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Claims 16-31 are deemed to be abandoned due to non-payment of the claims fees (Rule 45(3) EPC).

(54) **Multilayer light structural panel unit and its manufacturing process**

(57) The invention relates to the field of constructions, in particular to buildings and installations, namely, wall panels, ceilings, floors, and can be used in the construction of multi-storey buildings with supporting concrete, metal and wooden framing for large scale and individual building, buildings reconstruction, additional storeys. There is a multilayer light structural panel and its manufacturing process claimed.

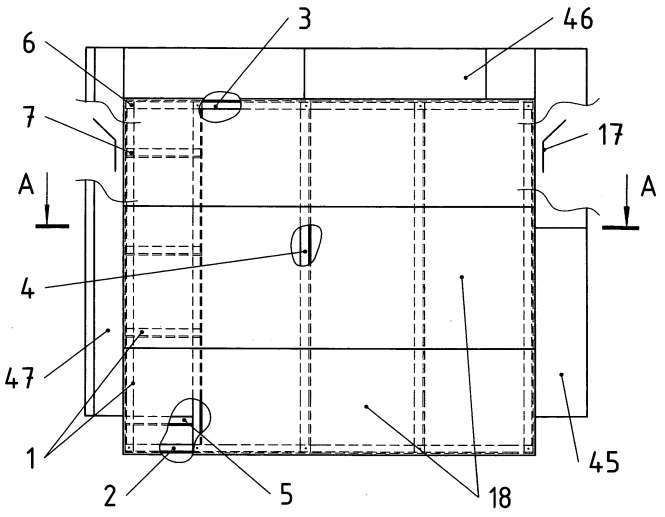


Fig. 1

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Description

[0001] The invention relates to the field of ground development, in particular to the walls of the building and installations, namely, wall panels, ceilings, floors, and can be used in the construction of multi-storey buildings with supporting concrete, metal and wooden framing for large scale and individual building, buildings reconstruction, additional storeys.

[0002] There is a construction of structural panel with communications, containing a series-connected inside magnesite panel, insulation film, sound-absorbing tape, metal frame, including a U-shaped and C-shaped profiles made of galvanized steel sheets, perforated and connected by self-drilling screws, rivets, brazing or welding, water-resistant layer of a waterproofing film, cellulose insulation Yunizol, external magnesite panel and facade finishing layer of mineral wool placed inside. Where the height of building panels is up to 8 m, and thickness is 150 - 250 mm [Patent BY 5130 for useful model «Structural panel», IPC : E04B 1/02].

[0003] However, the well-known construction panel contains an vapor proof over cover - vapor barrier facade of mineral wool, which increases moisture-formation between the steam proof warmth-keeping lagging and the paneling, up to 7 times the thermal conductivity of the insulation, which is confirmed with studies of thermal conductivity dependence on the water content of the mineral wool insulation [V. Rudenko, A. Panin, A. Zholudev and others «Thermally insulation in goods-producing industries. - M., Publishing office "BSG ", 1996]. And according to the data [Application of expanded polystyrene in goods-producing industries. Seminar data on xpandable polystyrene - S. Petersbourg, 1998], moisturizing expanded polystyrene insulation for every 1% leads to an increase in thermal conductivity by 4%, which undoubtedly impairs the performance and durability of these panels and the environment in which collected from homes, as used in this panel, rock wool at least than 2 times the price of cellulose insulation, it used polymeric binder fibers based on phenol formaldehyde that makes the connection unstable and short-lived life of the mineral wool is not more than 25-26 years old [V. Rudenko, A. Panin, A. Zholudev and others «Thermally insulation in goods-producing industries. - M., Publishing office "BSG ", 1996] and a pair of phenol formaldehyde adversely affect human health [A. Uvarov. Laminal enclosure structure with application of ragstone fiber composite material and its technology of manufactoring . - Dis. PhD in Technical Sciences - M., 1995, p. 116]. The most appropriate for the application is the ventilated walls design.

[0004] Besides vapor-proof waterproof film has no fire resistance and durability (up to 25 years taking into account required 50 years) [Regulations on the organization and reconstruction, repair and buildings, facilities and utilities of social and cultural services maintenance. BCH-58-88 (p), Goskomarhitektury. - M, Stroyizdat, 1990].

[0005] There is the structural system for the low-rise buildings construction with metal frames, including the external supporting walls, interior supporting walls, partitions, construction of inter floors and attic floor with a framework of steel sections, load-bearing trusses or beams, roof and wall beams made of steel profiles, wherein said structural elements are formed on the basis of a rack made of thin-walled steel sections connected by a detachable connection, thin-walled profiles frame exterior walls and attic floors contain a perforated wall and the heat-sound-insulating material in the walls and floors located within the height of the cross section frame members. It'protected from the inside with vapor barrier film and from the outside with the diffusion waterproofing film. And the side wall framing, partitions and ceilings are lined inside with plasterboard or gypsum sheets. The system additionally contains the foundation where side framing is mounted [Patent RU 62128 for useful model «Structural design for construction of low-rise building with metal frame», IPC : E04B 1/24].

[0006] But the specificity of thin-walled structures is such that with its real loading due to mismatch of shear center and centroid of the resulting load there is the so-called torsional bending, leading to cross section warping (flatness) and additional normal and shear stresses appearance in the shelves and rod elements walls. Plane-sections hypothesis for these profiles calculations is incorrect. In addition, there is the the possibility of profiles walls local buckling. It should be also taken into account when designing and calculating the panels on the basis of cold-formed profiles.

[0007] While such panels design there shall more carefully analyze the elements stress-strain state and select profiles with some notorious reserve or apply additional amplifiers in the node joints and planes.

[0008] Besides of that insufficient corrosion protected steel-walled lightweight construction, made of cold-formed sections, may disintegrate at a rate of 0.004 mm / year in a short time due to electromechanical corrosion. It is caused by electrolytes aqueous solutions and is result of micro elements [Yan Brudka, Mechislav Lubinski, edited by PhD in Technical Sciences S. Karmilov «Light constructional steel work»]. Perforation is also performed incorrectly: according to the Finnish technology - perforation and punching hardening, is undoubtedly more expensive than the Russian equivalent of punching: broaching and extrusion with single notching of extruded burrs that not only makes more distractions on protective zinc coating, but also forms the molded bumps in the walls collecting dust and moisture. It greatly forces the corrosion.

[0009] The electrolyte is the atmospheric moisture containing CO2, but more often there are other chemical compounds. Water containing some salts condenses on the metal. Small electrolyte solution layer creates conditions conducive electrochemical corrosion.

[0010] As a result, despite the fact that most of the metallic element remains almost not corrated, the con-

struction may rapidly be damaged due to the occurrence of some deep pitting. Torsional stress further increase the rate of corrosion cracking over percentage. In this case thin-walled steel parts shall not touch materials containing gypsum, magnesium chloride, coal or coke ash, slag and coke, as it may cause rapid steel corrosion [Yan Brudka, Mechislav Lubinski, edited by PhD in Technical Sciences S. Karmilov «Light constructional steel work»]. Elements stress-strain state analysis and profiles selection with some reserve or additional amplifiers in the nodes and in the planes application shall be more careful while panels designing, but it's not done in this case. The profiles additionally have no centering holes and special lugs to reduce assembly and durability accuracy. Profiles connection allowance is 1 - 3 mm, which results to gaps formation between the joined profiles and increases the risk for self-tapping screws to cut-off, greatly reduces the product reliability and lifetime. Such allowance and absence of significant profiles marking do not allow collecting the framework without selection and fit. Technological scheme to assemble the framework and walls made on site without strict amount control of self-tapping screws, clear attaching points adherence, screw tightening step compliance may reduce the strength, reliability and durability. There are sheet materials, gypsum boards used in the mentioned case, but not individual parts facing

[0011] There is known cold-formed profiles of galvanized steel set for prefabricated buildings «Nordalfa», having at least one C-shaped profile formed between a continuously connected against each other C-shaped profile wall, with width determining the width of the C-shaped profile, and two symmetrically disposed about the longitudinal axis perpendicular profile and wall shelves of C-profiles of equal height, which determines the height of the C-shaped profile, the free end of each of which is bent through an angle α towards the free end opposite the shelves and makes the corresponding linear linear angle stiffener width L_c of the C-shaped profile. And at least one run roofing profile formed continuously interconnected roof profile wall and two flanges perpendicular to the wall of the roofing profile of equal height, with the free end of each is bent outwardly at an angle β in the opposite free end of the flange opposite direction and generates a corresponding T-shaped angle stiffener roof profile. Wherein shelf C-shaped profile is provided with at least two additional longitudinal stiffening angle stiffener s, each of which is formed as a corrugation, each wall and the coupling flange of the C-profile are rounded with a radius of curvature R_c. Each transition between the flange and the angle stiffener of C-profiles made rounded with a radius of curvature r_c, and each paired wall and shelf roof profile are rounded with a radius of curvature R_k, each bridge between the flange and the roof angle stiffener profile formed rounded with a curvature radius r_k, and roof angle stiffener profile has two mutually perpendicular portion, the first of which determines the width and the second is the angle stiffener height. The thickness of each profile is from 0.55 to 1.5 mm [Patent BY 7651 for useful model «Profile set for rapifly erected low-rising building", IPC : E04C 3/07].

[0012] This cold-bent profile set is suitable for creating buildings frameworks and for the construction of low-rise buildings up to 3 storeys only. There are three or at least two types of profiles in this construction set - C-shaped and roof sections, which increases the metal content and the amount of thermally conductive inclusions. It deteriorates the products characteristics insulating. Thickness up to 1.5 mm is ineffective for building profiles bearing structure as the manufacturing process steps busy pillars and beams in the form of insulation frames, particularly frame members of the type with inclined roof truss profiles types and total value with appropriate suppressants compared with rational design solutions chosen designs in the form of solid wood, metal rolling model or concrete elements of the base plate. Supporting frame reinforcement is a roofing profile, it increases metal content, and as a result, thermal conductivity and thermal resistance worsens. There is known as multi-layer construction panel, adopted as the prototype of the claimed element of structural panel light multilayer unit having its inner frame made as a collapsible frame, the unconstructive and plating insulation, with the frame made of galvanized perforated therm profiles and containing the lower and upper slide the U-shaped profile with limb edges made in one direction, installed between the vertical edges of C-shaped profile arranged in a row at equal distances from each other in the longitudinal direction of the guide and rigidly connected with them by fastening elements and thermo perforation made in the form of elongated holes arranged profiles in the longitudinal holes, wherein the holes in different areas are located across the width of the profiles disposed on mutually alternating manner. As the material of the inner cladding there is applied double gypsum sheets, and the outer cladding material is the fiber cement board "Fibrit" or other finishing material. The non-structural insulation material is the heat insulation slab or cellulose mineral wool insulating "Ecowool." As the fasteners there are used galvanized self-tapping screws for therm profiles. The authors point out that the structural panel is designed for high-rise building [Patent RU 55393 for useful model «Multilayer structural panel », IPC : E04C 2/26].

[0013] In fact, this structure has so many defects to make it dangerous and unsuitable for high-rise construction.

[0014] Calculations for therm profiles primarily stated in the reduction of the geometric characteristics of the cross-sectional profiles for the perforation length, depending on the profile height and thickness.

[0015] Such a perforation, leading to strength decrease and substantial decrease in wall profiles estimated length coefficient, angle stiffener utes to the local stability loss. Therefore, the effect of the therm profiles walls perforation is considered in the wall thickness reduction calculation for a factor kr = 0, 7 under bending and for compressive ratio k_r = 0, 7 under bending and for com-

pressive ratio $k_r n$ = 0, 45... 0, 65 as cutting off. When cross-section calculating the perforated part is calculated as the universal hole in the whole volume. The calculation is made with graphs on the basis of standard loads. Total results safety factor is 1.7. In addition, it is very difficult to predict how perforated construction will act over time, showing its plastic and fatigue characteristics.

