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(54) **METHOD OF CONSTRUCTING PASSIVE FOUNDATIONS THAT REDUCE HEAT LOSS OF A BUILDING, AS WELL AS THE COSTS AND CONSUMPTION OF MATERIALS**

VERFAHREN ZUR HERSTELLUNG PASSIVER FUNDAMENTE ZUR REDUZIERUNG DES WÄRMEVERLUSTS SOWIE DER KOSTEN UND DES MATERIALVERBRAUCHS IN EINEM GEBÄUDE

PROCÉDÉ DE CONSTRUCTION DE FONDATIONS PASSIVES QUI RÉDUISENT UNE PERTE THERMIQUE D'UN BÂTIMENT, AINSI QUE LES COÛTS ET LA CONSOMMATION DE MATÉRIAUX

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US-A- 4 524 553 US-A1- 2005 262 786

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Description

[0001] The Invention relates to a method of the construction of passive foundation and, in particular, of connecting it with walls, which is characterised in that in order to improve the thermal insulation so as to limit the heat losses from a building or to simplify the structure or to reduce the building costs, the surface of the foundations or the contact surface of building or structural materials of foundations and building or structural materials of walls is purposefully reduced i.e. by being partly replaced with a column structure (made i.e. of reinforced concrete) and partly with horizontal thermal insulation, whereas thermal insulation, which is an important objective of the method, is placed under the walls of the building or between the foundation and the walls in places where the continuity of the foundations is reduced or interrupted (e.g. between the columns). Horizontal insulation is therefore located under a considerable part of the walls, except for the surface of the columns.

[0002] Methods of vertical insulation of foundations (including walls) on the side of the foundation are known and widely used in the construction industry. This does not, however, insulate the entire surface of the foundations that are in contact with the ground, but only their sides. A method of construction of passive foundations is known from US2005/0262786A1.

[0003] A key issue, in particular in low-energy and passive construction industry, is the lack of horizontal thermal insulation of bottom parts of walls or foundations, since these constitute virtually one continuous plane of the heat flow from the building to the ground. This is due to the fact that the foundations carry the load of the entire building, whereas insulation materials (XPS, Styrodur, etc.) are not strong enough to transfer this load (and thus cannot function as horizontal insulation under the entire structure of the building).

[0004] It should be noted, however, that the transfer of heat between the building materials (e.g. brick, concrete, foundation blocks, etc.) of the foundations and walls (of the building) largely depends on the surface area through which heat can flow to the ground. The contact surface between the foundations and walls is generally approx. 20-50 cm wide; this relates only to the contact surface of building materials i.e. concrete or bricks, not the entire wall, including the insulation).

[0005] The present solution is aimed at reduction of the area of said contact surface and at replacing it partly with horizontal insulation and partly with column structure transferring the load to e.g. continuous footing, or possibly with a different type of structure that would reduce the area of the cross-sections of the foundations or the walls to reduce heat transfer.

[0006] A method of insulating foundations from the bottom is also known from application No. 390772 to the Patent Office of the Republic of Poland "Lost shuttering, especially for continuous footings, spot footings and foundation walls, which simultaneously acts as thermal

and damp-proof insulation that insulates the foundation particularly from the bottom, made of extruded polystyrene (XPS)". This solution, however, does not provide adequate strength and cannot be used with majority of buildings. Moreover, apart from the bottom insulation of the foundation, it is also possible to reduce, as proposed in this application, the contact surface between the foundations and walls and thus reduce the heat transfer between the foundations and walls. The proposed solution is also much cheaper and easier to implement.

[0007] A column structure is also known, although walls, including foundation walls, are usually made of concrete, bricks, blocks or other building materials with weak insulation parameters that enable the continuity of heat conduction from the building through the foundations to the ground, and therefore there is no critical horizontal thermal insulation between the foundations and walls. Additionally, these structures are designed for simplicity, not to reduce heat transfer.

[0008] The technique of micropiling also does not interrupt said continuity. In this technique, in contrast to traditional foundations, the differences involve the part of the foundation which is buried in the ground and not the plinth nor the method of insulation of the walls or foundations.

[0009] The technique of implementing horizontal damp-proof insulation between the foundations and walls is also known and widely used. This insulation, however, does not meet the requirements of thermal insulation. In the present solution, horizontal thermal insulation plays an important role. It can also function as a water and damp-proof (polystyrene, aquastyr, XPS) insulation, as well as the discontinuity of materials that draw water. Regardless of the present proposal for thermal insulation, it may also be used as water and damp-proof insulation.

