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(54) **METHOD FOR ERECTING STRUCTURAL ELEMENTS OF BUILDING/CONSTRUCTION OF MONOLITHIC REINFORCED CONCRETE AND TECHNOLOGICAL EQUIPMENT TO IMPLEMENT IT**

VERFAHREN ZUR ERRICHTUNG VON STRUKTURELEMENTEN EINES GEBÄUDES/EINER KONSTRUKTION AUS MONOLITHISCHEM STAHLBETON UND TECHNOLOGISCHE AUSRÜSTUNG ZUR DURCHFÜHRUNG DAVON

PROCÉDÉ DE MONTAGE D'ÉLÉMENTS DE STRUCTURE DE BÂTIMENT/CONSTRUCTION DE BÉTON ARMÉ MONOLITHIQUE ET ÉQUIPEMENT TECHNOLOGIQUE POUR LE METTRE EN PLACE

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Description

[0001] The present group of inventions is related to civil engineering and can be used in erection of multi-storey buildings/constructions.

[0002] MD 4161 relates to construction and can be used in the erection of multi-storey cast-in-situ buildings. The process for erection of cast-in-situ building includes the erection of cast-in-situ piece of the building: floor slab of the entire building - vertical structures of the overlying stage/floor of the entire building. The basic principle of the process: erection of the floor slab of the stage/floor of the building and, after setting of concrete floor slab of this stage/floor, concrete-filling of vertical structures of the next stage/floor of the entire building - time curing of the poured concrete up to the attainment of the working strength - erection of another floor slab, etc. In the execution of works the formwork is based on the stacked vertical structures of the building. Production tooling includes: the formwork transfer mechanism, the reinforcement binding device, the vertical formwork panel, the set of angular vertical formwork panels, the set of opening forming panels, the tightening device and the floor slab formwork girder. The result is to increase the strength properties of the erected buildings, reduce the period of construction, building materials saving, the possibility of mechanization and automation of technological processes.

[0003] RU 2078884 relates to construction and can be used in the construction of multi-storey monolithic buildings.

[0004] US 4076778 relates to a climbing formwork for use in the erection of reinforced concrete structures in which the raising of the formwork from storey to storey is carried out by the use of movable vertically extending members the height of which when fully extended is in excess of the height of two storeys of a building to be erected, the members being maintained in their correct vertical positions by supporting tubes set into the concrete of the structure. The members carry between them beams or the like for supporting the outer forms and preferably some or all of the inner forms used for pouring the structure and are raised to a height equivalent to that of one storey of the structure after the completion of the pouring of the concrete of a storey. The vertically extending members are preferably in the form of double acting hydraulic cylinders having a piston extendable under hydraulic pressure, the extension of the piston being utilized for raising the forms. Alternatively the vertically extending members may be of constant length and raised by means of climbing jacks.

Method for erecting monolithic buildings and technological equipment for its implementation is known (group of inventions, 1)

[0005] Method under the preferred embodiment includes erection of the building monolithic segment consisting of floor structure of the whole building and vertical structures of the upper tier/storey of the whole building. Main principle of the method: erecting the tier/storey floor structure of the whole building; following setting of concrete of said floor structure, pouring concrete of vertical structures of the next tier/storey of the whole building; curing the poured concrete until the design strength is achieved; erecting subsequent floor structure, etc. During performance of works, formwork rests on the already poured vertical structures of building. Technological equipment comprises, without limitation, travelling formwork and vertical shuttering panels. Travelling formwork includes lifting jacks with props, where U-shaped jack frames are installed.

[0006] Posts of said jack frames are equipped with bearing plates. Frames located on both sides of the being erected vertical structures are connected together by rigid links. On bearing plates of said jack frame posts, carriages are mounted with possibility of travelling across said being erected vertical structures with vertical shuttering panels installed on them. During concreting, jack frames rest on vertical shuttering panels installed on the underlying vertical structures. Following the required strength of concrete is attained, jack frames are relocated to rest upon props of lifting jacks, and formwork is lifted to the next tier/storey.

[0007] The fact that jack frames during performance of works rest upon vertical shuttering panels imposes increased requirements to the strength properties of panels. It results in excessive consumption of metal during manufacturing of the panel frames, increased power consumption for relocation of formwork. Erection of multilayer vertical structures using known travelling formwork requires some time for the poured concrete to attain necessary strength in order to make it possible to re-rest jack frames on lifting jacks, which are installed on the already erected vertical structures, and to mold a cavity for the new layer. It extends the time of construction.

[0008] The present group of inventions is directed toward solution of following tasks: reduction of time for erection of buildings/constructions of monolithic reinforced concrete; reduction of material and labor costs.

[0009] The set task is resolved by the method for erecting vertical structures of building/construction of monolithic reinforced concrete including process steps as defined in claim 1.

[0010] The vertical structures can be erected simultaneously for the whole building/construction.

[0011] The set task is resolved by the method for erecting multilayer vertical structures of building/construction of monolithic reinforced concrete including process steps as defined in claim 3.

[0012] Prior to fill molding cavity of the base (constructional) layer with concrete, removable recess-forming cages can be hanged on the inner surface of formwork panels. Prior molding of the last (outer) layer, these cages shall be removed.

[0013] On posts of jack frames, panels can be installed

with holes performed in their decks, where sleeves of elastic material are inserted. Following adjustment of width of molding cavity of the base (constructional) layer, reinforcing rods are inserted in holes with protruding ends located on both sides of the plane of panels. Following removal of panels and prior molding the next layer, a mesh cage is secured on the inserted reinforcing rods.

[0014] Vertical multilayer structures can be erected simultaneously for the whole building/construction.

[0015] The set task is resolved by the method for erecting the "floor structure - vertical structure" segment of building/construction of monolithic reinforced concrete including process steps as defined in claim 7.

[0016] Floor structure and vertical structures of the whole building/construction can be erected simultaneously.

[0017] The set task is resolved by the method for erecting the "floor structure-multilayer wall" segment of building/construction of monolithic reinforced concrete including process steps as defined in claim 9.

[0018] Prior to fill molding cavity of the base (constructional) layer with concrete, removable recess-forming cages can be hanged on the inner surface of formwork panels. Prior molding of the last (outer) layer, these cages shall be removed.