[0016] Perforation advantage as the possibility of reducing heat and eliminating the so-called "thermal (cold) bridge" is very disputable from the point of view of theoretical physics, as most of the metal characteristics s, particularly high electrical and thermal conductivity, are caused mainly traffic free (valence) electrons. In addition, the thermo perforation technology as the way of forging method "thermo cutting through "(thermo perforation) adopted in the prior example does not consider covering the edges of the through-holes with a protective layer while perforating, as was originally intended by perforation equipment developer SAMESOR (Finland). Consequently, sufficient corrosion-resistant lightweight steel structures made from cold-formed sections may deteriorate in a short period due to electromechanical corrosion caused by aqueous solutions of electrolytes, which is result of microelements.

[0017] Thus, therm profiles are not reliable in corrosion resistance conditions. The application of facing plates with magnesite without insulating gaskets and seals to protect the metal frame panel from corrosion and mineral wool made of glass fibers or strength rock wool with organic binder affects the durability and reliability as chlorides and oxides of magnesium, as well as chemical compounds such heaters in conjunction with moisture form the aggressive environment, accelerating the corrosion process.

[0018] In this construction, the building panel is provided per floor structure reinforcement, with taken into account increased wind loads directly proportional to the building floor height as to by construction norms and rules. Not taking into account the fact that number of building storeys there shall be applied the strengthened structures. From the description it can be assumed that the amplifiers are not provided at all. Correspondingly, the amount of deformation in which cracks form in a galvanized coating and corrosion resistance is broken.

[0019] Fiber cement slab constructions "Fibrit" used for the siding are heavy, which increases the load on the construction and the screws, and leads to instability and fragility, moreover, these plates are harder and more brittle than magnesium oxide boards, increasing the structures fragility. There are compounds and profiles of the cladding panels used for construction in the calculations, but not engineering approvals, compliance with which to increase the structures reliability and durability, applicable only for factory-built structures.

[0020] In addition, this structure is intended to be assembled on the construction site, while there are large variations and inaccuracies in the assembly, as there are no knot turndowns, having no centering holes and special lugs to reduce the "human factor" for speed, accuracy and panel assembly, which also deteriorates strength and durability of the building.

[0021] Frame sections are connected to this design self-tapping screws in the panels for any number of storeys of buildings, at the time, it is known that the upper floors of high-rise buildings may arise additional shear load resonant vibrations from the construction of ground tremors and wind speed, with the increase in number of storeys increases proportionately and wind load, and so the impact of destructive factors. Accordingly mounting profiles on the screws connecting the panels with a tolerance is from 1 to 3 mm, working on the cut, does not provide the required building envelope strength, showing clear fragility of the panel structure.

[0022] Furthermore, due to the ecowool high hygroscopicity, it can be used for solid insulation layer without compensating devices and wicking inserts. There is no such a device in the descangle stiffener ed structure. For the reason there is the condensation and internal moisture in the insulation increases, whereby the therm profiles rust, reducing durability.

[0023] One of the ways to improve porous fibrous insulation panels is to develop the knowledge about the structure of these materials, its influence on the sorption-desorption in the envelope (wall buildings), as well as the development of appropriate forms of construction [V. Guriev, A. Dmitriev, I. Romanenkov, T. Uhova, S. Heiner. Principles of effective non-combustible insulation and translucent materials and structures. The Russian architectural construction encyclopedia. Volume U. Science, materials and technologies in the construction of Russia in XXI century.- M., VNIINTPI, 1998].

[0024] The actual durability of this design is 5 years. It is unacceptable for multilayer structures with effective insulation design as the lifetime is 50 years [Regulations on the organization and reconstruction, repair and buildings, facilities and utilities of social and cultural services maintenance. BCH-58-88 (p), Goskomarhitektury. - M, Stroyizdat, 1990].

[0025] Also in this structure , the question of the condensation drainage and the man-triggered of moisture flow isn't solved (in case of an accident), became a wet heat-insulating layer can be chilled in the winter, and that would significantly worsen the panels service property.

[0026] As the prototype way of production of the sandwich panels construction as a primary standard, and as a declared way of production is taken as an element of the structural panel. They are punched, collected as frameworks of construction panels, quilted with taptites (screwed up with self-drilling screws), then shoot them, and cover a framework with a frost-protecting material, protect it within with the vapor proof firm and internal stave, and from outside with a g-sort film, a warmth-keeping jacket and an external mat. Thus, for the erection grating of a wall panels on the mounting table the top and U-typed gage material bottom, fix them horizontally, to the U-typed gage material bottom the vertical racks is set

from the C-shaped profile to which the short breastplate from the U-typed gage material for the device window and doorways are fixed, stitch all broach units and connections by taptites or bullets, and for assembly of a floor slab at the mounting table stack C-typed gage material horizontally, and U-typed gage materials - pedimental, uniting two C-typed gage materials in the I-beam with the help of a self-drilling screws and placing two-I-beams in a parallel to each other horizontally, after that, on a site of an assembly, the unilateral construction panels are placed together, establishing a waterproofing film, covering a framework with a magnetite plate and connecting it to a framework with the self-drilling screws, and for assembly of two-sided panels in a ready-unilateral panels on the erection side of communications the occur aged arm is put within the inner conductor for drawing on a building site of electric cables, cables of communication, heating pipes. After the communications installation, they move on a heat-insulating site where the densely fill emptiness of the construction panel with a cellulose heat insulation, then a noise-attenuating belt is establish , a vapor barrier film and a magnetite plate, sewing up with the self-drilling screws, further unilateral and two-sided construction panels are placed on a site of an external finishing where they are decorated with the front finishing materials. Yunizol is used as a cellulose insulant. Unilateral panels are decorated with an Icenin isolation. As front finishing materials there is used the mineral cotton facade, acrylic plaster, hinged ventilated facades, wooden bars, a siding, a brick, a stone [Patent UA 38599 for useful model «Structural panel method of manufacture», IPC : E04B 2/02].

[0027] However, in the known structure insufficiently saved from the corrosion the easy steel thin-walled structure s executed from the cold-bent section, can collapse with a speed from 0,004 mm/year soon, because of the electro mechanic attack , which is caused by aqua system and exists as a result of an action of micro elements.

[0028] The electrolyte is the atmospheric moisture containing CO2, but most often other chemical compounds. On metal water is condensed ,which contains a quantity of salts. The small layer of the electrolyte solutions creates the conditions promoting electrochemical corrosion.

[0029] As a result, despite of that, the prevailing part of a metal element remains almost untouched with corrosion, the structure can be quickly collapsed owing to the emergence even in some places of deep corrosion ulcers. In addition , tension from torsion increases the speed of corrosion, cracking by some tens percent. Besides, a thin-walled steel elements can't adjoin to the construction materials containing plaster, magnesium chloride, coal or coke ashes, and also a coke slag , as they cause a fast steel corrosion.

[0030] It is necessary to analyze the intense of a deformed condition of elements at structure of such panels treat more carefully and to select the profiles with some notorious stock or to apply an additional amplifiers both, in knots and in the planes, that is not done in the known structure [Yan Brudka, Mechislav Lubinski, edited by PhD in Technical Sciences S. Karmilov «Light constructional steel work»].

[0031] In a known way, a vapor resistance insulates are applied. Therefore without a compensating devices and a moisture water-wicking filling pieces , in the described structure ,such devices are absent, the moisture in them, that will lead to the shrinkage and deprivation of a thermal covering capacity [V. Rudenko, A. Panin, A. Zholudev and others «Thermally insulation in goods-producing industries. - M., Publishing office "BSG ", 1996]. The formation of the condensed water vapor and an increasing gain in the moisture of an insulant, leads to corrosion development therefore profiles corrosion, that reduces the stain of a gauge material. Besides, in a known way the performance of the connecting elements isn't provided; the number of the technological repartitions are of more amount, the profiles are made not of coil, but of the plate steel that is irrationally and less technologically. Processes of profiles connection , connections of lining of facings with a grating and drawings in an external heat-insulation layer aren't automated. Also in one of the known ways of a computer-assisted control of the technological processes and a computer quality control isn't applied.

[0032] As in a known structural panels, the ways of their production and erection, the main technological processes are burdened with the increased costs of a man-handling materials, a customizations and mechanisms on an assembly building (or to a floor), the technological pauses are connected with the drying desiccation of the surface, a numerous dubbing and smooth machining, are directly depend on a professional level and the qualification of the personnel, acceleration of such processes are impossible without the cardinal change of the way of production of building envelops, allowing significantly to reduce the number of technological operations, connected with the damp processes and their input in hours of labour. Besides, the use of the vapor resistance warming systems increases a permanent water content, that leads to the impedance factor of a heat transfer process.

[0033] Proceeding from the above, the task was to put the real invention in a basis of: to offer a Structural panel light sandwich unit, to uniform the walls, coverings and the floor structure, - not interfering diffusion and a moisture vapor transmission, completed with the system of the removal and other liquid condensing, for decrease in an indicator of the residual humidity, supplied with the system of the connecting elements, having a full external finishing for a year-round erection of the elements of panels, and thus, having the reduced thickness, the smaller weight allowing significantly to reduce hours of labor input and energy, intensity of the production and installation, at the expense of decrease in the number of technological operations connected with the damp processes, cars and the mechanisms, giving the chance of reduction the

terms of structuring and construction, with the indicators of fire resisting property raised, sound stripping and a frost protection, and also the way of production of an element of the easy sandwich structural panel, allowing to unite in the program structuring product, production with the monitoring system and audit of the technological effectiveness of an each process, the analysis of the terms observance, qualities, operational factors for the improvement system, a decrease in intensity and intensity of energy of construction material, creation of an efficient power buildings and constructions with possibility to control automatically the indoor climate of rooms and the solutions of the problem of a natural flushing streams of air providing, a removal of a condensed and other liquids for the decrease in an indicator of a retentively water content , taking into account, that the requirements of standards so-called «energetically passive house» (germ. Passiv haus) and the structure of an active house ,is helping to function in harmony with buildings, with the nature and people to be in a message with them in ecologically rational way of life. The good architecture, internal microclimate and ecologically safety structure s aren't less important, than the decrease in consumption of energy resources [W.Feist Das kostengünstige Passivhaus - Proektbeschreibung/ Arbeitkreis kostengünstige Passivhäuser. Protokolband Nor 1 Darmstadt 1996. s. 9 - 21, W.Feist Gestaltungsgrundladen Passivhäuser/ Verlag das Beispiel, 2001. Passivhäuser].

[0034] Invention is the problem to solve, because in the element of the multilayered easy construction panel, containing an internal framework, executed in the form of the steel dismountable iron frame containing transpierce horizontal bottom and top guide member elements between which the punched vertical stud elements rowed in the fore/aft direction of directing elements and rigidly related by means of transferring elements and joint connections are established, and also an inside heat-insulation layer, both external and internal facing work, thus, a horizontal and vertical elements are executed in the shape of steel profiles, and profiles of vertical elements have C-typed sections.

[0035] The framework elements are represents the finished details, thus the horizontal details are also executed in the shape of the profiles of a C-typed section and also include the horizontal cofferdam, thus the vertical and horizontal details are connected and have in joining junctions in the additional perpendicular turnover of a short shelves of a trapezoid shape, the perforation of the details is executed in the form of cross and longitudinal carvings under the shaped section, metal, rolled or wooden elements of gaining of a grating, and also in the form of technological break-through and the directing pins - for strengthening of docking device by an additional edges of stiffening rib, the inside heat-insulation layer is three-layered executed, in the form of two layers of a cellulose heat insulation between which an internal temperature filling piece is located and inserted with an internal vertical blast chambers, by drainage channels and the condensate-collector channels, connected among themselves in the uniform system, an internal and external facing work are executed by the national teams, in the shape of a fish joint and the constructional fastening knots, an external laid on joints and the horizontal P-typed profiles are covered with an external heat-insulation layer and attached to an external surface of an external facing. Thickness of the steel details of a framework is 0,5 - 1,2 mm. Frame details can be covered with at least one of the additional protective demolition.

[0036] Fastening elements of the joint connections are made as the shape of screwed connections, and also connections on rivets, on the basis of the bonding and welding or connections by means of cold punching with formation of geometrical and force closure.

[0037] Structural panel light multilayer unit contains additional intensifying elements - metal profiles, wooden elements and elements of details of lining- attached to regiments of details of a frame in the form of the C-typed profile by means of curved and inverted «long tab», and also carvings, break-through and guiding rail pins of the frame part.