Advantages

[0010] In general, the advantages can be divided into those resulting from the reduction of heat transferred through the walls and foundations to the ground, and the technical and economic advantages due to the simplification of the house-building process.

[0011] The advantages related to the reduced heat transfer through the wall and the foundations to the ground are due to the large reduction of the area of the contact surface (continuity) between the structural elements of the walls and the structural elements of the foundations.

[0012] In traditional construction industry, the structure of a building is characterised by the continuity of its structural elements (especially foundations and walls of the building), since these structural elements (bricks, blocks, concrete) are very inefficient as thermal insulators. Walls are laid directly on the foundation (setting aside the issue of damp-proof insulation), which results in a large area of heat transfer between the walls and foundations, and in turn with the ground. In the present solution, this sur-

face is very significantly reduced, as typical foundations traditionally extending along the entire circumference of the house and under other structural walls have been replaced with reinforced-concrete column structure (or with walls having smaller cross-sections or walls not extending along the entire length of the foundations but only as spots/sections). This structure has a much smaller surface area through which heat transfer occurs, however, due to the excellent strength of concrete, it is sufficient to transfer the entire load of the building to the continuous footing or a foundation of different type. The columns may be of any shape, including oblong or turning shapes (at corners), depending on the shape/course of the foundations (it can include foundation walls with reduced surface/cross-section areas). The reduction of the surface area of the foundations (replacing walls with columns) is a very significant advantage, since the heat loss through the foundations is reduced by a factor of a few, a dozen or several dozens. Assuming concrete strength of 15 MPa (or 150 kg/cm²), weight of an exemplary house of 150 tons can be transferred by columns with an area of 0.1 m², i.e. by 4 columns with dimensions of 10/25 cm. By default, the contact area between the foundations and the walls depends on the length of the foundations, which often exceeds 50 m (single-family detached house) and the width along which the walls are based on the foundations i.e. 25 cm, which gives an area of 12.5 m². This value is more than a hundred times greater than the one obtained from the calculations for the columns and heat transfer is generally proportional to that surface.

Due to structural reasons, for most buildings it is necessary/reasonable to place more columns/supports than said 4, however the heat loss reduction factor can still be in the range of several dozens.

[0013] The simplified construction of the foundations, in particular the reduction of the costs and shortening the time of constructing and insulating foundation walls is an additional advantage. Typically, the entire foundation wall should be made of solid materials (blocks or concrete) and should be thermally insulated (polystyrene, aquastyr, XPS), and, in the case of low-energy and passive houses, this insulation should be located on both sides of the foundation. Damp-proof insulation or other items such as dimplet membrane should be additionally taken into account. The need to use all these items can be eliminated or greatly reduced only to the surfaces of the columns, i.e. an area several dozen times lower. The economic, technical, organisational and time-related benefits are substantial.

Application

[0014] The proposed solution is primarily used in the construction of low-energy and passive single-family detached houses, as well as in the construction of other forms of single-family houses, and in traditional, multi-family, industrial, warehouse, residential, office, resort, skeleton construction and other sectors of the construc-

tion industry.

[0015] The present solution can be applied in different variants. Basically, the method of the construction of passive foundation or of connecting them with walls is characterised in that in order to improve the thermal insulation so as to limit the heat losses for a building or to simplify the structure or to reduce the building costs, the surface of the foundations or the contact surface of building/structural materials of foundations and building/structural of materials walls is purposefully reduced i.e. by being partly replaced with a column structure (e.g. made of reinforced concrete) and partly with horizontal thermal insulation, whereas thermal insulation, which is an important objective of this method, is placed under the walls of the building or between the foundation and the walls in places where the continuity of the foundations is reduced or interrupted (e.g. between the columns). Horizontal insulation is therefore located under a considerable part of the walls, except for the surface of the columns.

[0016] It is preferable for the method in variant 1 that the horizontal insulation or the reduction of the surface area of the walls may be made at different heights. In particular under the wall of the building (e.g. directly under the wall of the building), but also between the continuous footing and the foundation wall, at the height of the foundation wall or the height of the wall of the building.

[0017] It is preferable for the method in variant 1 that it is possible to completely eliminate the foundation walls and their insulation and cover, and to replace them with a column structure laid i.e. on continuous footing, or to reduce the amount of foundation walls, i.e. by lowering their height.