[0019] On posts of jack frames, panels can be installed with holes performed in their decks, where sleeves of elastic material are inserted. Following adjustment of width of molding cavity of the base (constructional) layer, reinforcing rods are inserted in holes with protruding ends located on both sides of the plane of panels. Following removal of panels and prior molding of the next layer, mesh cage is secured on the inserted reinforcing rods.

[0020] Floor structure and vertical multilayer structures of the whole building/construction can be erected simultaneously.

[0021] The set task is resolved also by a travelling formwork according to claim 13.

[0022] Extendible supports of jack frames can be provided with motion drive and can be installed on each post of jack frames in guides located at an angle (preferably 45 degrees) to the being erected vertical structures. In addition, guides for motion of extendible supports located on posts of each U-shaped jack frame are arranged in opposite directions from posts along the being erected vertical structures.

[0023] Rotation drive of the shell can be installed on a pad located on its top end and contains a gear wheel engaging a gear ring secured on outer surface in the top part of the lifting jack prop.

[0024] Not part of the invention is a vertical shuttering panel for erection of multilayer structures, which contains bearing frame with an edge profiles around the panel perimeter, a deck secured on said frame with holes performed in it, where sleeves of elastic material are inserted. On end face of the top edge profile of a panel, at least one bracket with holes for fixing elements to connect with the U-shaped jack frame can be secured.

[0025] In edge profiles of the vertical shuttering panels, holes for fixing elements to connect with other panels can be performed. In the panel deck and bearing frame elements, holes for tightening devices can be performed. Panel can be sized for the whole height of tier/storey.

[0026] The set of features of both every individual invention and the group of inventions, including structural elements (assemblies, parts, etc.), when they are used jointly, makes it possible to resolve the set task. Shells installed on the props of lifting jacks with possibility of rotation and vertical motion allow isolation of props in the process of structures concreting. In the process of implementation of methods for erecting structural elements of building/construction, load from the whole formwork is transferred to the previously erected vertical structures by means of jacks, unlike to panels as it follows from prior art. It makes it possible to decrease significantly amount of metal used to manufacture the frame of panels resulting in reduction of power consumed for relocation of formwork. Besides, it becomes possible to arrange additional layers of structures immediately following concrete of the erected base (constructional) layer achieves the stripping strength. Time to stripping of structures is less than time required for the poured concrete to set to a strength, when it becomes possible to transfer the formwork load on it by means of lifting jacks. As compared with prior art, it allows reduction of construction time. Installation of guides on the jack frame posts, where holders of the vertical shuttering panels are installed with possibility of motion across the being erected vertical structures, makes it possible, just as its provided by the prior art, to adjust the wall thickness, including reduction of the wall thickness of upper tiers/storeys, which contributes the decreased expenditure of construction materials. Extendible supports installed on posts of jack frames allow relocation of travelling formwork on the poured vertical structures and extraction of lifting jacks to continue performance of works. Application of removable recess-forming cages hanged prior concreting on the vertical shuttering panels, as well as panels with holes in their decks for inserting reinforcing rods to secure mesh cage prior concreting of the next layer makes it possible to improve bonding of layers of vertical structures. It increases reliability and quality of construction works.

[0027] Inventions are explained by means of drawings, where:

Fig.1 - view of travelling formwork along the being erected single-layer wall with lifting jacks resting upon the erected wall;

Fig.2 - the same as in Fig.1, where oppositely facing panels form the molding cavity;

Fig.3 - view of formwork and molded "floor structure - single-layer wall" segment of building;
floor structure formwork is not shown;

Fig.4 - the same as in Fig.3 with partial section of the molded wall, where formwork panels are brought apart, formwork rests on extendible supports of jack

frames, and props of lifting jacks are extracted (their bottom sections are raised);

Fig.5 - the same as in Fig.4, where lifting jacks rest upon the erected wall prior lifting the formwork on the next tier/storey;

Fig.6 - view of the jack frame post base with attached panels;

Fig.7 - view A in Fig.6;

Fig.8 - section view B-B in Fig.7;

Fig.9 - section view C-C in Fig.7;

Fig.10 - section view of the top and bottom parts of the travelling formwork lifting jack;

Fig.11 - the same as in Fig.2, where multilayer wall is erected by application of the recess-forming cages hanged on panels;

Fig.12 - view of formwork and molded "floor structure - multi-layer wall" segment of building with recesses in the wall; floor structure formwork is not shown;

Fig.13 - view of the vertical shuttering panel (as such not forming part of the invention) " with holes in the deck for erection of multilayer walls;

Fig.14 - view of formwork along the erected multilayer wall with application of a panel with holes in the deck, where reinforcing rods are inserted;

Fig.15 - view of formwork and the "floor structure - wall constructional layer" segment of building molded using panel with holes in the deck, where mesh cage is secured on reinforcing rods protruding from the constructional layer; floor structure formwork is not shown.

[0028] In the specific embodiment as defined below, travelling formwork comprises lifting jacks with props 1, where U-shaped jack frames 2 are installed on. In the base of each post 3 of said jack frames, guides 4 are secured, where holders 6 of the vertical shuttering panels 7 are installed with motor drive providing possibility of their motion across the being erected vertical structures 5. Also, on posts 3 of the jack frame 2, extendible supports 8 are installed moveably. On props 1 of lifting jacks, shells 9 are installed freely with possibility of rotation and vertical motion. Lower end of each shell 9 is located in the base of the lower (end side) arm of lifting jack. Posts 3 of adjacent jack frames 2 located on each side of the being erected vertical structures 5 are connected with each other by rigid links 10. Travelling formwork includes also vertical shuttering panels 7 connected rigidly with each other and secured on holders 6 of jack frames 2. Each said panel 7 contains bearing frame with an edge profile around the panel perimeter. Extendible supports 8 of jack frames 2 are provided with motion drive and are installed on each post 3 of jack frames 2 in guides 11 located at an angle (preferably 45 degrees) to the being erected vertical structures 5. In addition, guides 11 are directed in opposite sides from posts 3 along the being erected vertical structures 5. It is evident that extendible supports 8 can be located only on the one of posts 3 of jack frames 2. In this case, extendible supports 8 on adjacent jack frames 2 will be located in the staggered order along the being erected vertical structures 5. Such an arrangement ensures reliable resting of the whole formwork on the being erected vertical structures following extraction of props 1 of lifting jacks from them. It is also evident that extendible supports 8 can be executed in the form of outriggers of the truck crane (supports of extendible, folding, pivotable and extendible, pivotable and folding types, etc.) and located on posts 3. Rotation drive of the shell 9 is installed on a pad located on its top end and contains gear wheel 12 engaging gear ring 13 secured on outer surface in the top part of the lifting jack prop 1. When props 1 are extracted from vertical structures 5, disengaging of gear wheel 12 and gear ring 13 occurs. Props 1 are lifted together with shells 9.