[0038] The connections of the punched technological cross and the longitudinal carvings («long tab») with an augmenter of a frame structure is reached at the expense of an application of glue, screw connections, and for metal amplifiers profile, also at the expense of the bonding, welding and cold punching with the formation of the geometrical and force closure. On details of external and internal fixing holes precast claddings fastening knots with an additional shaping are executed. In the knot of a fastening details of the external and internal national team of facing the hollow metal core with a bonnet in which the through a full-length bore is installed.

[0039] Details of the external and internal national teams facing work of the moisture resistant, fire-resistant and heat-insulating sealants are supplied with. The inside heat-insulation layer consists of two external layers of the cellulose insulant, which have been strongly connected with an internal temperature and a moisture-regulating is inserted. Condensate collector fairways have a moisture vapor transmission material with the twisted filament with the metalized coatings into them. There are the connecting elements in an element of structural panel, tapping point are executed for mating with. The structural panel light multilayer unit has on perimeter connecting grooves under connecting gains are : vertical, horizontal, angular. The knot of the panel element connection and connecting element forms the «Pressure breakdown labyrinth».

[0040] Assigned task is determined by the method of the light multilayer structural panel production according to which steel framework produced in the form of C-shaped profile, perforate them, cut and then make the frame of the structural panel element in the shape of stripped frame. Then connect blocks of the frame. Inside the frame inner heat-insulating layer is installed and outer panel is covered with external insulating layer.

[0041] As the framework elements completed details produced in a form of C-shaped profiles with perforation in the form of punching, carvings and embossing on the one rolling mill with one industrial process operated by the bundled software. Framework is built from horizontal details (directed: top and bottom seals) and transverse details (balusters). For all that horizontal and transverse details - balusters in a form of C-shaped profiles are covered with fireproof, waterproof and heat-insulating consolidators. Then transverse details gradually fixed with horizontal elements (seals and guiding). Inner heat-insulating layer is three-layered. There are two layers of cellulose heat-insulating material between which temperature-humidity regulating insert is situated fulfilled with inner transverse air chambers, drain and condensate-collecting channels connected into unified system. This heat-insulating layer is inserted within seals gradually fixed transverse elements-balusters. After that these elements fixed on an assembly table by horizontal elements (guiding and seals) and heavily fixed by the fasteners , nodal connections and at least one automated industrial process. Inner and outer lining is combined. And the inner lining elements are put on the one frame's face and then fix it with the frame using at least one industrial process. After that structural panel light multilayer unit is inverted lined side down and attached through consolidator to the second frame's face with the usage of at least one industrial process. On its external face outer fish joints and P-shaped profile is fixed. On the external face of exterior cladding with P-shaped profile heat-insulating layer is applied. Then frame's element is scrolled to the exterior cladding segment where its final external decoration is made.

[0042] Transverse rack-mount elements guiding's and seals of C-shaped profiles are made of 0,5-1,2 mm width steel with possible future application with at least one additional protective layer. On the horizontal details' flanges - guiding and seals of C-shaped profile at the junction additional transverse trapeziform bends are made. Fixing systems of nodal connections are made in a form of screwed connection and clinker connection on the base of soldering and welding and also cold forming connection with formation of form and force closure. Additional amplifying elements on the pane attached to the flanges of C-shaped horizontal and transverse frame's details with the help of the bow and inverted lugs (nibbling's), and also nochings and guiding details embossing of the C-shaped frame's profiles- profiled metallic and wooden elements of revetment details with at least one automized industrial process. Performing technological diametrical and axial carvings (lugs) are connected with additional frame's amplifying elements by the use of soldering, welding and cold forming with the form closure formation. In the in the frame of structural pane's element composed mounting sockets for attachment with connection elements. In the inner heat-insulating layer external layers of cellulose heat-insulating material are fixed with inner temperature-humidity insert. On the details of external and inner precast linings attachment fillings with additional millings and securement apertures are made. External heat-insulating layer is made of ecocotton and caulked with the junction pressing with at least one zero-emissioned automized connection. At the attachment fitting of the detail of precast lining hollow metal core with a cap. In which central reach-through hole is installed. Assemblages of external and inner precast linings implemented with waterproof, fireproof and heat-insulating consolidators. In condensate-collecting channels there are stretches from vapour permeability material with interwoven strings with metalized covering. Identification mark is on every detail. In ready-made attachment nodes of connection grooving of the structural pane's elements are installed in line with designation without selection and fitting of connection elements including transverse, horizontal and angular.

[0043] Pane's nod and element connection is made with the formation of the pressure breakdown labyrinth. The design of the element of structural pane, prepared frame filling, production of frame's elements and coating details, administrating the connection process, the attachment of the details to the frame. Control over the consistency of laying of inner and external heat-insulating layers and quality control of all industrial processes and operations exercised by at least one automated bundled software.

[0044] The invention character is explained by drafts. There is the structural panel light multilayer unit with connecting elements, the communication chart of the connecting details in Fig. 1

Fig. 2 - same, scheme of the horizontal section.

Fig. 3 - same, scheme of the vertical section.

Fig. 4 - same, application scheme of the frame amplifier element, metal and wooden

Fig. 5 - same, application scheme of the sheet frame amplifier element.

Fig. 6 - same, connecting scheme of structural panel with corner connecting element, coin.

Fig. 7 - same, connecting scheme of structural panel with horizontal element connection and finishing strip.

Fig. 8 same, connecting scheme of structural panel with horizontal element connection.

Fig. 9 same, connecting scheme of structural panel with corner connecting element (inside corner).

Fig. 10 same, frame elements connecting scheme.

Fig. 11 same, frame elements connecting scheme

by cold punching making form and force closure.

Fig. 12 same, cladding unit fastening scheme.

Fig. 13 same, cladding attachment point fastening scheme.

[0045] Structural panel light multilayer unit consist of the basic construction and external laminated protective decorative coating. Basic construction is a basis of the structural panel light multilayer unit implemented in a shape of demountable frame 1, which consists of horizontal bottom fence 2 and horizontal upper fence 3, between which traversed seals are installed 4, ranked in lengthwise direction of horizontal fences 2,3 that are connected by horizontal seals 5, and horizontal details 2,3,5 braced with transverse seals details by the use of fastening elements 6 and/or nod connections 7.

[0046] All these frame details 1 are made of perforated steel profiles of C-shaped cut with short flanges 8, on which nodded connection is perpendicular to flanges 8 folding lines 9 of trapeziform are made. On horizontal elements in a form of C-shaped profile bottom 2, upper3 guiding's and seals 5 and vertical rack-mount element in a form of C-shaped profile perforation is made in a form of technological opening 10, diametrical and lengthwise 12 carvings (lugs) under profiled metallic 13a, foliated 13b and wooden elements 13c of the frame strengthening and also in a shape of guiding stamping 14 and industrial notching's 15 for nodded connections 7 strengthening by additional elements 13 of frame strengthening fig,3.

[0047] Horizontal details - bottom 2 and upper 3 guiding's and seals 5 and also transverse frame's 1 rack-mount details 4, connected with the help of steel clinkers, threaded screw, soldering or by the use of cold forming with the formation of form and force-closure 16a, round 16b and squared shape.

[0048] To the frame's details 3, 4 lifting lugs attached.

[0049] Structural panel light multilayer unit may contain additional element 13, frame's strengthening construction, attached to the flange 8 horizontal elements 2,3,5 and transverse elements 4 in a form of C-shaped profile is also with the help of cambered 11 and inverted 12 "lugs" and notching's 15 of horizontal elements 2,3,5 and transverse frame's 1 elements 14,5, flat-pattern parts 18 connected with perforating technological diametrical 11 and axial 12 notching's ("lugs") and also operational opening 10, notching's 15 by the usage of sizing, spiral connections and for profiled metallic strengthening elements 13 also with the use of soldering, welding and cold forming with the formation of form and force closure 16.

[0050] Between shot flanges 8 of horizontal elements 2,3,5 and transverse elements 4 C-shaped frame's 1 profile situated inner heat-insulating material layer 19, which is three-layered in a form of two-layers 20 of cellulose heat-insulating material and between them situated temperature-humidity regulating insert 21 fixed with the layers 20. Insert 21 has inner vertical air boxes 2, drain 23 and condensate-collecting channels 24 that form a uniform system. Condensate-collecting channels 24 include stretchers 25 that are produced from vapor-permeable material interweaved with threads with metalized covering.

[0051] Inner 26 and outer 27 covering pane's element is made of separate details 18 that are supplied with the waterproof, fireproof and heat-insulating compactors 28 according to the State Standard 481-90, and they include fish joints 29 and attachment fitting 30 with additional millings 31 and mounting hole 32. In attachment fitting 30 external 27 and inner 26 split basques metal core 33 with a cap 34 where implemented a reach-through central hole is situated.

[0052] To the external surface of the external split basques 27 attached horizontal P-shaped profile 36 and external fish joints 37, that are covered with heat-insulating layer 38, that consists of heater 39 (ecocotton) and fixed system 40 to foliated element 18 and basque detail 27 and/or suspension system 41 for the attachment of hinged system 42 , including aerated systems, that are attached through foliated elements 18 of basques 26, 27 to the metal framework 1 in accordance with project documentation (architectural decisions).

[0053] Structural panel light multilayer unit has connection nodes in which connective elements 44 and also transverse connection 45, horizontal connection 46, angular connecting elements 47 are situated. In perimeter of the structural panel light multilayer unit has connecting grooving's 48 for elements connection 44, vertical elements 45, horizontal elements 46, corner elements 47a and 47b and nod connector 43 of the structural panel light multilayer unit and connection element 44, 45, 46, 47 form " pressure breakdown labyrinth"

[0054] Nodal connections 43 of structural panel light multilayer unit hardware used for technological cells 49 production that are necessary for stringing, additional heat-insulating, filling with lightweight concretes and other mixtures. From the inner front face of the structural multilayer unit under coating elements 26,27 there is a layer 50 made of polyethylene vapor-tight film.

[0055] Connecting grooves 48 are also used to connect to finishing strips 51.

[0056] Fig. 3 shows the basic structure 52, a multilayer light structural panel, and an external protective and decorative laminate coating 53 of multilayer light construction panel unit.

[0057] External (inner) or obverse surfaces of these panes can be supplied with the embossed productive coating, heat-insulating (façade), hinged system (crate) and also include the option of extra input for many anchoring elements on façade and facing part of structural panel units of exterior walls.

[0058] Production of frame's details in a form of cold-bented metallic C-shaped profiles of structural panel light multilayer unit is made by using of rolling method. Roll-fed galvanized steel or colored steel with or without pro-

tective coating. Additionally on the rolling mill, with the usage of stamping method on the C-shaped horizontal 2,3,5, transverse 4 manufacturing holes 10 performed. Diametrical 11, lengthwise 12 notching's ("lugs"), guiding stamping 14 and notching's 15 are made. Then details are cut to the length. For the steel dismountable frame 1 production with the usage of horizontal bottom 2 , upper 3 guiding details and for transverse rack-mount detail 4 , only C-shaped profiles are used. On the short flanges 8 bends 9 are of trapeziform. All these operations are made at one-rolling mill and as one producing process.

[0059] During the frame's 1 adjustment transverse rack-mount details 4 C-shaped profile gradually fixed to the horizontal elements- squinches 5 and upper guiding elements 3 of C-shaped profiles. These elements are put in a line in lengthwise direction of bottom guiding elements 2 of C-shaped profile and heavily fixed by the fixing elements 6 and/or by the nodded connections 7.

[0060] Technological perforations 10, diametrical 11 an axial 12 ("lugs") are performed for the profiled metal, flat-pattern or wooden elements 13 of profile's strengthening. And also stampings 14 and technological notching's 15 for nodal connections 7 strengthening.

[0061] Horizontal bottom 2, upper 3 guiding profiles and transverse frame's 1 rack-mount profiles 4 fixed by the use of steel rivets, threaded screws, soldering (welding) or with the use of cold forming with the formation of form and force closure 16.

[0062] To the frame elements 3, 4 lifting lags are fastened 17 structural panel light multilayer unit supplied with additional amplifying framework elements 13 fastened to the C-shaped flanges 8 and to cambered 11 and inverted 12 "lugs". And to the horizontal 2,3,5 , transverse elements 4 in a form of C-shaped frame profiles notching's.