[0018] It is preferable for the method in variant 1 that foundation walls are replaced with only thermal insulation or other type of partition (metal sheet or mesh, precast elements) in order to reduce the transfer of heat or the amount of rodents penetrating into the area under the floor.

[0019] It is preferable for the method in variant 1 that the column structure is replaced with foundation walls whose cross-sections are smaller, or with walls not extending along the entire length foundation but placed only as spots/sections. Such foundation wall sections or spots may be called columns or walls.

[0020] It is preferable for the method in variant 1 that it includes use of additional reinforcements, in particular to improve the bending strength of the column structure.

[0021] It is preferable for the method in variant 1 that it is be used in connection with buildings and foundations of any shape.

[0022] It is preferable for the method in variant 1 that the foundation may be of any kind i.e. as spots under the columns, without having to lay continuous footing.

[0023] It is preferable for the method in variant 1 that is used with respect to variety of structures in the construction industry, i.e. in skeletal, metal, wood structures, or other light structures, or in industrial constructions.

[0024] It is preferable for the method in variant 1 that the structure of the foundations can be made of all sorts of materials including preferably steel.

[0025] It is preferable for the method in variant 1 that the cross-sections of columns or foundation walls are of various shapes at different heights (e.g. conical or stepped), for example with a larger cross-section at the bottom of the column (area of contact with the footing) to provide better stability, and with a smaller cross-section at the top to transfer less heat or lower the costs of manufacturing.

DESCRIPTION OF THE FIGURES

[0026] FIG. 1 shows example of the solutions used so far, where the wall (3) of a building is placed on a foundation wall (2), which is placed on a foundation footing (1). There may also be a thin layer of damp-proof insulation between these elements, but it was not added to the figure as it is irrelevant in this case. On the outside of the building there is thermal insulation (5) of the wall, in some cases also thermal insulation (4) of the foundations, whereas sometimes thermal insulation of the foundations is added on the inside of the building to provide additional insulation. The continuity of the wall (3) of the building, foundation wall (2) and foundation footing (1), which is in contact with the ground (this is also often the case for the foundation wall) causes the loss of large amounts of heat, which is transferred to the ground.

[0027] An example of the implementation of the foundations as presented in this application is shown on FIG. 2, which includes foundation footing (1), but above it there is a column (6) structure, which transfers the load of the entire building, including the walls (3), which include horizontal insulation to prevent the heat from flowing into the ground, onto the footing (1). The heat is transferred out of the building through the column (6) in the direction of the foundations and the ground. Column (6) surface, however, is many times less than the heat transfer surface of a typical foundation. The horizontal insulation (7) between the wall (3) of the building and the foundation footing (1) (especially directly under the wall (3) of the building) is of key importance, whereas in the case of the column structure the existing foundation wall can be replaced with any filling (8) i.e. condensed dirt (ground), thermal insulation (without load-bearing structure), or with metal sheet or mesh (protection against intrusion of rodents into the house), precast elements or other components.

For the reasons of strength, it is recommended to add a strong structural beam in the lower part of the wall (3) of the building, which will be attached to the column (6). The side insulation of foundation walls is limited in this case only to the surface of the column. Foundation walls (2) with cross-sections smaller than the existing ones, or foundation walls (2) that do not extend along the entire length of the foundations only in spots or sections can be used instead of columns (6). It is a matter of nomen-

clature whether such elements are defined as columns structure or as walls with smaller cross-sections.

5 Claims

1. The method of construction of passive foundation **characterized in that** in order to improve the thermal insulation so as to limit the heat losses for a building or to simplify the structure or to reduce the building costs, the surface of the foundations or the contact surface of building structural materials of the foundations (2) and building structural materials of walls (3) of the building is reduced by being partly replaced with a column structure (6) preferably made of reinforced concrete and partly with horizontal thermal insulation (7), wherein the thermal insulation (7) is placed under the walls (3) of the building or between the foundation (2) and the walls (3) in places where the continuity of the foundations walls is limited or interrupted between the columns (6), wherein the horizontal insulation (7) is therefore located under a considerable part of the walls (3), except for the surface of the columns (6).
2. The method according to claim 1 **characterized in that** the horizontal thermal insulation (7) is placed at different heights, in particular directly under the wall (3) of the building or on the height of the foundation wall (2).
3. The method according to claim 1 **characterized in that** the reduction of the foundation surface is made at different heights.
4. The method according to claim 1 **characterized in that** the foundation walls (2) and their insulation and cover are completely eliminated and replaced with a column (6) structure laid on continuous footing (1).
5. The method according to claim 1 **characterized in that** the surface of foundation walls (2) is reduced by lowering their height.
6. The method according to claim 1 **characterized in that** foundation walls (2) are replaced with thermal insulation (7) or other type of partition, preferably made of metal sheet, metal mesh or precast elements.
7. The method according to claim 1 **characterized in that** the column (6) structure is replaced with foundation walls (2) whose cross-sections are smaller, or with foundation walls (2) placed only in spots/sections
8. The method according to claim 1 **characterized in that** it includes use of additional reinforcements of