[0029] Travelling formwork comprises also vertical shuttering panels 7 containing bearing frame containing edge profiles around the panel perimeter. On end face of the top edge profile of panel 7, at least one bracket 14 with holes for fixing elements to connect with holders 6 of the U-shaped jack frames 2 can be secured. In edge profiles of the vertical shuttering panel, holes for fixing elements to connect with other panels can be performed. In the panel deck and bearing frame elements, holes for tightening devices can be performed. Panel can be sized for the whole height of tier/storey. For erection of multilayer structures, panels 15 can be used with holes 17 performed in their decks 16, where sleeves of elastic material are inserted. Also, for erection of multilayer structures, panels 7 can be used with removable recess-forming cages 18 hanged on them from the inner side.

[0030] Single-layer vertical structures are erected as follows.

[0031] Lifting jacks containing props 1 enclosed in shells 9 with U-shaped jack frames 2 provided with extendible supports 8 and installed on these props 1 are mounted on the already erected structures 5. Posts 3 of adjacent jack frames 2 located on each side of the being erected vertical structures are connected with each other by rigid links 10. Reinforcement cages of vertical structures are installed for the whole height of tier/storey and are secured to the protruding reinforcement of previously erected structures. Formwork panels 7 containing brackets 14 are secured to holders 6, and all panels 7 located in single plane are connected rigidly with each other. Width of molding cavity is adjusted by movement of holders 6 in guides 4. Panels located in parallel on the opposite side of reinforcement cage of the being erected vertical structures are connected by means of tightening devices. Concrete is poured in molding cavities of the being erected vertical structures 5. Reciprocating and rotational or only rotational motion is imparted to shells 9 enclosing props 1 of lifting jacks. When 30-40% design strength of erected structures is attained, U-shaped jack frames 2 are laid resting on the poured vertical structures 5 by means of extendible supports 8; props 1 of lifting jacks with their enclosing shells 9 are extracted from said vertical structures, while cavities formed in these structures

are filled with concrete, and the formwork panels are moved away from the molded surface. Said cavities can be filled not for the whole height (not shown in figures). In this case, sockets are left for further installation of props 1 of lifting jacks. When the required strength of concrete is attained, props 1 of lifting jacks are placed resting upon the already erected structures 5, U-shaped jack frames 2 are raised with formwork on the next tier/storey and the cycle of erection of vertical structures is repeated. Vertical structures can be erected simultaneously for the whole building/construction.

[0032] Multilayer vertical structures are erected as follows.

[0033] First stages of erecting the base (constructional) layer are performed in just the same manner as described above.

[0034] When molded structures (constructional layer) attain the stripping strength, formwork panels 7 on one or both sides are moved away from the molded surface (an example is shown in figures, where panels are moved away only on the one side to form the second layer 22). Width of molding cavity of the new layer is adjusted and this cavity is filled with molding material. When 30-40% design strength of the base (constructional) layer is attained, U-shaped jack frames 2 are laid resting on the poured vertical structures 5 (constructional layer) by means of extendible supports 8; props 1 of lifting jacks with their enclosing shells 9 are extracted from said vertical structures (constructional layer), while cavities formed in these structures are filled with concrete. The formwork panels 7 are moved away from the molded multilayer surface, props 1 of lifting jacks are placed resting on the already erected base (constructional) layer of vertical structure 5, U-shaped jack frames 2 are raised with formwork on the next tier/storey and the cycle of erection of the multilayer vertical structures is repeated. In one of possible embodiments (Figs, 11,12), prior to fill molding cavity of the base (constructional) layer with concrete, the removable recess-forming cages 18 are hanged on the inner surface of the formwork panels 7 and removed prior molding of the last (outer) layer. Vertical structures can be erected simultaneously for the whole building/construction. Under another embodiment (Figs. 14,15), panels 15 (Fig. 13) are installed on posts 3 of jack frames 2. The deck 16 of said panels 15 is provided with holes 17 performed in it, where sleeves of elastic material are inserted. Following adjustment of width of molding cavity of the base (constructional) layer, reinforcing rods 19 are inserted in holes 17 with their ends located on both sides of the plane of panels 15. Following panels are moved away prior molding of the next layer, mesh cage 20 is secured on the inserted reinforcing rods 19. Vertical multilayer structures can be erected simultaneously for the whole building/construction. It is evident that outside the constructional layer it is possible to erect simultaneously two - facing and insulating - layers at once. In this case, panels 7 or 15 are moved away from the molded constructional layer on both sides and works are performed as it is described above.

[0035] The "floor structure - vertical structure" segment of building/constructions is erected of monolithic reinforced concrete as follows.