[0063] These profiled metal, wooden amplifying 13, frame elements 14,15 and sheet details 18 connected with perforating manufacturing diametric 11 lengthwise notching ("lugs"), manufacturing holes 10 and notching's 15 by the usage of adhesion and screwed connection. And profiled metallic amplifying elements 13 by the usage of soldering, welding and cold forming with the form and force closure 16 formation.

[0064] Inner heat-insulating layer 19 is made to be three-ply in the form of two exterior layers 20 cellulose heat-insulating wool - cellulose wool between which there is an inner moisture and water regulating insert 21, made according to an extrusion technique and having inner vertical air-chambers 22, drain canals 23, as well as condensate collectors 24, in addition to it there are zones made of vapour-permeable material stranded with threads with metallized coating 24 in condensate collectors 25. Inner vertical air-chambers 22, drain canals 23 and condensate collectors build up an integrated system 24. The layers of cellulose wool with moist coating and sealing 20 are connected to the inner insert 21.

[0065] Details of the inner 26 and outer linings 27 are made to be assembled and also it is provided with water- and fire-proof heat-insulating sealing's 28, in addition there are fish joints and mount fittings with additional shaping and fixation holes made on the inner 26 and outer 27 lining details, there is a metallic hollow core with a head in the detail fixation of the outer and inner assembly linings. There is a central hole in the hollow core head 35.

[0066] There are U-channels 36 and outer fish joints 37 fixed to the outer surface of the lining 27, then there is a heat-insulating coating 38 applied on the outer surface of the lining 27. This coating consists of heat retainer 39 and mount systems 40 to the sheet articles 18, lining details 26, 27 and/or for attached system 42 fixation. The fixation is made through the sheet articles 18 and lining details 26, 27 to the metal structure of the frame 1 according to the design documentation (architectural decisions).

[0067] There are connections 43 on the light multilayer structural panel. There are connecting pieces 44, 45, 46, 47 on this panel, and there are dadoes 48 along the element perimeter for connecting elements 44 also there are vertical connecting elements 45, horizontal connecting elements 46, angular connecting elements 47a and 47. The element connection 43 of the light multilayer structural panel and connecting elements 44, 45, 46, 47 are made with "labyrinth ring" formation.

[0068] Fitting connections 43 of the main element construction of the light multilayer construction panel serve for technological vacuum 49 for laying of communication, additional heating, filling with light concrete and other mixtures. There is a layer 50 of polyethylene vapor-tight coat on the inner, face sides of light multilayer construction panel element under the lining details 26 and 27.

[0069] Panel facial (internal) or outside surfaces may be supplied with a protective coating, insulation (facade), mounted system (furring) and there is also the variant of anchor items of structural elements facing parts on the facade and building exterior wall panels. Connecting grooves 48 are also used to connect the finishing strips 51.

[0070] Fig. 3 shows the basic structure 52 multi layer light structural panel with covered outer protective and decorative laminate coating 53 element multi-layer light structural panel.

[0071] There is a marking made on all the panel elements for convenience of identification and assembly. According to the first «prefabricated» variant suggested in invention of the light construction panel element (of the main construction and connecting elements) manufacturing method suggested, details are manufactured view of an assembly set. Then elements of the light multilayer construction panel are supplied to the stationery assembly facilities and (or) mobile, located on the building site or districts of compartment building, where final assembly into the large panel elements of building envelopes for the subsequent delivery to the construction site is performed (with protective and decorative layer or without it). Thus, all main technological operations are carried

out with application of conveying principle, at the same time operations connected to damp processes are performed as a rule in the horizontal position at the temperature conditions effective for each technological process, which decreases thrice the ratio of labour to output, to reduce the time of light multilayer construction panel elements manufacture. The existence of the typical connections and junctions of the connecting elements as well as technological channels for communication laying including sprag tube (hose) for inner engineering communication laying, additionally increases degree of completion of the light multilayer construction panel.

[0072] Assembly set is a set of assembly details of the main construction of the light multilayer construction panel details and details of protective and decorative layer of the mounting unit - one panel, produced according to the design documentation in the sufficient transportation packing. There are connecting, fixing, mating and mounting elements (angle staff, battens, cantilevers) are included into the complement of the assembly set, also there are connecting elements with element-by element, detail-by-detail and nod-by-nod marking made on the surface according to the assembly scheme. They are assembled and packed into the unit load on the same facility.

[0073] According to the second "industrial" variant the assembly hall of the parent enterprise, manufacturing assembly sets there are large-panel elements of the building envelopes - elements of the light multilayer construction panels assembled and loaded to the building site. Elements are loaded with outer protective and decorative laminated coating: heating system, hinged prefabricated system or with protective and decorative coating (or without it).

[0074] The rayon of delivery by the first variant is unrestrained, by the second it is not more than 300 km. Light construction panels in the final condition ready for mounting are fixed in the in the hermetical unit load (provided with packing list): in an unit load and returnable container are ready for «just in time» mounting.

[0075] There are unit loads unpacked, additional element fixing is performed and formed elements of pane are hanged on the building site. Those additional elements ensure maximum lock on of all the horizontal and vertical elements. Mounting scheme and flow diagram are sent to the construction and mounting organization. Light construction panel ready for montage and assembled form light multilayer construction panel elements is mounted in all seasons also at low temperatures up to -15 °C, montage is performed by 3 - 4 assemblers into the position mentioned in the erection drawing. It takes up to four times faster than the assembly of a wall construction from brick of blocks. Such an erection drawing allows to reduce intensivity of the facade decoration, there are link up points of the light multilayer construction panels, façade connecting elements are hanged, finishing coating layer is applied (colouring). Intensivity of the assembly process of the building envelope is reduced up to four times, heavy-weight machines and mechanisms up to 5 times, it allows to speed up the building process in average up to 2-3 months. The reduction of large-panel product weight in not less than five times (in comparison to the traditional blocks, concrete panels and products made of bricks) allows not to use special vehicles for transportation (CSU and PC systems), with restrictions in weight and quantity (up to 6 large-panel units). Light construction panels are transported by truck-trailers and truck-semitrailers (up to 20 large-panel units in assembled condition).

[0076] After assembly the building envelopes from light multilayer construction panels connected with each other by special connecting elements form a regulated ventilation system (cooling system)in summer period and condensable and other liquid withdrawal (formed or got to the system of drainage canal) in autumn and winter. This system is applied to reduce the residual moisture indicator and possibility of heat insulating properties of the building envelopes at the expense of convective currents controlled by special valves (plugging the system during winter period of operation) in the buildings erected using light multilayer construction panel elements.

[0077] In addition, there are no thermal profiles with perforated walls used, because it prevents cold joint formation, as it is in one of analogues [Patent RU 62128 for useful model «Structural design for construction of low-rise building with metal frame», IPC : E04B 1/24] also it prevents "thermo perforation" in the view of lengthened holes across the width of the profile, as in prototype [Patent RU 55393 for useful model «Multilayer structural panel », IPC : E04C 2/26].

[0078] Number of floors with use of light multilayer construction panel is restricted by carrying capability of the frame only: steel frames, formed and fabricated sections, frames with wooden beams, reinforced metallic ledgers (for buildings and constructions up to 4 floors, reinforced-concrete, one-piece or assembly frames, as well as combinated frames: with reinforced-concrete struts and metallic beams, it allows to make the number of floors unlimited. It is more rational constructive decision then [Patent RU 62128 for useful model «Structural design for construction of low-rise building with metal frame», IPC : E04B 1/24] and [Patent BY 7651 for useful model «Profile set for rapifly erected low-rising building", IPC : E04C 3/07].

[0079] According to the «industrial» and «prefabricated» variants there are used the following details in the quality of lining: lining details manufactured from sheet material with milled fixation holes. Additionally there can be made joint "quarter bat" on the lining details by the milling. In the known solutions there are sheet materials used, not lining details. So in analogue [Patent RU 62128 for useful model «Structural design for construction of low-rise building with metal frame», IPC : E04B 1/24] (there are used gypsum wall boards double gypsum-fiber sheets and in prototype [Patent RU 55393 for useful model «Multilayer structural panel », IPC : E04C 2/26] there

are used additional fiber-cement sheets "Fibrit".

[0080] The presence of assembly scheme and marking on the lining details allows to speed up the SKD assembly of the light multilayer construction panels, perform the assembly of conveyor and ensure additional possibility structural reinforcement - recovery of calculated and operating characteristics of light multilayer construction panels and details.

[0081] To improve sound proofing properties of the large-panel elements of the building envelope that structural panel light multilayer unit is made stratified and with inner air chambers 22. In the quality of inner heat insulating layer there is used 3-layer heat insulating layer 19, consisting of two outer layers 20 of cellulose wool, covering inner temperature and moisture regulating insert 21, used to improve sound-insulation и to regulate temperature and moisture regime, to collect and derivate condensate stream to the inner drainage system of inner (steam pressure) and outer ("dew point"). Also it is used to derivate any emergency leakages from within and from without of the building envelopes.

[0082] The main construction of the light multilayer construction panel element at cost of use of moisture-resistant, fire-resistant and heat-insulating sealer 28, 3-layer heat-insulating layer 19, inner air chambers 22, "labyrinth box" effect in element connections, at cost of "mortise and tenon" connection of connecting elements, lining details 26 and 27 (glass-magnesite sheet), allow to reach the impedance factor of heat transmission 3,2 $M^{2\cdot}$°C/Vt, isolation index of air noise 50 dB, noise isolation 45dBA at main construction thickness 190 mm.

[0083] To improve heat-insulating properties of large-panel elements of building envelopes in the multilayer structure of the main construction of the claimed element of the light multilayer construction panel perform the outer vapor-permeable heat-insulating layer 38 of the thickness not less than 30 mm, resistance of heat transmission of the glass-magnesite sheet, used for lining details 26 and 27 , not more than 0,26 Vt/m°C at density not less than 900 kg/m^3 for outer lining elements manufacture 27 and not less than 600 kg/m^3 for lining detail manufacture 26 facial (inner) areas.

[0084] Lining details 26 and 27 of the claimed element of the light multilayer construction panel is made from magnesite or glass-magnesite sheet (glass magnesium board, dolomitic-fibrous sheet, xylolite-fibrous sheet, KWL), as a material, possessing high moisture-resistance, fire-resistance, elasticity (flexibility) and less weight at increased density in comparison to cement-and-wood-particle slab and its analogues made on the base of milled plant material - "wood and fabric" concrete. Lining details 26 and 27 of the claimed light multilayer construction panel element form face (inner) ad outer surfaces of the main construction.

[0085] Application in the connections of mortise and tenon, joggle joint types prevents moisture penetration and formation of the "cold joint" effect. "Fraggles" and "fillets" are formed by the outer fish joints 37 from strips of glass-magnesite sheet, fixed to the lining details 26, 27 through the sealer 28 to the "fraggle" details (to form a mounting fit) between lining detail stud 27 or 26 in the view of "mortise" and "tenon".

[0086] In the quality of sound deadening, moisture resistant, heat insulating and fire-resistant sealing 28 there are used details made fireproof elastic material according to GOST 481-90, additionally treated with special matter or without treatment, in the form of angle staff and/or stripes, fixed between metallic frame and lining details from outer side and metallic frame and inner lining details.

[0087] The light multilayer construction panel elements can be delivered with all the types of protective and decorative cover, heating systems, exterior finish (plaster, decorative coatings, with protective cover in the view of paints. Also as additional it is possible to use additional firring of the main construction - hinged systems (including "ventilated") from within and on the inside (from room side) according to the design documentation requirements.

[0088] The main advantages of the ready product manufactured according to the given invention is ecological cleanliness, complete reprocessability of the main used materials, significant decrease of the area of connection to the base and to the floor panels (semimounted bonding technique)n and wall thickness in 2 and more times (minimum thickness with winterization 190 mm). In comparison to the traditional small-piece products (from 300 mm without winterization and from 400 mm with it), at the expense of significant increase of heat transition resistance factor at less thickness, taking into consideration all the requirements of the applied standards of the so-called "energetically passive house" (germ . Passivhaus).

[0089] The thickness of the main construction elements of the light construction panels and building envelopes assembled from them, as well as their overall dimensions in complete condition can vary according to the design requirements to durability and heat-isolating properties of fire-resistance and fire risk.

