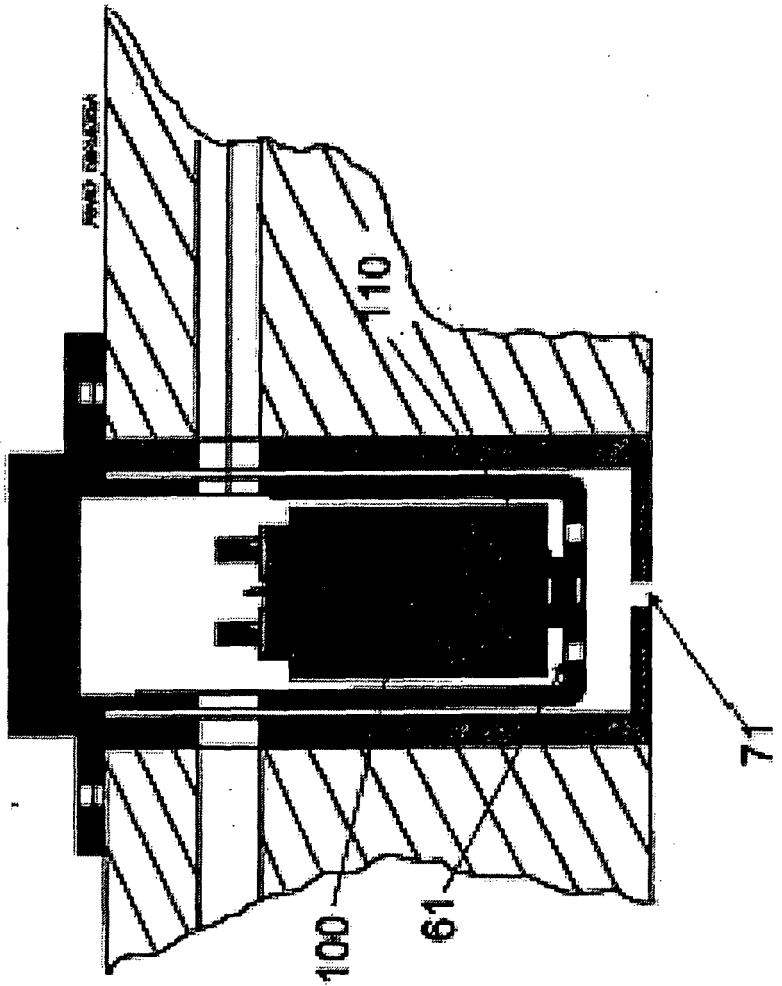



Fig.7

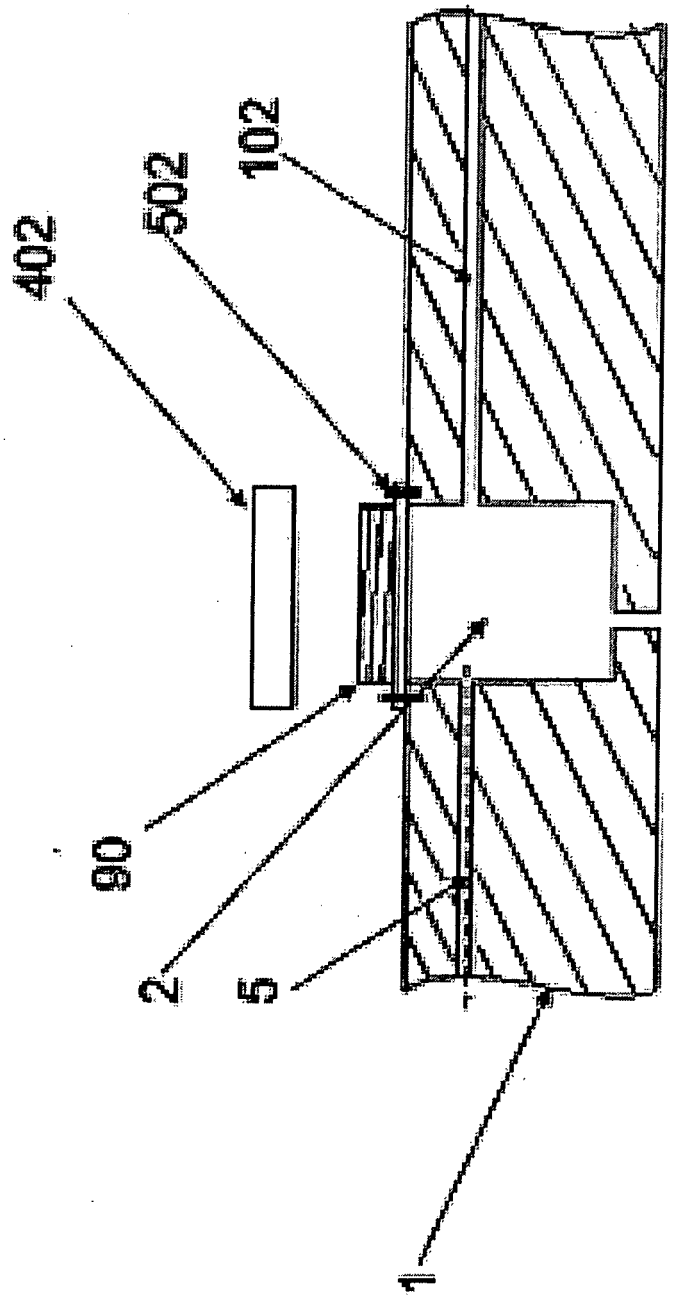



Fig. 8

First embodiment

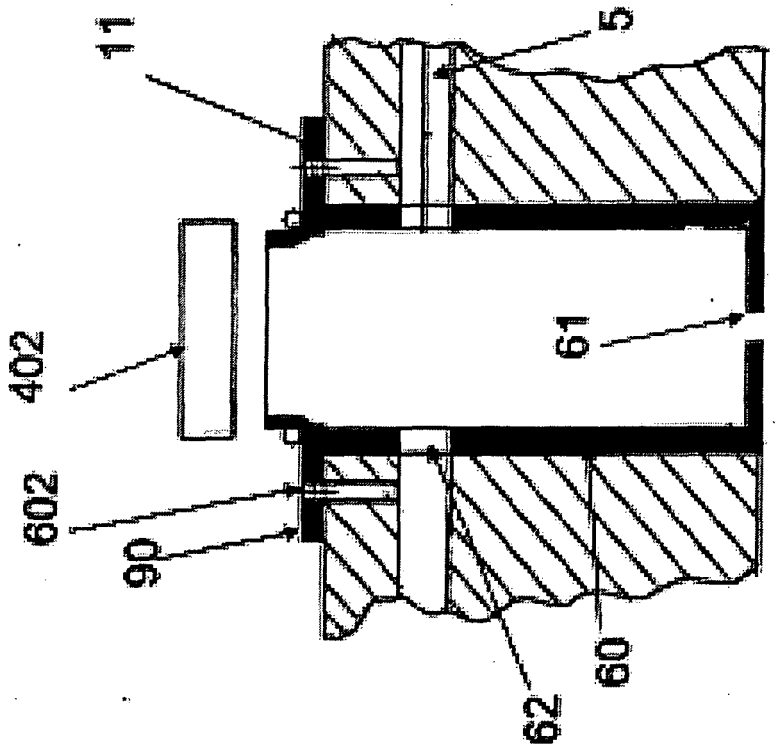



Fig. 9

Second embodiment

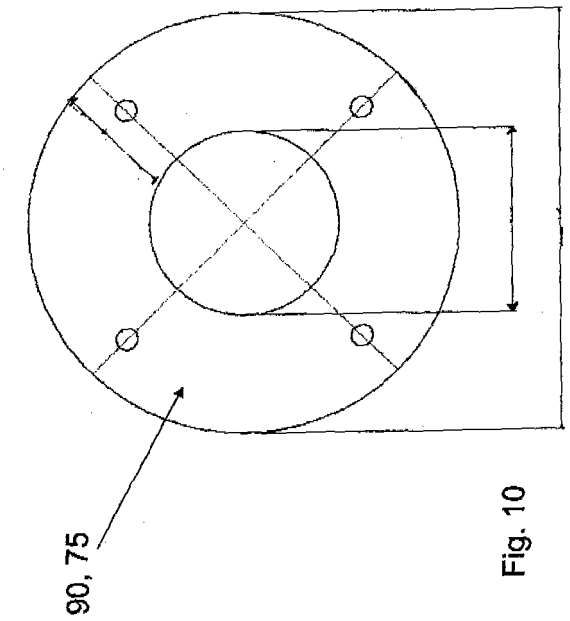



Fig. 10

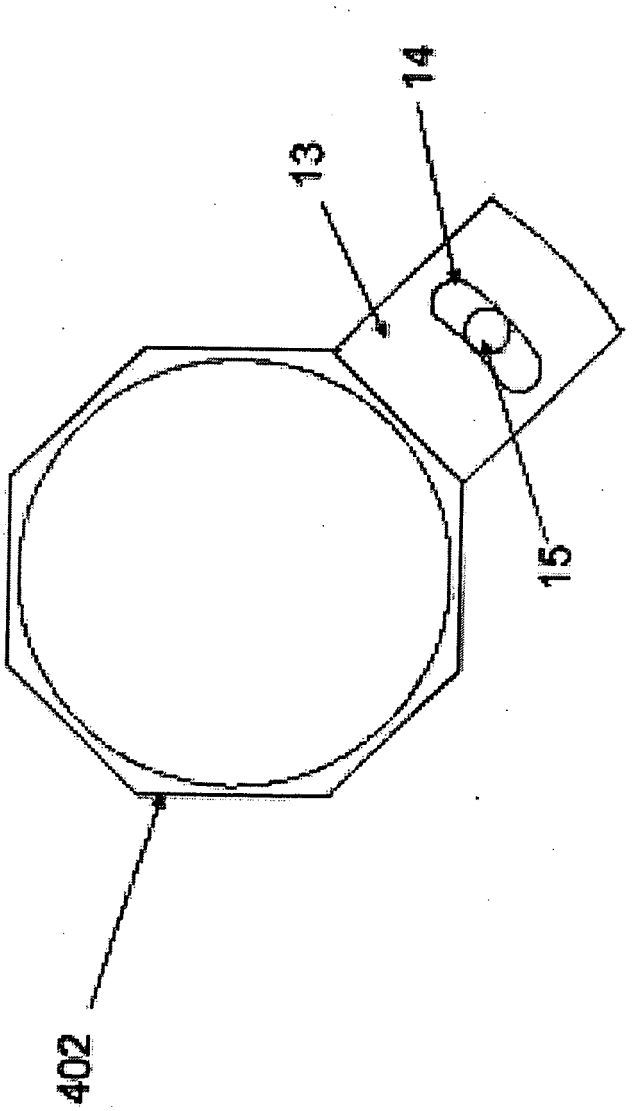



Fig. 11

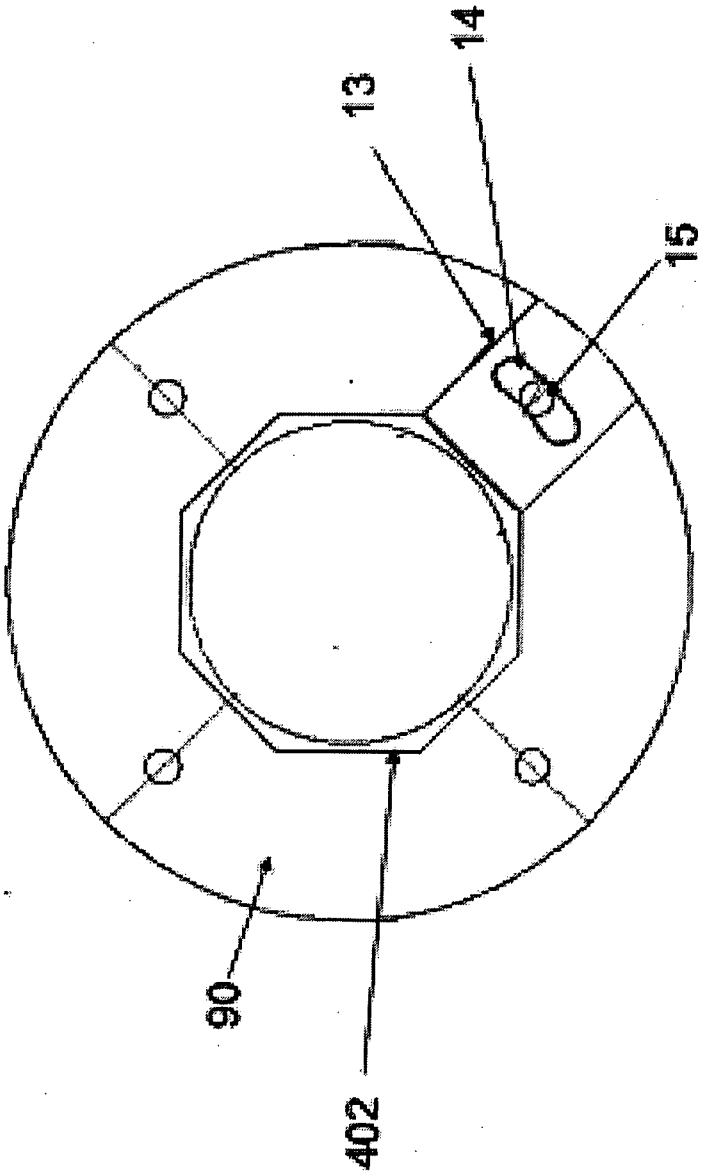



Fig. 12

European Patent Office

# EUROPEAN SEARCH REPORT

Application Number
EP 06 42 5393

## 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 | SU 1 799 940 A1 (MAKIDONSKIJ SERGEJ A [SU]) 7 March 1993 (1993-03-07)<br>* figure 1 * | 1,2,5, 13-15, 38,43, 44,50 | INV. E01B3/28 |
| A | JP 2001 123401 A (NALUX CORP) 8 May 2001 (2001-05-08)<br>* abstract; figure 1 * | 1,38,43, 50 | |
| A | DE 199 57 223 A1 (PFLEIDERER INFRASTRUKTURT GMBH [DE]) 21 June 2001 (2001-06-21)<br>* abstract; figure 1 * | 1,38 | |
| A | WO 79/00031 A (MOEHREN H) 25 January 1979 (1979-01-25)<br>* abstract; figures 1,2 * | 1-4,38 | |

TECHNICAL FIELDS SEARCHED (IPC)

E01B

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| Munich | 19 October 2006 | Fernandez, Eva |

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

## ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 06 42 5393

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

19-10-2006

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---|---|---|
| SU 1799940 A1 | 07-03-1993 | NONE | |
| JP 2001123401 A | 08-05-2001 | NONE | |
| DE 19957223 A1 | 21-06-2001 | NONE | |
| WO 7900031 A | 25-01-1979 | EP 0006870 A1 | 23-01-1980 |

EPO FORM P0459

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