[0036] Lifting jacks containing props 1 enclosed in shells 9 with U-shaped jack frames 2 provided with extendible supports 8 and installed on said props 1 are mounted on the already erected structures 5. Posts 3 of adjacent jack frames 2 located on each side of the being erected vertical structures are connected with each other by rigid links 10. The floor structure formwork 21 with reinforcement cages is mounted and reinforcement cages of vertical structures for the whole height of tier/storey are installed. Said reinforcement cages are secured to protruding reinforcement of previously erected vertical structures and floor structure. Formwork panels 7 containing brackets 14 are secured to holders 6, and all panels 7 located in single plane are connected rigidly with each other with their bottom part located at the level of the top of the floor structure formwork. Width of molding cavity is adjusted by movement of holders 6 in guides 4. Panels 7 located in parallel on the opposite side of reinforcement cage of the being erected vertical structures are connected by means of tightening devices. Concrete of floor structure is poured and at the final stage of its setting concrete is poured in molding cavities of the being erected vertical structures. Reciprocating and rotational or only rotational motion is imparted to shells 9 enclosing props 1 of lifting jacks. When 30-40% design strength of erected structures is attained, U-shaped jack frames 2 are laid resting on the poured vertical structures 5 (constructional layer) by means of extendible supports 8; props 1 of lifting jacks with their enclosing shells 9 are extracted from said vertical structures, while cavities formed in these structures are filled with concrete, and the formwork panels are moved away from the molded surface. Props 1 of lifting jacks are placed resting on the already erected structures, U-shaped jack frames 2 are raised with formwork on the next tier/storey and the cycle of erection of the said building segment is repeated. Floor structure and vertical structures can be erected simultaneously for the whole building/construction.

[0037] The "floor structure -multilayer wall" segment of building/construction of monolithic reinforced concrete is erected as follows.

[0038] First stages of works are performed in just the same manner as during erection of the "wall - floor structure" segment. When the base (constructional layer) attains the stripping strength, formwork panels on one or both sides are moved away from the molded vertical surface (an example is shown in figures, where panels are moved away only on the one side to form the second layer 22). Width of molding cavity of the new layer is adjusted and this cavity is filled with molding material. When 30-40% design strength of the base (constructional) layer of vertical structures is attained, U-shaped jack frames 2 are laid resting on the base layer by means of extendible supports 8; props 1 of lifting jacks with their

enclosing shells 9 are extracted from said base layer, while cavities formed in vertical structures are filled with concrete. The formwork panels 7 are moved away from the molded multilayer surface, props 1 of lifting jacks are placed resting on the erected base (constructional) layer of vertical structure, U-shaped jack frames 2 are raised with formwork on the next tier/storey and the cycle of erection of the building/construction part is repeated. Possible embodiments of the method for erecting multilayer vertical structures are disclosed above in respective section of the present patent specification. Floor structure and multilayer vertical structures can be erected simultaneously for the whole building/construction.

[0039] Utilization of inventions makes it possible to reduce consumption of materials for technological equipment and power costs for this equipment relocation. Time required for erection of buildings/constructions with multilayer vertical structures is reduced. When works are carried out simultaneously at the whole building/construction, just as it is specified in the family patent, creation of the monolithic building segment including floor slab structure of building and vertical structures of the upper tier/storey is ensured. Furthermore, rigidity and strength properties of the erected buildings/constructions are improved, which makes it possible to utilize inventions efficiently during construction activities in seismic regions.

Claims

1. Method for erecting vertical structural elements of building/construction of monolithic reinforced concrete including process steps of:

   - installing lifting jacks containing props (1) enclosed in shells (9) on already erected structures; installing U-shaped jack frames (2) equipped with posts (3) and extendible supports (8) on said posts (3); connecting the posts (3) of said jack frames (2) located adjacently on both sides of the being erected vertical structures (5) by rigid links (10);
   - installing reinforcement cages of the vertical structures for the whole height of a tier/storey with their connection to protruding reinforcement of the already erected structures;
   - installing formwork panels (7) for erection of the vertical structures (5) on the posts (3) of the jack frames (2); securing rigidly said panels (7) located in a single plane to define a molding cavity; adjusting a width of the molding cavity; and connecting said panels located in parallel on the opposite side of the reinforcement cage of the being erected vertical structures (5) by means of tightening devices;
   - pouring concrete into the molding cavity of the being erected vertical structures (5); imparting reciprocating and rotating or only rotating motion to the shells (9) enclosing the props (1) of the lifting jacks; resting the U-shaped jack frames (2) upon the poured vertical structures by means of the extendible supports (8) following a 30-40% design strength of the poured structures is attained; extracting the lifting jack props (1) with their enclosing shells from said poured structures which leaves a cavity in the poured structures, followed by a subsequent filling of the cavities formed in the vertical structures with concrete; and moving the formwork panels (7) away from a surface of the poured structures;
   - resting the props of the lifting jacks upon the already poured structures; lifting the U-shaped jack frames with the formwork panels on a next tier/storey; and repeating the cycle for erecting vertical structures.

2. The method according to claim 1, wherein the vertical structures (5) are erected simultaneously for the whole building/construction.

3. Method for erecting multilayer vertical structures of building/construction of monolithic reinforced concrete including process steps of:

   - installing lifting jacks containing props (1) enclosed in shells (9) on already erected structures; installing U-shaped jack frames (2) equipped with posts (3) and extendible supports (8) on said posts (3); connecting the posts (3) of said jack frames (2) located adjacently on both sides of the being erected multilayer vertical structures (5) by rigid links;
   - installing reinforcement cages of the multilayer vertical structures (5) for the whole height of a tier/storey with their connection to protruding reinforcement of the already erected structures;
   - installing formwork panels (7) for erection of the multilayer vertical structures (5) on the posts (3) of the jack frames (2); securing rigidly said panels (7) located in a single plane to define a molding cavity; adjusting a width of the molding cavity; and connecting said panels (7) located in parallel on the opposite side of the reinforcement cage of the being erected multilayer vertical structures (5) by means of tightening devices;
   - pouring concrete into the molding cavity of the being erected multilayer vertical structures (5); imparting reciprocating and rotating or only rotating motion to the shells (9) enclosing props (1) of the lifting jacks; moving the formwork panels (7) away from the poured surface on one or both sides following a stripping strength of the poured structures is attained; adjusting a width of a molding cavity of a new layer and filling said cavity with molding material;

- resting the U-shaped jack frames (2) upon the poured vertical structures by means of the extendible supports (8) following a 30-40% design strength of a base constructional layer i of the poured structures is attained; extracting the props (1) of the lifting jacks with their enclosing shells (9) from said poured structures which leaves a cavity in the poured structures, followed by a subsequent filling of the cavities formed in the vertical structures with concrete;
- moving the formwork panels (7) away from the poured multi-layer surface of the poured structure; resting the props (1) of the lifting jacks upon the already poured base constructional layer of the multilayer vertical structure; lifting the U-shaped jack frames (2) with the formwork panels (7) on a next tier/storey; and repeating the cycle for erecting multilayer vertical structures.