[0090] From the light construction panels of the main construction, protective and decorative layer cover suggested in the invention of elements there can be assembled dividing walls, interior and exterior walls of buildings, self-supporting floor elements and panels covering. And the face or outer surface of the walls can be supplied with protective coating, insulation (facade), mounted by the system (crate) and there is also possible an option for additional input of multiple anchoring elements on the facade and the front of the building elements of the exterior wall panels.

[0091] The main construction of the light multilayer construction panel can be used in the combination with all types of protective and decorative coverings.

[0092] Protective and decorative coating of the multilayer prefabrication element construction of the light multilayer construction panels in the form of a curtain wall systems is performed as internal and external subsys-

tems and systems that are attached to the main structure. As a protective, decorative and technological layers there are used: "ventilated" systems, winterization systems with outer and facade decoration: decorative coatings, moldings and wall facade elements: the granite-cement facade products, granite, ashlar, siding (plastic and metal), metallic facades, composite panels.

[0093] Guiding lug, centering holes and marking allow you to assembly the items on the free selection and fitting (detail connection: stand-jumper, rack-rail). All parts are connected to the effect of mounting - tension, which provides increased strength.

[0094] The proposed method allows to make separated internal and external air chambers in the element structure of a multilayer light building panel. The difference in density of the used material - the outer and inner layers of insulation, and air chambers allow to increase rates of noise and heat insulation with reduced thickness of the inner insulating layer.

[0095] Marking applied to all parts of the element details speeds up the assembly process according to the assembly diagrams and without any time delay to determine the location of each part according to the assembly diagram and to control the correct assembly by the scan method.

[0096] Labor costs and manufacturing costs are reduced through the use of low energy materials and processes, the complexity of installation is reduced due to the fact that at the construction site there are products supplied of full operational readiness, with exterior trim and fill openings, as well as through the use of fasteners in the corner of vertical and horizontal docking sites, and reducing construction time due to the rapid installation of all-season will bring the construction industry to a new technological level.

Claims

1. Multilayer light structural panel unit, having the framework, containing an internal framework, executed in the form of the steel dismountable iron frame containing transpierce horizontal bottom and top guide member elements between which the punched vertical stud elements rowed in the fore/aft direction of directing elements and rigidly related by means of transferring elements and joint connections are established, and also an inside heat-insulation layer, both external and internal facing work, thus, a horizontal and vertical elements are executed in the shape of steel profiles, and profiles of vertical elements have C-typed sections. The framework elements are represents the finished details, thus the horizontal details are also executed in the shape of the profiles of a C-typed section and also include the horizontal cofferdam, thus the vertical and horizontal details are connected and have in joining junctions in the additional perpendicular turnover of a short shelves of a trapezoid shape, the perforation of the details is executed in the form of cross and longitudinal carvings under the shaped section, metal, rolled or wooden elements of gaining of a grating , and also in the form of technological break-through and the directing pins - for strengthening of docking device by an additional edges of stiffening rib, the inside heat-insulation layer is three-layered executed, in the form of two layers of a cellulose heat insulation between which an internal temperature filling piece is located and inserted with an internal vertical blast chambers, by drainage channels and the condensate-collector channels, connected among themselves in the uniform system, an internal and external facing work are executed by the national teams, in the shape of a fish joint and the constructional fastening knots, an external laid on joints and the horizontal P-typed profiles are covered with an external heat-insulation layer and attached to an external surface of an external facing.

2. Multilayer light structural panel unit according to p.1, **characterized in that** the frame parts are made of steel framework thickness is 0.5 - 1.2 mm.

3. Multilayer light structural panel unit according to p. 1 - 2, **characterized in that** frame details can be covered with at least one of the additional protective demolition.

4. Multilayer light structural panel unit according to p. π. 1 - 2, **characterized in that** fastening elements of the joint connections are made as the shape of screwed connections, and also connections on rivets, on the basis of the bonding and welding or connections by means of cold punching with formation of geometrical and force closure.

5. Multilayer light structural panel unit according to p. π. 1 - 2, **characterized in that** it contains additional intensifying elements - metal profiles, wooden elements and elements of details of lining- attached to regiments of details of a frame in the form of the C-typed profile by means of curved and inverted «long tab», and also carvings, break-through and guiding rail pins of the frame part.

6. Multilayer light structural panel unit according to p. 1 - 2, **characterized in that** the connections of the punched technological cross and the longitudinal carvings («long tab») with an augmenter of a frame structure is reached at the expense of an application of glue, screw connections, and for metal amplifiers profile, also at the expense of the bonding, welding and cold punching with the formation of the geometrical and force closure.

7. Multilayer light structural panel unit according to p.

n. 1 - 2, **characterized in that** on details of external and internal fixing holes precast claddings fastening knots with an additional shaping are made.

8. Multilayer light structural panel unit according to p. π. 1 - 2, **characterized in that** in the knot of a fastening details of the external and internal national team of facing the hollow metal core with a bonnet in which the through a full-length bore is installed.

9. Multilayer light structural panel unit according to p. 1 - 2, **characterized in that** details of the outer and inner prefabricated linning and facing are equipped with water-resistant and fire-resistant seals.

10. Multilayer light structural panel unit according to p. 1 - 2, **characterized in that** in the inner three heat-insulating layer external layers of cellulose heat-insulating material are fixed with inner temperature-humidity insert

11. Multilayer light structural panel unit according to p. 1 - 2, **characterized in that** condensate collector fairways have a moisture vapor transmission material with the twisted filament with the metalized coatings into them.

12. Multilayer light structural panel unit according to p. n. 1 - 2, **characterized in that** there are mounting sockets for attachment with connection elements.

13. Multilayer light structural panel unit according to p. π. 1 - 2, **characterized in that** there are on perimeter connecting grooves under connecting gains: vertical, horizontal, angular

14. Multilayer light structural panel unit according to p. 1 - 2, **characterized in that** the knot of the panel element connection and connecting element forms the «Pressure breakdown labyrinth».

15. Multilayer light structural panel unit production method, whereby as the framework elements completed details produced in a form of C-shaped profiles with perforation in the form of punching, carvings and embossing on the one rolling mill with one industrial process operated by the bundled software, **characterized in that** framework is built from horizontal details (directed: top and bottom seals) and transverse details (balusters). For all that horizontal and transverse details - balusters in a form of C-shaped profiles are covered with fireproof, waterproof and heat-insulating consolidators. Then transverse details gradually fixed with horizontal elements (seals and guiding). Inner heat-insulating layer is three-layered. There are two layers of cellulose heat-insulating material between which temperature-humidity regulating insert is situated fulfilled with inner transverse air chambers, drain and condensate-collecting channels connected into unified system. This heat-insulating layer is inserted within seals gradually fixed transverse elements-balusters. After that these elements fixed on an assembly table by horizontal elements (guiding and seals) and heavily fixed by the fasteners , nodal connections and at least one automated industrial process. Inner and outer lining is combined. And the inner lining elements are put on the one frame's face and then fix it with the frame using at least one industrial process. After that structural panel light multilayer unit is inverted lined side down and attached through consolidator to the second frame's face with the usage of at least one industrial process. On its external face outer fish joints and P-shaped profile is fixed. On the external face of exterior cladding with P-shaped profile heat-insulating layer is applied. Then frame's element is scrolled to the exterior cladding segment where its final external decoration is made.

16. Multilayer light structural panel unit production method according to p.15, **characterized in that** transverse rack-mount elements guidings and seals of C-shaped profiles are made of 0,5-1,2 mm width steel with possible future application with at least one additional protective layer.

17. Multilayer light structural panel unit production method according to p. π. 15 - 16, **characterized in that** on the short horizontal details' flanges - guiding and seals of C-shaped profile at the junction additional transverse trapeziform bends are made.

18. Multilayer light structural panel unit production method according to p. 15 - 16, **characterized in that** fixing systems of nodal connections are made in a form of screwed connection and clinker connection on the base of soldering and welding and also cold forming connection with formation of form and force closure.

19. Multilayer light structural panel unit production method according to p. 15 - 16, **characterized in that** on the framework of the multilayer light structural panel unit there are instolled the additional amplifying elements on the pane attached to the flanges of C-shaped horizontal and transverse frame's details with the help of the bow and inverted lugs (nibblings), and also nochings and guiding details embossing of the C-shaped frame's profiles- profiled metallic and wooden elements of revetment details with at least one automized industrial process.

20. Production method of the multilayer structural panel unit according to par. No. 15 16, is **characterized by** that fact that perforating technological cross and lateral holes («lugs») are connected to the additional

strengthening frame elements owing to the glued and fastener joints and for the contour metal amplifiers owing to the soldering, welding and cold forging with form and force closure formation.

21. Production method of the multilayer structural panel unit according to par. No. 15 16, is **characterized by** that fact that there are assembly mounting sockets made for connecting element coupling in the element frame of the structural panel.

22. Production method of the multilayer structural panel unit according to par. No. 15 16, is **characterized by** that fact that there are closely connected outer layers of cellulose heat insulation and inner temperature and moisture regulating insert in the inner heat-insulating layer.

23. Production method of the multilayer structural panel unit according to par. No. 15 16, is **characterized by** that fact that there are attachment fitting with additional milling and fixation holes made on the details of the outer and inner assembly linings.

24. Production method of the multilayer structural panel unit according to par. No. 15 16, is **characterized by** that fact that in the attachment fitting of the assembly lining details there is a hollow metallic core fixed with a cap where through center hole.

25. Production method of the multilayer structural panel unit according to par. No. 15 16, is **characterized by** that fact that outer heat-insulating layer is performed from cellulose wool and is thickened plane pressing at least with one automated process.

26. Production method of the multilayer structural panel unit according to par. No. 15 16, is **characterized by** that fact that assembly details of outer and inner assembly linings are supplied with moisture-resistant and fire-resistant seal.

27. Production method of the multilayer structural panel unit according to par. No. 15 16, is **characterized by** that fact that in the condensate-collecting mains there are sheets made from vapor-permeable material stranded with threads with metallized coating.

28. Production method of the multilayer structural panel unit according to par. No. 15 16, is **characterized by** that fact that all the details and elements are marked with identification.

29. Production method of the multilayer structural panel unit according to par. No. 15 16, is **characterized by** that fact that in the assembly mounting sockets of the element frame dadoes of the multilayer light structural panel there are connecting elements are disposed according to the marking on the free selection and fitting: vertical, horizontal, angular, included in the scope of supply with multilayer light structural panel units.

30. Production method of the multilayer structural panel unit according to par. No. 15 16, is **characterized by** that fact that the knot of the panel element connection and connecting element forms the «Pressure breakdown labyrinth».

31. Production method of the multilayer structural panel unit according to par. No. 15 16, is **characterized by** that fact that multilayer light structural panel unit and complete building envelope designing, frame and lining detail manufacture, frame detail connection process management, lining detail and frame fixing process management, control of density of internal and external thermal insulation layer application, quality control of all processes and operations carried out in at least one automated software system.