the column (6) structure, in particular to improve the bending strength thereof.

9. The method according to claim 1 **characterized in that** it is used in connection with buildings and foundations of any shape. 5
10. The method according to claim 1 **characterized in that** the continuous footing (1) is replaced with spot footing. 10
11. The method according to claim 1 **characterized in that** is used for various construction structures, preferably skeletal, metal, wood or other light structures, or in industrial construction. 15
12. The method according to claim 1 **characterized in that** the structure of the foundations is made of various materials, including preferably steel. 20
13. The method according to claim 1 **characterized in that** the cross-sections of columns (6) or foundation walls (2) have various shapes at different heights, preferably with a larger cross-section at the bottom of the column (6) or foundation walls (2) and with a smaller cross-section at the top thereof. 25

Patentansprüche

1. Bauweise eines Passivfundaments, **dadurch gekennzeichnet, dass** zu einer besseren Wärmedämmung, die die Wärmeverluste aus dem Gebäude beschränkt, oder zur Vereinfachung der Konstruktion oder zur Reduzierung der Baukosten die Fläche der Fundamente oder die Kontaktfläche der Konstruktionsbaustoffe der Fundamente (2) und der Konstruktionsbaustoffe der Wände (3) des Gebäudes vermindert wird, indem sie teilweise durch eine Pfeilerkonstruktion (6), vorzugsweise aus Stahlbeton, und teilweise durch eine horizontale Wärmedämmung (7) ersetzt wird, wobei die Wärmedämmung (7) unter den Wänden (3) des Gebäudes oder zwischen dem Fundament (2) und den Wänden (3) an solchen Stellen eingebracht wird, in welchen die Kontinuität der Fundamentwände vermindert oder zwischen den Pfeilern (6) unterbrochen ist, wobei die Wärmedämmung auf solche Weise unter einem wesentlichen Teil der Wände (3) mit Ausnahme der Fläche der Pfeiler (6) angeordnet ist. 30 35 40 45 50
2. Bauweise nach Anspruch 1, **dadurch gekennzeichnet, dass** die horizontale Wärmedämmung (7) auf verschiedenen Höhen angeordnet wird, bevorzugt direkt unter der Wand (3) des Gebäudes oder auf der Höhe der Fundamentwand (2). 55
3. Bauweise nach Anspruch 1, **dadurch gekennzeichnet,**

dass die Fläche des Fundamentes auf verschiedenen Höhen vermindert wird.