4. The method according to claim 3, wherein, prior to filling the molding cavity of the base constructional layer with concrete, removable recess-forming cages (18) are hanged on an inner surface of the formwork panels (7), and, prior to molding of a last outer layer, said cages (18) are removed.

5. The method according to claim 3, wherein panels (15) with holes (17) performed in their decks (16), where sleeves of elastic material are inserted, are installed on the posts (1) of the jack frames; following adjustment of a width of the molding cavity of the base constructional layer, reinforcing rods (19) are inserted in said holes (17) with the protruding ends located on both sides of the plane of the panels (15); and following moving the panels (15) away and prior to the molding of the next layer, a mesh cage (20) is secured on the inserted reinforcing rods (19).

6. The method according to claims 4 or 5, wherein the vertical multilayer structures are erected simultaneously for the whole building/construction.

7. A method for erecting a floor structure - vertical structure segment of a building/construction of monolithic reinforced concrete including process steps of:

- installing lifting jacks containing props (1) enclosed in shells (9) on already erected vertical structures; installing U-shaped jack frames (2) equipped with posts (3) and extendible supports (8) on said posts (3); connecting the posts (3) of said jack frames (2) located adjacently on both sides of the being erected vertical structures by rigid links (10);
- installing floor structure formwork (21) with reinforcement cages and installing reinforcement cages of the vertical structures for the whole height of a tier/storey with their connection to protruding reinforcement of the already erected structures and reinforcement of the floor structure;
- installing formwork panels (7) for erection of the vertical structures on the posts (3) of the jack frames (2); securing rigidly said panels (7) located in a single plane to define a molding cavity; adjusting a width of the molding cavity; and connecting said panels (7) located in parallel on the opposite side of the reinforcement cage of the being erected vertical structures by means of tightening devices; locating a bottom part of the formwork panels at the level of a top part of the floor structure formwork (21);
- pouring concrete of the floor structure; pouring concrete into the molding cavity of the being erected vertical structures at the final stage of setting of said floor structure concrete; imparting reciprocating and rotating or only rotating motion to shells (9) enclosing the props (1) of the lifting jacks; resting the U-shaped jack frames (2) upon the poured vertical structures by means of the extendible supports (8) following a 30-40% design strength of the poured structures is attained; extracting the props (1) of the lifting jacks with their enclosing shells (9) from said poured structures which leaves a cavity in the poured structures, followed by subsequent filling of the cavities formed in the vertical structures with concrete; and moving the formwork panels (7) away from a surface of the poured structures;
- resting the props (1)of the lifting jacks upon the already poured vertical structures; lifting the U-shaped jack frames (2) with the formwork panels (7) on a next tier/storey; and repeating the cycle for erecting the vertical structures.

8. The method according to claim 7, wherein the floor structure and the vertical structures of the whole building/construction are erected simultaneously.

9. A method for erecting a floor structure - multilayer vertical structure segment of building/construction of monolithic reinforced concrete including process steps of:

- installing lifting jacks containing props (1) enclosed in shells (9) on already erected vertical structures; installing U-shaped jack frames (2) equipped with posts (3) and extendible supports on said posts (3); connecting the posts (3) of said jack frames located adjacently on both sides of the being erected vertical structures by rigid links;
- installing floor structure formwork (21) with reinforcement cages and installing reinforcement cages of the vertical structures for the whole height of a tier/storey with their connection to

protruding reinforcement of the already erected structures and reinforcement of the floor structure;

- installing formwork panels (7) for erection of the vertical structures on the posts (3) of the jack frames; securing rigidly said formwork panels (7) located in a single plane to define a molding cavity; adjusting a width of the molding cavity; and connecting said panels located in parallel on the opposite side of the reinforcement cage of the being erected vertical structures by means of tightening devices; locating a bottom part of the formwork panels at the level of a top part of the floor structure formwork (21);
- pouring concrete of the floor structure; pouring concrete into the molding cavity of the being erected vertical structures at the final stage of setting of said floor structure concrete; imparting reciprocating and rotating or only rotating motion to the shells (9) enclosing the props (1) of the lifting jacks; moving the formwork panels (7) away from the poured surface on one or both sides following a stripping strength of the poured structures is attained; adjusting a width of a molding cavity of a new layer and filling said cavity with molding material;
- resting U-shaped jack frames (2) upon the poured vertical structures by means of the extendible supports following a 30-40% design strength of a base constructional layer of the poured vertical structures is attained; extracting the lifting jack props (1) with their enclosing shells (9) from said poured vertical structures which leaves a cavity in the poured structures, followed by a subsequent filling of the cavities formed in the vertical structures with concrete;
- moving the formwork panels (7) away from a multilayer surface of the poured structures; resting the props (1) of the lifting jacks upon the already poured base constructional layer of the vertical structure; lifting the U-shaped jack frames (2) with the formwork panels (7) on a next tier/storey; and repeating the cycle for erecting the building/construction segment.

10. The method according to claim 9, wherein prior to filling the molding cavity of the base constructional layer with concrete, removable recess-forming cages (18) are hanged on an inner surface of the formwork panels (7), and, prior to the molding of a last outer layer, said cages (18) are removed.

11. The method according to claim 9, wherein panels (15) with holes (17) performed in their decks (16), where sleeves of elastic material are inserted, are installed on the posts (3) of the jack frames; following adjustment of the width of the molding cavity of the base constructional layer, reinforcing rods (19) are inserted in said holes (17) with protruding ends located on both sides of the plane of the panels (15); and following moving the panels away and prior to the pouring of the next layer, a mesh cage (20) is secured on the inserted reinforcing rods (19).

12. The method according to claims10 or 11, wherein the floor structure formwork (21) and the vertical multilayer structures of the whole building/construction are erected simultaneously.