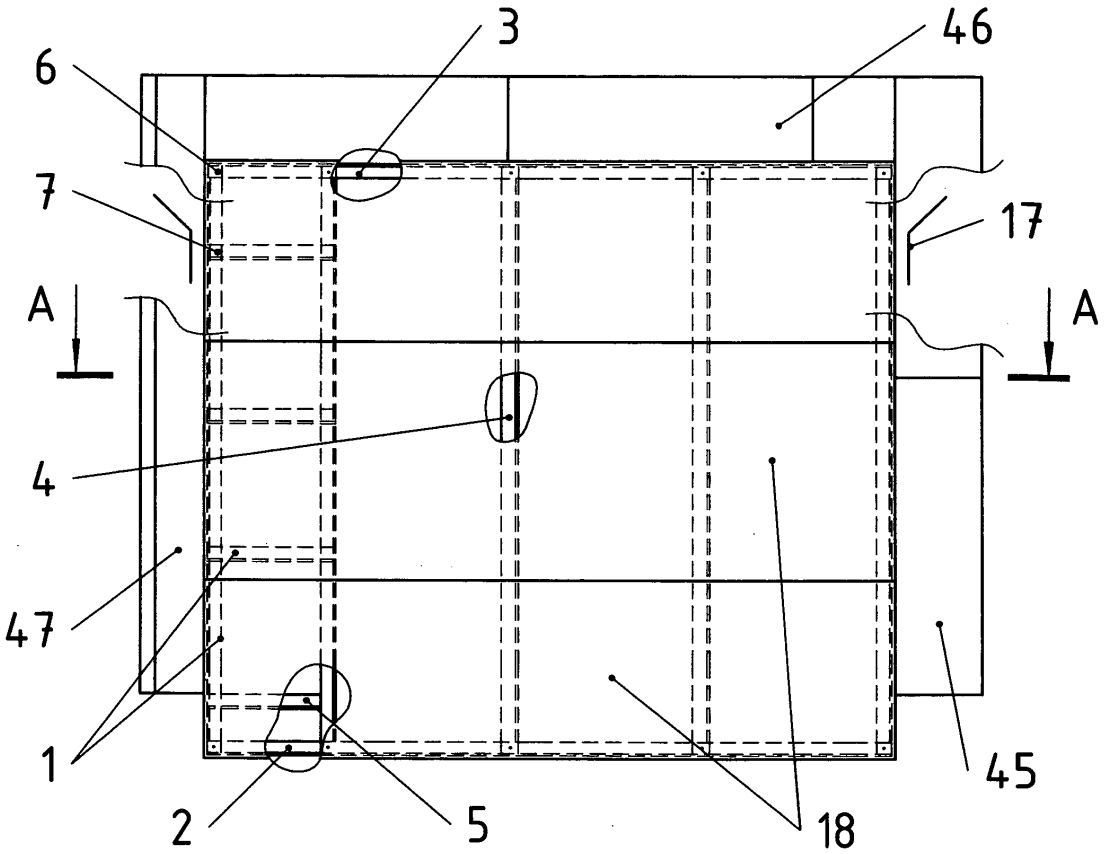


Fig. 1

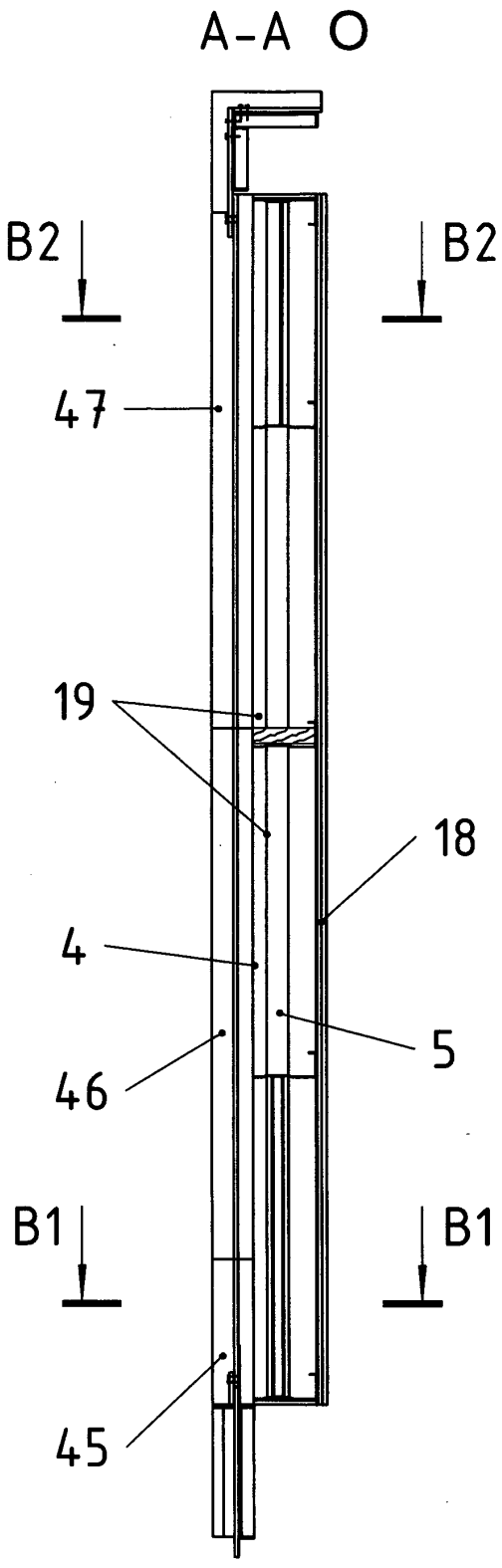


Fig. 2

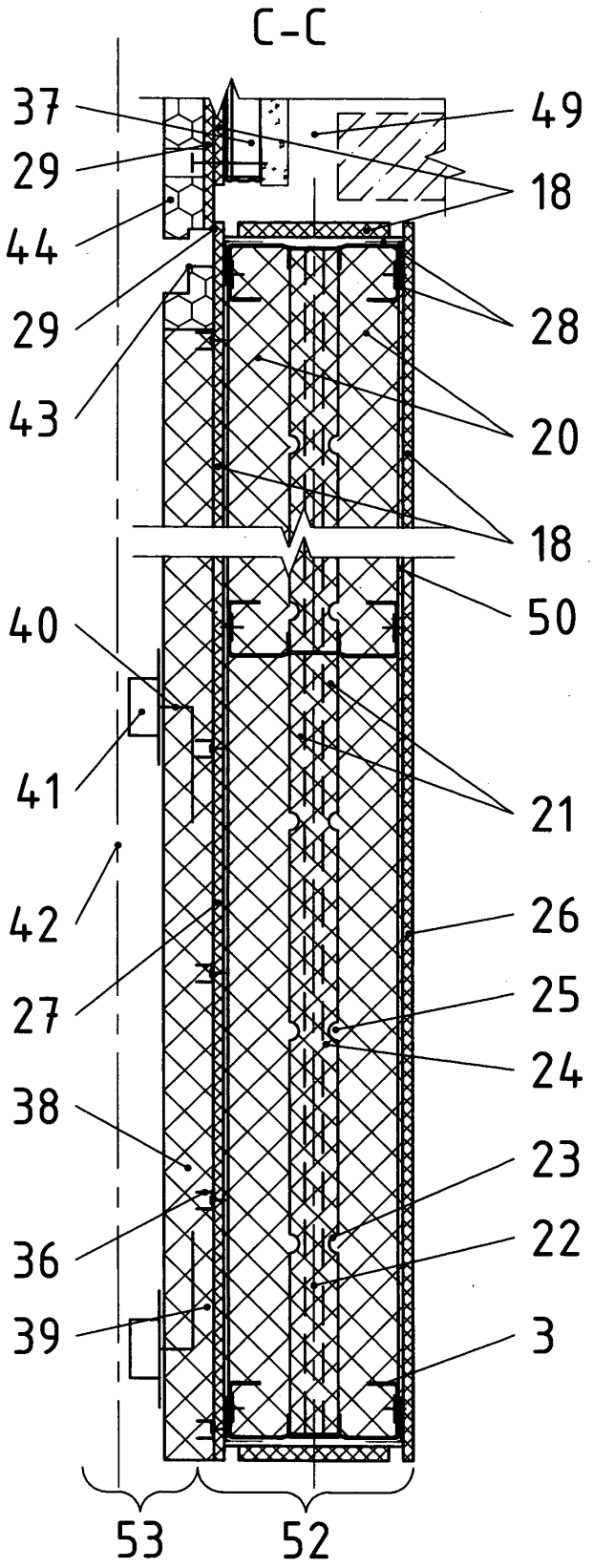

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Fig. 3

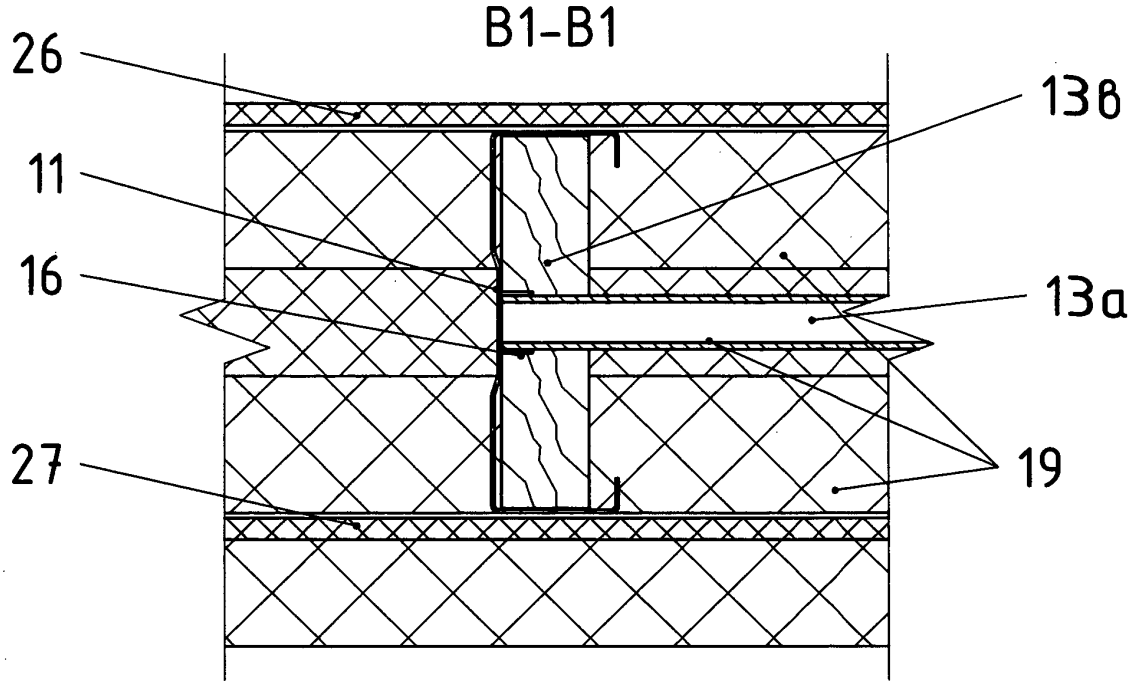


Fig. 4