4. Bauweise nach Anspruch 1, **dadurch gekennzeichnet, dass** die Fundamentwände (2) sowie ihre Wärmedämmung und Schutzvorrichtungen entfallen und sie vollständig durch eine auf Streifenfundamenten gegründete Pfeilerkonstruktion (6) ersetzt werden. 10
5. Bauweise nach Anspruch 1, **dadurch gekennzeichnet, dass** die Fläche der Fundamentwände (2) durch eine Reduzierung ihrer Höhe vermindert wird. 15
6. Bauweise nach Anspruch 1, **dadurch gekennzeichnet, dass** die Fundamentwände (2) durch eine Wärmedämmung (7) oder einen anderen Typ der Trennwand ersetzt werden, die bevorzugt aus Blech, Metallgitter oder Fertigteilen gefertigt ist. 20
7. Bauweise nach Anspruch 1, **dadurch gekennzeichnet, dass** die Pfeilerkonstruktion (6) durch Fundamentwände (2) mit kleineren Querschnitten oder durch Fundamentwände (2), die nur punkt-/abschnittsweise vorkommen, ersetzt wird. 25
8. Bauweise nach Anspruch 1, **dadurch gekennzeichnet, dass** zusätzliche Verstärkungen der Pfeilerkonstruktion (6) verwendet werden, insbesondere die ihre Biegefestigkeit erhöhen. 30
9. Bauweise nach Anspruch 1, **dadurch gekennzeichnet, dass** sie in Bezug auf Gebäude oder Fundamente mit beliebiger Form verwendet wird. 35
10. Bauweise nach Anspruch 1, **dadurch gekennzeichnet, dass** anstatt eines Streifenfundamentes (1) eine Gründungssole verwendet wird. 40
11. Bauweise nach Anspruch 1, **dadurch gekennzeichnet, dass** sie in Bezug auf Baukonstruktionen verwendet wird, bevorzugt auf Gerüstkonstruktionen, Konstruktionen aus Holz, Metall und andere leichte und Industriekonstruktionen. 45
12. Bauweise nach Anspruch 1, **dadurch gekennzeichnet, dass** das Fundament aus verschiedenen Materialien gefertigt ist, die bevorzugt den Stahl umfassen. 50
13. Bauweise nach Anspruch 1, **dadurch gekennzeichnet, dass** die Querschnitte der Pfeiler (6) oder der Fundamentwände (2) auf verschiedenen Höhen eine verschiedene Form haben, bevorzugt mit einem größeren Querschnitt in unteren Teilen der Pfeiler (6) oder Fundamentwände (2) und mit einem kleineren Querschnitt in ihren oberen Teilen. 55

Revendications

1. Procédé de construction d'une fondation passive, **caractérisé en ce que**, pour obtenir une meilleure isolation thermique limitant les pertes de chaleur d'un bâtiment ou pour simplifier la structure ou réduire les coûts de construction, la surface des fondations ou la surface de contact des matériaux de construction des fondations (2) et des matériaux de construction des murs (3) du bâtiment est réduite, en étant remplacée en partie par une structure de pilier (6), de préférence en béton armé, et en partie par une isolation thermique horizontale (7), ladite isolation thermique (7) étant placée au-dessous des murs (3) du bâtiment ou entre la fondation (2) et les murs (3) dans les endroits où la continuité des murs de fondation est réduite ou interrompue entre les piliers (6), ladite isolation thermique étant ainsi placée au-dessous d'une partie importante des murs (3) à l'exception de la surface des piliers (6). 5
2. Procédé selon la revendication 1, **caractérisé en ce que** l'isolation thermique horizontale (7) est placée à des hauteurs différentes, de préférence directement au-dessous du mur (3) du bâtiment ou à la hauteur du mur (2) de fondation. 10
3. Procédé selon la revendication 1, **caractérisé en ce que** la surface de la fondation est réduite à des hauteurs différentes. 15
4. Procédé selon la revendication 1, **caractérisé en ce que** les murs de fondation (2) ainsi que leur isolation et les protections sont entièrement éliminés et remplacés par la structure de pilier (6) basée sur des semelles continues (1). 20
5. Procédé selon la revendication 1, **caractérisé en ce que** la surface des murs de fondation (2) est diminuée par la réduction de leur hauteur. 25
6. Procédé selon la revendication 1, **caractérisé en ce que** les murs de fondation (2) sont remplacés par l'isolation thermique (7) ou par un autre type de séparation, de préférence en tôle, treillis de métal ou en éléments préfabriqués. 30
7. Procédé selon la revendication 1, **caractérisé en ce que** la structure de pilier (6) est remplacée par des murs de fondation (2) aux sections transversales plus petites ou par des murs de fondation (2) présents seulement dans certains points/certaines sections. 35
8. Procédé selon la revendication 1, **caractérisé en ce que** l'on applique des renforts supplémentaires de la structure de pilier (6), notamment ceux qui augmentent sa résistance à la flexion. 40
9. Procédé selon la revendication 1, **caractérisé en ce qu'il** est appliqué en cas de bâtiments ou de fondations d'une forme quelconque. 45
10. Procédé selon la revendication 1, **caractérisé en ce qu'au** lieu de la semelle continue (1) on utilise la semelle d'un pilier. 50
11. Procédé selon la revendication 1, **caractérisé en ce qu'il** est appliqué en cas de constructions de bâtiment, de préférence d'ossatures, de constructions en bois, en métal et d'autres constructions légères et de constructions industrielles. 55
12. Procédé selon la revendication 1, **caractérisé en ce que** la fondation est construite en matériaux variés qui comprennent de préférence l'acier.
13. Procédé selon la revendication 1, **caractérisé en ce que** les sections transversales des piliers (6) ou des murs de fondation (2) sont formées différemment à des hauteurs différentes, de préférence avec une section transversale plus grande dans les parties inférieures des piliers (6) ou des murs de fondation (2) et une section transversale plus petite dans leurs parties supérieures.