13. A travelling formwork to implement the method according to claims 1 or 3 or 7 or 9 comprising lifting jacks having props (1) with U-shaped jack frames (2) installed on them and containing posts (3); in the base of posts (3), guides (4) are secured, where holders (6) of formwork panels (7) for vertical structures (5) are installed with the possibility of travelling across erected vertical structures (5) by means of a motor drive for their motion; wherein at least one of the posts (3) of the jack frames (2) is provided with an extensible support (8) installed on it; on the props (1) of the lifting jacks, shells (9) are installed freely with the possibility of rotation and vertical motion; a lower end of each shell (9) is located on a lower end side arm of the base of the corresponding prop (1); the posts (3) of adjacent jack frames (2) being located on each side of the to be erected vertical structures (5) are connected with each other by rigid links (10); vertical formwork panels (7) are connected rigidly with each other and are secured on the holders (6); said panels (7) contain bearing frames with an edge profile around the panel perimeter.

14. The travelling formwork according to claim 13, wherein the extendible supports (8) of the jack frames (2) are provided with a motion motor drive and are installed on each post (3) of said jack frames (2) in guides (11) located at an angle of preferably 45 degrees to the being erected vertical structures (5); guides (11) for the motion of the extendible supports (8) are located on the posts (3) of each U-shaped jack frame (2) are arranged in opposite directions from the posts (3) along the being erected vertical structures (5).

15. The travelling formwork according to claim 13, wherein a rotation drive of a shell (9) is installed on a pad located on the top end of said shell and contains a gear wheel (12) engaging a gear ring (13) secured on an outer surface in a top part of the lifting jack prop (1).

Patentansprüche

1. Verfahren zum Errichten von vertikalen Strukturelementen eines Gebäudes/einer Konstruktion aus mo-

nolithischem Stahlbeton, das die folgenden Prozessschritte beinhaltet:

- Installieren von Hebeböcken, die Stützen (1) enthalten, die in Hüllen (9) eingeschlossen sind, auf bereits errichteten Strukturen; Installieren von U-förmigen Heberrahmen (2), die mit Pfeilern (3) ausgerüstet sind, und ausfahrbaren Abstützungen (8) auf den genannten Pfeilern (3); Verbinden der Pfeiler (3) der genannten Heberrahmen (2), die angrenzend auf beiden Seiten der errichteten vertikalen Strukturen (5) liegen, durch starre Verbindungsglieder (10);
- Installieren von Bewehrungskörben der vertikalen Strukturen für die gesamte Höhe einer Etage/eines Geschosses mit ihrer Verbindung zur vorstehenden Bewehrung der bereits errichteten Strukturen;
- Installieren von Verschalungsplatten (7) zur Errichtung der vertikalen Strukturen (5) auf den Pfeilern (3) der Heberrahmen (2); starres Sichern der genannten Platten (7), die in einer einzelnen Ebene liegen, um einen Formhohlraum zu definieren; Anpassen einer Breite des Formhohlraums; und Verbinden der genannten Platten, die parallel auf der entgegengesetzten Seite des Bewehrungskorbes der errichteten vertikalen Strukturen (5) liegen, mittels Spannvorrichtungen;
- Gießen von Beton in den Formhohlraum der errichteten vertikalen Strukturen (5); Ausüben einer Wechsel- und Rotations- oder nur Rotationsbewegung auf die Hüllen (9), die die Stützen (1) der Hebeböcke einschließen; Auflegen der U-förmigen Heberrahmen (2) auf die gegossenen vertikalen Strukturen mittels der ausfahrbaren Abstützungen (8) nach Erhalten einer Konstruktionsfestigkeit von 30-40% für die gegossenen Strukturen; Herausziehen der Hebebockstützen (1) mit ihren einschließenden Hüllen aus den genannten gegossenen Strukturen, wodurch ein Hohlraum in den gegossenen Strukturen verbleibt, gefolgt von einem anschließenden Füllen der in den vertikalen Strukturen ausgebildeten Hohlräume mit Beton; und Wegbewegen der Verschalungsplatten (7) von einer Oberfläche der gegossenen Strukturen;
- Auflegen der Stützen der Hebeböcke auf die bereits gegossenen Strukturen; Heben der U-förmigen Heberrahmen mit den Verschalungsplatten auf eine nächste Etage/ein nächstes Geschoss; und Wiederholen des Zyklus zum Errichten von vertikalen Strukturen.

2. Verfahren gemäß Anspruch 1, wobei die vertikalen Strukturen (5) für das gesamte Gebäude/die gesamte Konstruktion gleichzeitig errichtet werden.

3. Verfahren zum Errichten von mehrlagigen, vertikalen Strukturen eines Gebäudes/einer Konstruktion aus monolithischem Stahlbeton, das die folgenden Prozessschritte beinhaltet:

- Installieren von Hebeböcken, die Stützen (1) enthalten, die in Hüllen (9) eingeschlossen sind, auf bereits errichteten Strukturen; Installieren von U-förmigen Heberrahmen (2), die mit Pfeilern (3) ausgerüstet sind, und ausfahrbaren Abstützungen (8) auf den genannten Pfeilern (3); Verbinden der Pfeiler (3) der genannten Heberrahmen (2), die angrenzend auf beiden Seiten der errichteten mehrlagigen, vertikalen Strukturen (5) liegen, durch starre Verbindungsglieder;
- Installieren von Bewehrungskörben der mehrlagigen, vertikalen Strukturen (5) für die gesamte Höhe einer Etage/eines Geschosses mit ihrer Verbindung zur vorstehenden Bewehrung der bereits errichteten Strukturen;
- Installieren von Verschalungsplatten (7) zur Errichtung der mehrlagigen, vertikalen Strukturen (5) auf den Pfeilern (3) der Heberrahmen (2); starres Sichern der genannten Platten (7), die in einer einzelnen Ebene liegen, um einen Formhohlraum zu definieren; Anpassen einer Breite des Formhohlraums; und Verbinden der genannten Platten (7), die parallel auf der entgegengesetzten Seite des Bewehrungskorbes der errichteten mehrlagigen, vertikalen Strukturen (5) liegen, mittels Spannvorrichtungen;
- Gießen von Beton in den Formhohlraum der errichteten mehrlagigen, vertikalen Strukturen (5); Ausüben einer Wechsel- und Rotations- oder nur Rotationsbewegung auf die Hüllen (9), die Stützen (1) der Hebeböcke einschließen; Wegbewegen der Verschalungsplatten (7) von der gegossenen Oberfläche auf einer oder beiden Seiten nach Erhalten einer Ausschalfestigkeit der gegossenen Strukturen; Anpassen einer Breite eines Formhohlraums einer neuen Lage und Füllen des genannten Hohlraums mit Formmaterial;
- Auflegen der U-förmigen Heberrahmen (2) auf die gegossenen vertikalen Strukturen mittels der ausfahrbaren Abstützungen (8) nach Erhalten einer Konstruktionsfestigkeit von 30-40% für eine konstruktive Basislage der gegossenen Strukturen;
- Herausziehen der Stützen (1) der Hebeböcke mit ihren einschließenden Hüllen (9) aus den genannten gegossenen Strukturen, wodurch ein Hohlraum in den gegossenen Strukturen verbleibt, gefolgt von einem anschließenden Füllen der in den vertikalen Strukturen ausgebildeten Hohlräume mit Beton;
- Wegbewegen der Verschalungsplatten (7) von der gegossenen mehrlagigen Oberfläche der