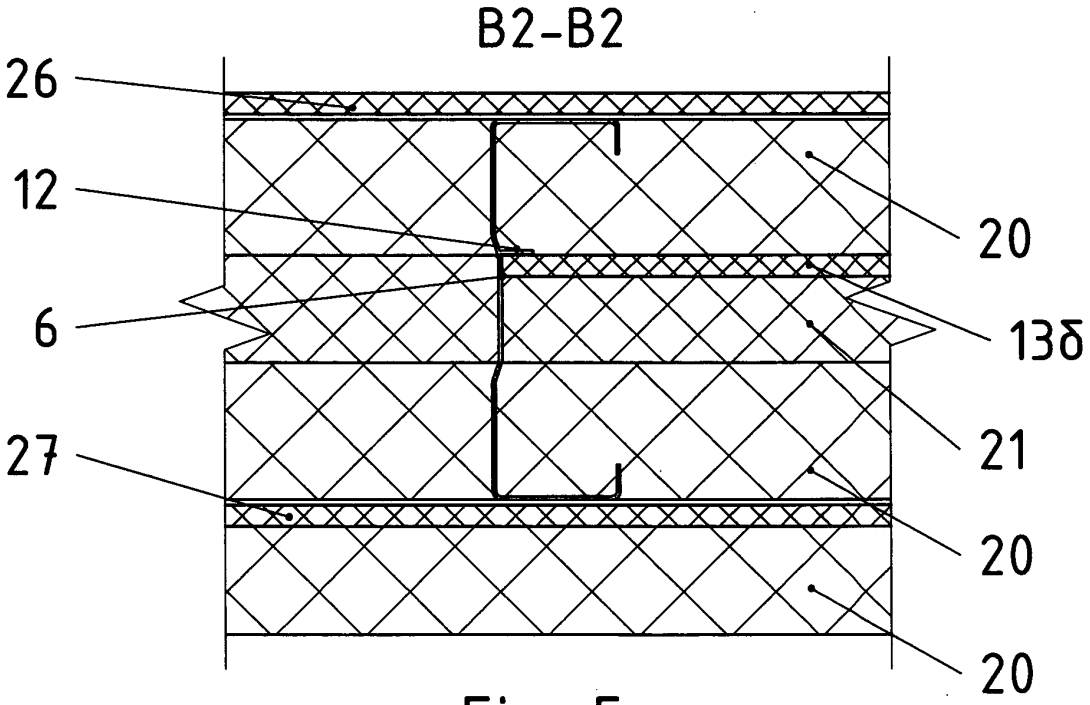


Fig. 5

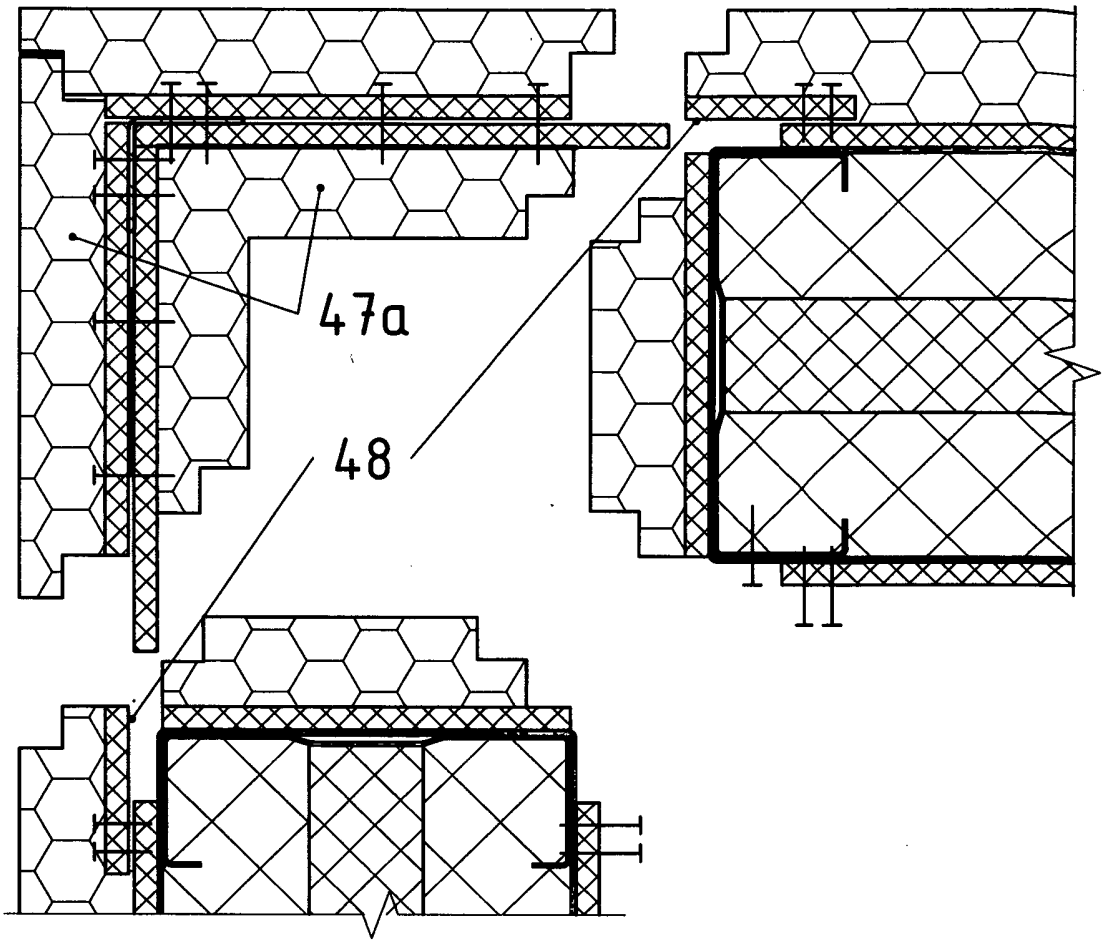


Fig. 6

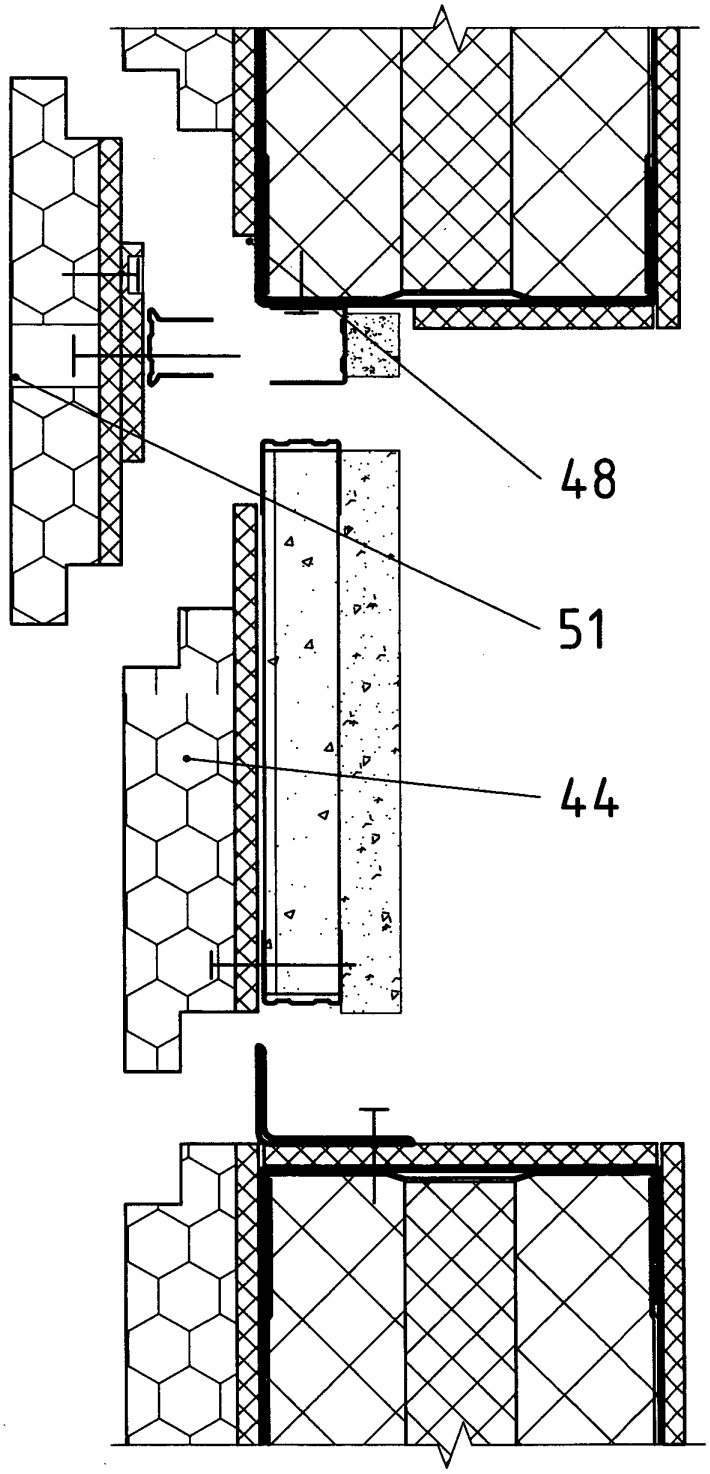


Fig. 7

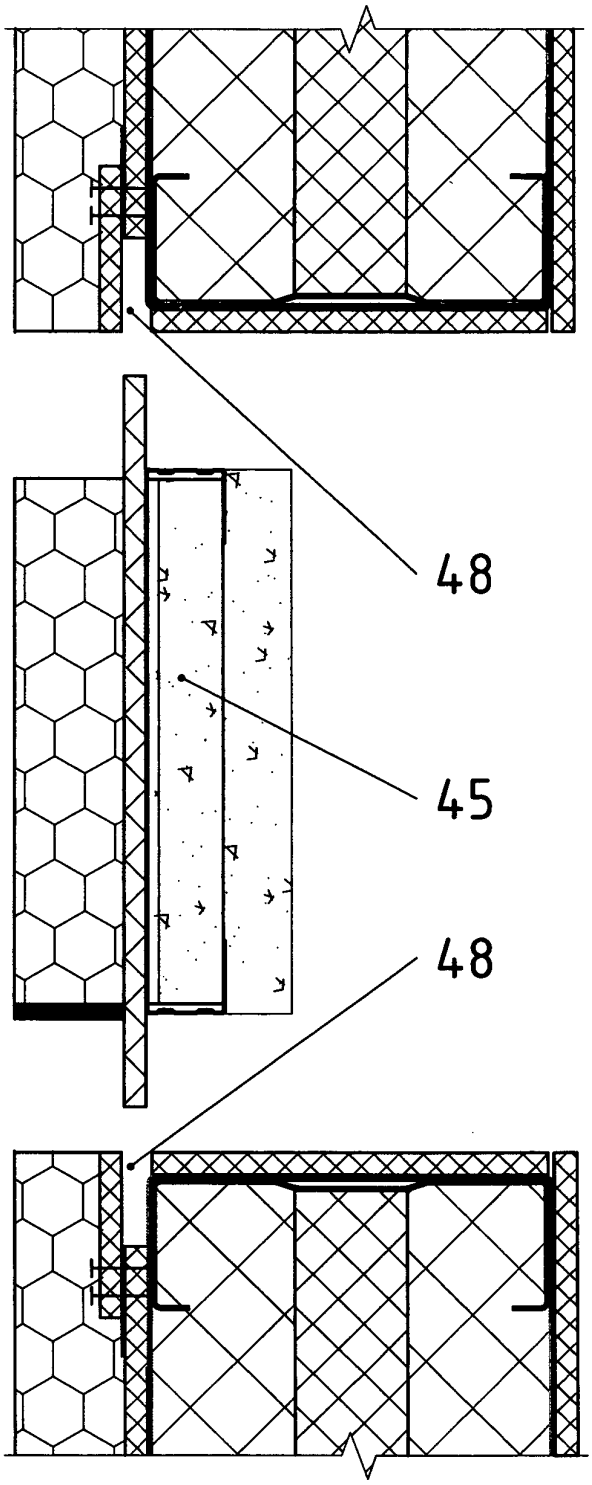


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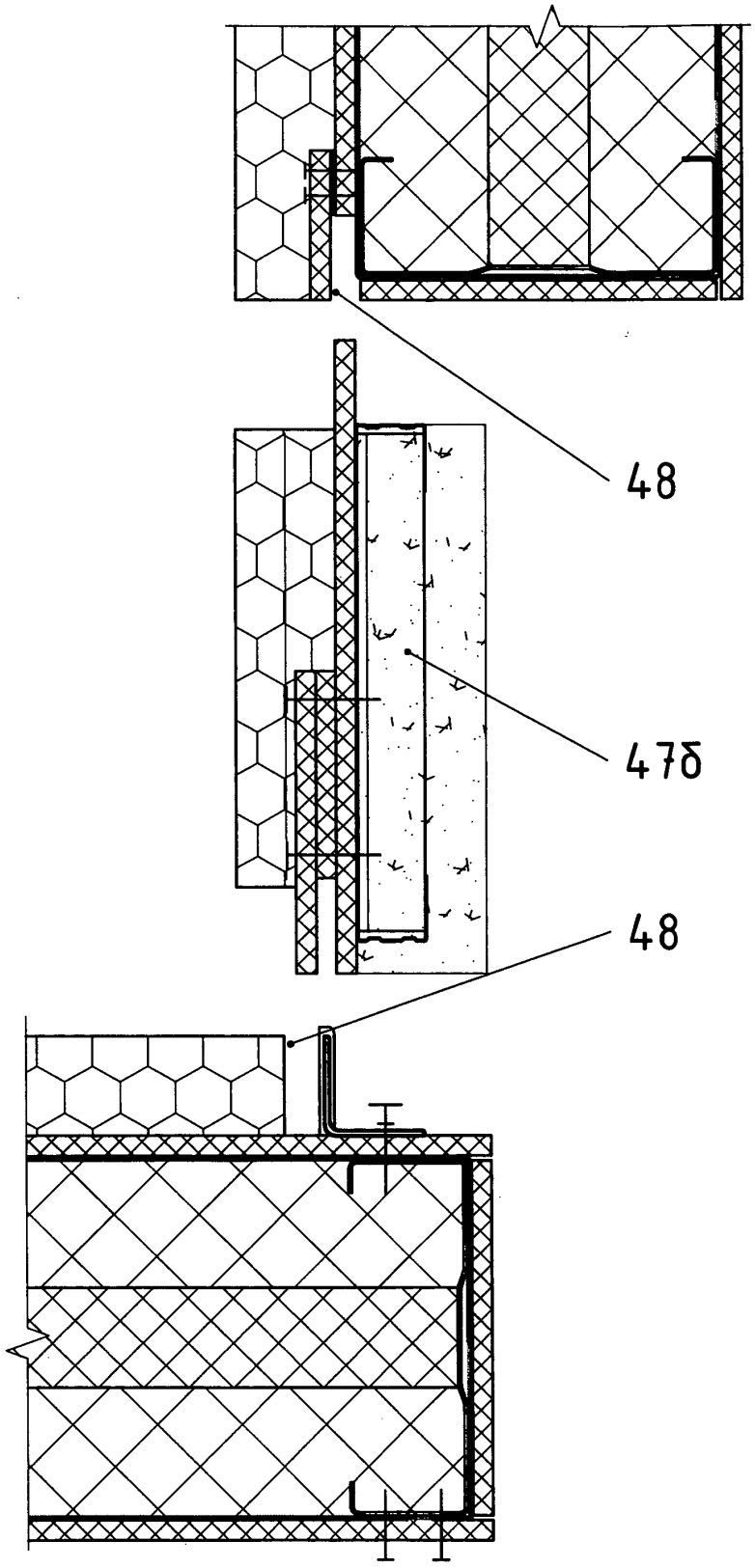