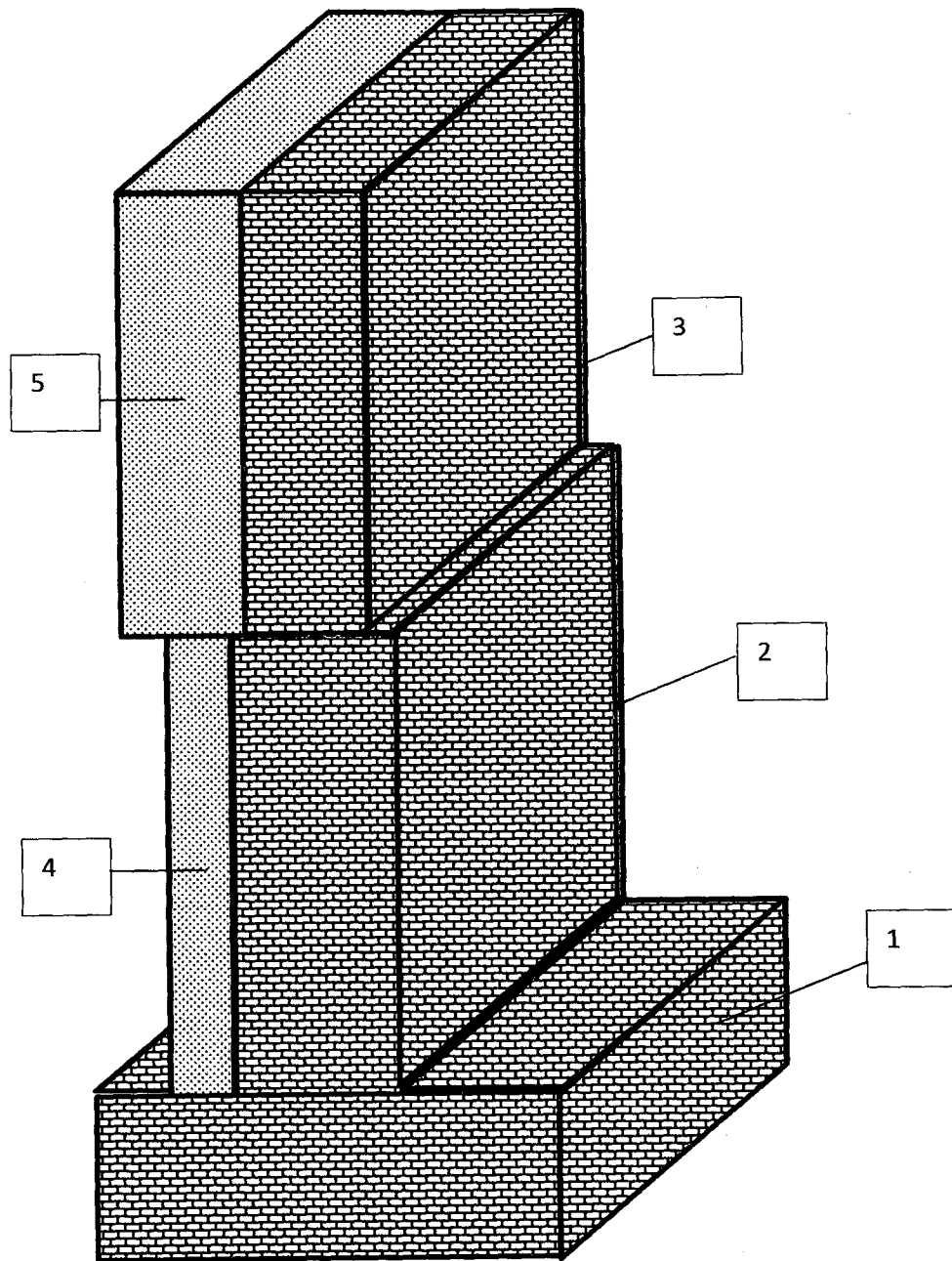


Fig. 1

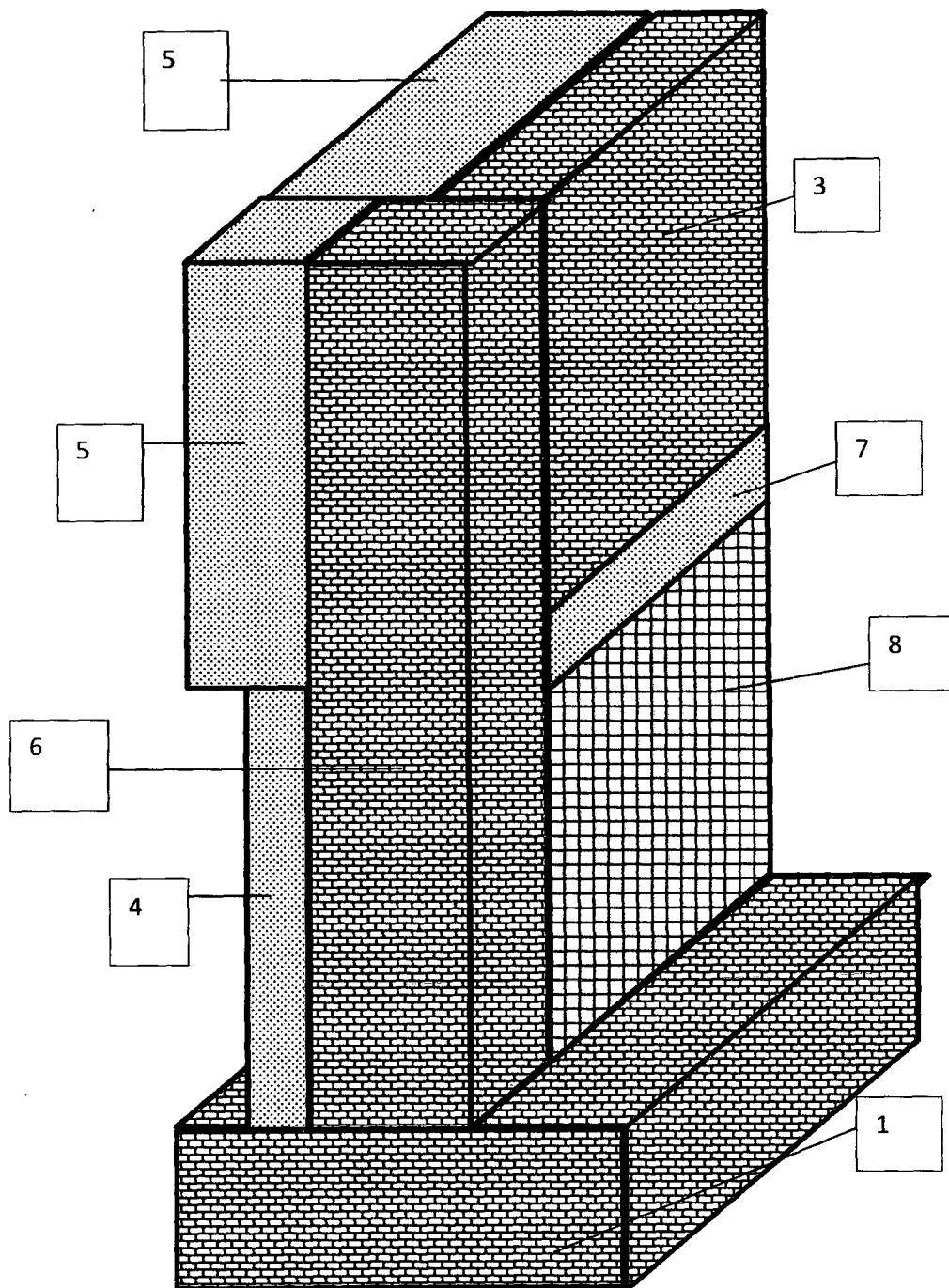


Fig. 2

REFERENCES CITED IN THE DESCRIPTION

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**ELJÁRÁS PASSZÍV ALAPOZÁSOK KIALAKÍTÁSÁRA, AMELYEK CSÖKKENTIK EGY ÉPÜLET HŐVESZTESÉGÉT,
VALAMINT A KÖLTSÉGEKET ÉS AZ ANYAGFOGYASZTÁST
SZABADALMI IGÉNYPONTOK**