gegossenen Struktur; Auflegen der Stützen (1) der Hebeböcke auf die bereits gegossene konstruktive Basislage der mehrlagigen, vertikalen Struktur; Heben der U-förmigen Heberrahmen (2) mit den Verschalungsplatten (7) auf eine nächste Etage/ein nächstes Geschoss; und Wiederholen des Zyklus zum Errichten von mehrlagigen, vertikalen Strukturen.

4. Verfahren gemäß Anspruch 3, wobei, vor dem Füllen des Formhohlraums der konstruktiven Basislage mit Beton, entfernbare Aussparungs-Schalungs-Käfige (18) auf eine Innenfläche der Verschalungsplatten (7) gehängt werden, und, vor dem Formen einer letzten äußeren Lage, die genannten Käfige (18) entfernt werden.

5. Verfahren gemäß Anspruch 3, wobei Platten (15) mit Löchern (17), ausgeführt in ihren Decks (16), wo Hülsen aus elastischem Material eingeführt werden, auf den Pfeilern (1) der Heberrahmen installiert werden; nach Anpassung einer Breite des Formhohlraums der konstruktiven Basislage Bewehrungsstäbe (19) in die genannten Löcher (17) eingeführt werden, mit den vorstehenden Enden auf beiden Seiten der Ebene der Platten (15) liegend; und nach Wegbewegen der Platten (15) und vor dem Formen der nächsten Lage ein Gitterkäfig (20) auf den eingeführten Bewehrungsstäben (19) gesichert wird.

6. Verfahren gemäß den Ansprüchen 4 oder 5, wobei die vertikalen, mehrlagigen Strukturen für das gesamte Gebäude, die gesamte Konstruktion gleichzeitig errichtet werden.

7. Verfahren zum Errichten eines Segments einer Bodenstruktur-vertikalen Struktur eines Gebäudes/einer Konstruktion aus monolithischem Stahlbeton, das die folgenden Prozessschritte beinhaltet:

- Installieren von Hebeböcken, die Stützen (1) enthalten, die in Hüllen (9) eingeschlossen sind, auf bereits errichteten vertikalen Strukturen; Installieren von U-förmigen Heberrahmen (2), die mit Pfeilern (3) ausgerüstet sind, und ausfahrbaren Abstützungen (8) auf den genannten Pfeilern (3); Verbinden der Pfeiler (3) der genannten Heberrahmen (2), die angrenzend auf beiden Seiten der errichteten vertikalen Strukturen liegen, durch starre Verbindungsglieder (10);
- Installieren von Bodenstruktur-Verschalung (21) mit Bewehrungskörben und Installieren von Bewehrungskörben der vertikalen Strukturen für die gesamte Höhe einer Etage/eines Geschosses mit ihrer Verbindung zur vorstehenden Bewehrung der bereits errichteten Strukturen und Bewehrung der Bodenstruktur;
- Installieren von Verschalungsplatten (7) zur Errichtung der vertikalen Strukturen auf den Pfeilern (3) der Heberrahmen (2); starres Sichern der genannten Platten (7), die in einer einzelnen Ebene liegen, um einen Formhohlraum zu definieren; Anpassen einer Breite des Formhohlraums; und Verbinden der genannten Platten (7), die parallel auf der entgegengesetzten Seite des Bewehrungskorbes der errichteten vertikalen Strukturen (5) liegen, mittels Spannvorrichtungen; Positionieren eines unteren Teils der Verschalungsplatten auf dem Niveau eines oberen Teils der Bodenstruktur-Verschalung (21);
- Gießen von Beton der Bodenstruktur; Gießen von Beton in den Formhohlraum der errichteten vertikalen Strukturen in der letzten Phase des Erhärtens des genannten Bodenstrukturbetons; Ausüben einer Wechsel- und Rotations- oder nur Rotationsbewegung auf Hüllen (9), die die Stützen (1) der Hebeböcke einschließen; Auflegen der U-förmigen Heberrahmen (2) auf die gegossenen vertikalen Strukturen mittels der ausfahrbaren Abstützungen (8), nach Erhalten einer Konstruktionsfestigkeit von 30-40% für die gegossenen Strukturen; Herausziehen der Stützen (1) der Hebeböcke mit ihren einschließenden Hüllen (9) aus den genannten gegossenen Strukturen, wodurch ein Hohlraum in den gegossenen Strukturen verbleibt, gefolgt von anschließendem Füllen der in den vertikalen Strukturen ausgebildeten Hohlräume mit Beton; und Wegbewegen der Verschalungsplatten (7) von einer Oberfläche der gegossenen Strukturen;
- Auflegen der Stützen (1) der Hebeböcke auf die bereits gegossenen vertikalen Strukturen; Heben der U-förmigen Heberrahmen (2) mit den Verschalungsplatten (7) auf eine nächste Etage/ein nächstes Geschoss; und Wiederholen des Zyklus zum Errichten der vertikalen Strukturen.

8. Verfahren gemäß Anspruch 7, wobei die Bodenstruktur und die vertikalen Strukturen für das gesamte Gebäude/die gesamte Konstruktion gleichzeitig errichtet werden.