Fig. 9

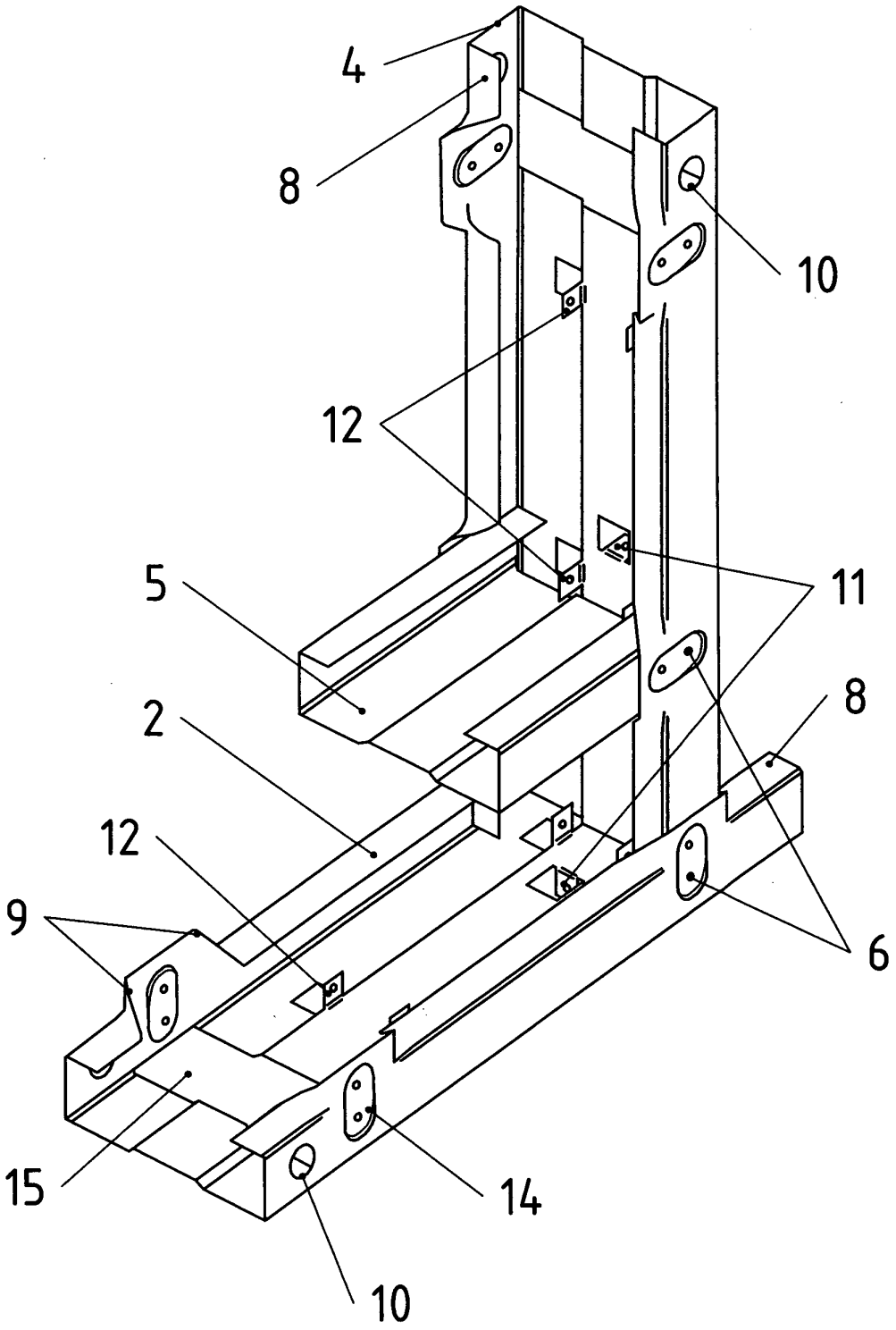


Fig. 10

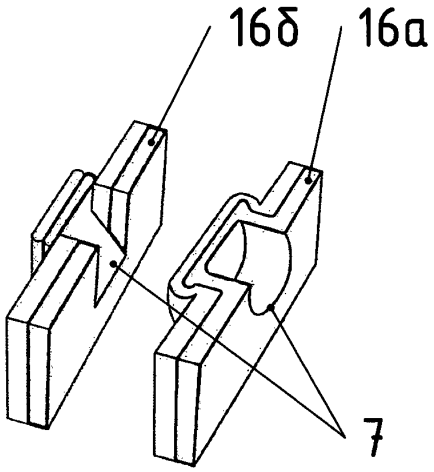


Fig. 11

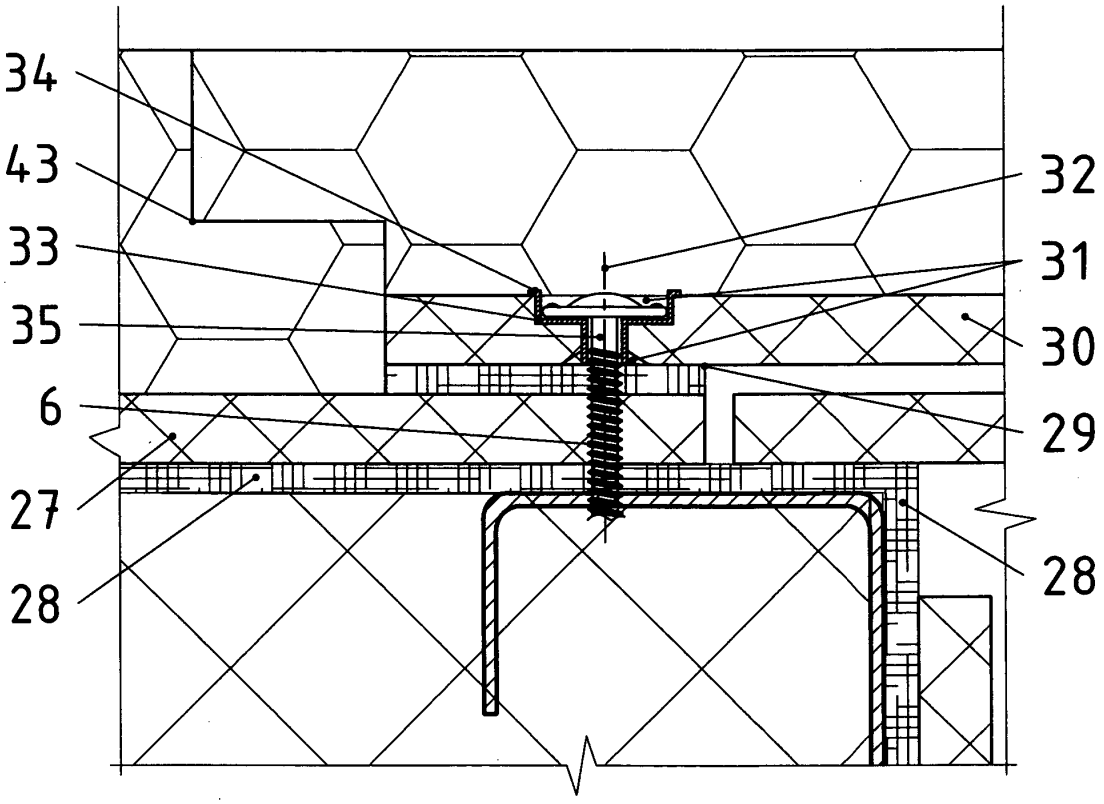


Fig. 12

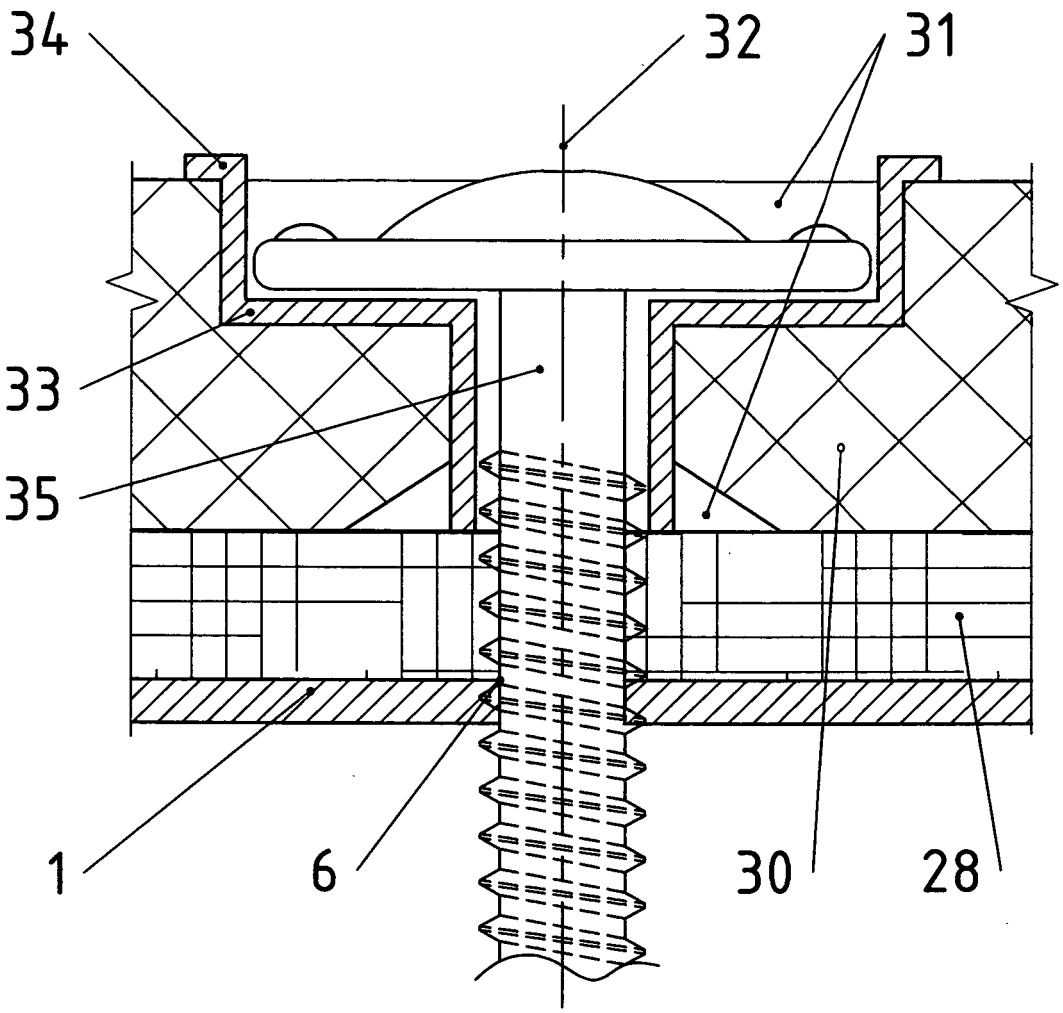


Fig. 13

REFERENCES CITED IN THE DESCRIPTION

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