1. Eljárás passzív alapozás (foundation) kialakítására (construction), **azzal jellemezve, hogy a hőszigetelés javítása érdekében** korlátozzuk egy épülethez a hőveszteségeket, vagy egyszerűsítjük a szerkezetet vagy csökkentjük az építési költségeket; az alapozások felületét vagy az épület alapozásainak (2) és a falai (wall) (3) épületszerkezeti anyagainak érintkezési felületét (contact surface) csökkentjük olyan módon, hogy részben helyettesítünk (replace) egy előnyösen megerősített (reinforced) betonból készült oszlop szerkezettel (6) és részben vízszintes hőszigeteléssel (thermal insulation) (7), ahol a hőszigetelés (7) az épület falai (3) alatt vagy az alapozás (2) és a falak (3) között helyezkedik el olyan helyekben, ahol az alapozások falainak folyamatossága (continuity) korlátozott vagy meg van szakítva az oszlopok (6) között, ahol a vízszintes szigetelés (7) ennél fogva a falak (3) jelentős része alatt helyezkedik el, kivéve az oszlopok (6) felületét.
2. Az 1. igénypont szerinti eljárás, **azzal jellemezve, hogy a vízszintes hőszigetelés (7) különböző magasságoknál (height) van** elhelyezve, elsősorban közvetlenül az épület fala (3) alatt vagy az alapozási fal (foundation wall) (2) magasságán.
3. Az 1. igénypont szerinti eljárás, **azzal jellemezve, hogy az alapozási felület (foundation surface) csökkentése különböző** magasságoknál van elvégezve.
4. Az 1. igénypont szerinti eljárás, **azzal jellemezve, hogy az alapozási falak (2) és szigetelésük és fedésük (cover) teljes** mértékben el vannak távolítva és helyettesítve vannak egy oszlop (column) (6) szerkezettel, amely folyamatos lábazaton (footing) (1) nyugszik.
5. Az 1. igénypont szerinti eljárás, **azzal jellemezve, hogy az alapozó falak (2) felülete csökkentve van (reduced) magasságuk** csökkentése (lowering) révén.
6. Az 1. igénypont szerinti eljárás, **azzal jellemezve, hogy az alapozó falak (2) helyettesítve vannak hőszigeteléssel (7) vagy** egyéb típusú válaszfallal (partition), amely előnyösen fémlemezről, fémhálóról (mesh) vagy előregyártott elemekből van elkészítve.
7. Az 1. igénypont szerinti eljárás, **azzal jellemezve, hogy az oszlop (6) szerkezet helyettesítve van olyan alapozási falakkal (2),** amelyek keresztmetszete kisebb, vagy olyan alapozási falakkal (2), amelyek csupán foltokban (spot)/szakaszokban (section) vannak elhelyezve.
8. Az 1. igénypont szerinti eljárás, **azzal jellemezve, hogy ez magában foglalja az oszlop (6) szerkezet további** megerősítésének (reinforcement) alkalmazását, elsősorban azért, hogy javuljon ennek hajlításiereje (bending strenght).
9. Az 1. igénypont szerinti eljárás, **azzal jellemezve, hogy ez bármilyen alakú épülettel és alapozással kapcsolatban** alkalmazható.
10. Az 1. igénypont szerinti eljárás, **azzal jellemezve, hogy a folyamatos lábazat (1) helyettesítve van foltszerű (spot) talpazattal.**
11. Az 1. igénypont szerinti eljárás, **azzal jellemezve, hogy ez alkalmazható különböző konstrukciós szerkezetekhez, előnyösen** vázszerű (skeletal), fém, fa vagy egyéb könnyű szerkezetekhez vagy ipari konstrukciókhoz.
12. Az 1. igénypont szerinti eljárás, **azzal jellemezve, hogy az alapozások szerkezete különböző anyagokból készíthető el,** beleértve előnyösen az acélt.
13. Az 1. igénypont szerinti eljárás, **azzal jellemezve, hogy az oszlopok (6) vagy alapozási falak (2) keresztmetszetei különböző** alakokkal rendelkezhetnek különböző magasságoknál, előnyösen nagyobb keresztmetszettel az oszlop (6) vagy az alapozási falak (2) aljánál és kisebb keresztmetszettel ezek tetejénél.



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