9. Verfahren zum Errichten eines Segments einer Bodenstruktur-mehrlagigen, vertikalen Struktur eines Gebäudes/einer Konstruktion aus monolithischem Stahlbeton, das die folgenden Prozessschritte beinhaltet:

- Installieren von Hebeböcken, die Stützen (1) enthalten, die in Hüllen (9) eingeschlossen sind, auf bereits errichteten vertikalen Strukturen; Installieren von U-förmigen Heberrahmen (2), die mit Pfeilern (3) ausgerüstet sind, und ausfahrbaren Abstützungen auf den genannten Pfeilern (3); Verbinden der Pfeiler (3) der genannten He-

berrahmen, die angrenzend auf beiden Seiten der errichteten vertikalen Strukturen liegen, durch starre Verbindungsglieder;

- Installieren von Bodenstruktur-Verschalung (21) mit Bewehrungskörben und Installieren von Bewehrungskörben der vertikalen Strukturen für die gesamte Höhe einer Etage/eines Geschosses mit ihrer Verbindung zur vorstehenden Bewehrung der bereits errichteten Strukturen und Bewehrung der Bodenstruktur;
- Installieren von Verschalungsplatten (7) zur Errichtung der vertikalen Strukturen auf den Pfeilern (3) der Heberrahmen; starres Sichern der genannten Verschalungsplatten (7), die in einer einzelnen Ebene liegen, um einen Formhohlraum zu definieren; Anpassen einer Breite des Formhohlraums; und Verbinden der genannten Platten, die parallel auf der entgegengesetzten Seite des Bewehrungskorbes der errichteten vertikalen Strukturen (5) liegen, mittels Spannvorrichtungen; Positionieren eines unteren Teils der Verschalungsplatten auf dem Niveau eines oberen Teils der Bodenstruktur-Verschalung (21);
- Gießen von Beton der Bodenstruktur; Gießen von Beton in den Formhohlraum der errichteten vertikalen Strukturen in der letzten Phase des Erhärtens des genannten Bodenstrukturbetons; Ausüben einer Wechsel- und Rotations- oder nur Rotationsbewegung auf die Hüllen (9), die die Stützen (1) der Hebeböcke einschließen; Wegbewegen der Verschalungsplatten (7) von der gegossenen Oberfläche auf einer oder beiden Seiten nach Erhalten einer Ausschalfestigkeit der gegossenen Strukturen; Anpassen einer Breite eines Formhohlraums einer neuen Lage und Füllen des genannten Hohlraums mit Formmaterial;
- Auflegen von U-förmigen Heberrahmen (2) auf die gegossenen vertikalen Strukturen mittels der ausfahrbaren Abstützungen nach Erhalten einer Konstruktionsfestigkeit von 30-40% für eine konstruktive Basislage der gegossenen vertikalen Strukturen; Herausziehen der Hebebockstützen (1) mit ihren einschließenden Hüllen (9) aus den genannten gegossenen vertikalen Strukturen, wodurch ein Hohlraum in den gegossenen Strukturen verbleibt, gefolgt von einem anschließenden Füllen der in den vertikalen Strukturen ausgebildeten Hohlräume mit Beton;
- Wegbewegen der Verschalungsplatten (7) von einer mehrlagigen Oberfläche der gegossenen Strukturen; Auflegen der Stützen (1) der Hebeböcke auf die bereits gegossene konstruktive Basislage der vertikalen Struktur; Heben der U-förmigen Heberrahmen (2) mit den Verschalungsplatten (7) auf eine nächste Etage/ein nächstes Geschoss; und Wiederholen des Zyklus zum Errichten des Gebäude-/Konstruktionssegments.

10. Verfahren gemäß Anspruch 9, wobei, vor dem Füllen des Formhohlraums der konstruktiven Basislage mit Beton, entfernbare Aussparungs-Schalungs-Käfige (18) auf eine innere Oberfläche der Verschalungsplatten (7) gehängt werden, und, vor dem Formen einer letzten äußeren Lage, die genannten Käfige (18) entfernt werden.

11. Verfahren gemäß Anspruch 9, wobei Platten (15) mit Löchern (17), ausgeführt in ihren Decks (16), wo Hülsen aus elastischem Material eingeführt werden, auf den Pfeilern (3) der Heberrahmen installiert werden; nach Anpassung einer Breite des Formhohlraums der konstruktiven Basislage Bewehrungsstäbe (19) in die genannten Löcher (17) eingeführt werden, mit vorstehenden Enden auf beiden Seiten der Ebene der Platten (15) liegend; und nach Wegbewegen der Platten und vor dem Gießen der nächsten Lage ein Gitterkäfig (20) auf den eingeführten Bewehrungsstäben (19) gesichert wird.

12. Verfahren gemäß den Ansprüchen 10 oder 11, wobei die Bodenstruktur-Verschalung (21) und die mehrlagigen, vertikalen Strukturen für das gesamte Gebäude/die gesamte Konstruktion gleichzeitig errichtet werden.

13. Fahrbare Verschalung zum Implementieren des Verfahrens gemäß den Ansprüchen 1 oder 3 oder 7 oder 9, umfassend Hebeböcke, die Stützen (1) aufweisen, mit U-förmigen Heberrahmen (2), die auf diesen installiert sind und Pfeiler (3) enthalten; wobei in der Basis der Pfeiler (3) Führungen (4) gesichert sind, wo Halter (6) von Verschalungsplatten (7) für vertikale Strukturen (5) installiert sind, mit der Möglichkeit des Fahrens über errichtete vertikale Strukturen (5) mittels eines Motorantriebs für deren Bewegung; wobei mindestens einer der Pfeiler (3) der Heberrahmen (2) mit einer erweiterbaren Abstützung (8) bereitgestellt ist, die darauf installiert ist; wobei auf den Stützen (1) der Hebeböcke Hüllen (9) frei installiert sind, mit der Möglichkeit der Rotation und vertikalen Bewegung; wobei ein unteres Ende von jeder Hülle (9) auf einem unteren Endseitenarm der Basis der entsprechenden Stütze (1) liegt; wobei die Pfeiler (3) von angrenzenden Heberrahmen (2) auf jeder Seite der zu errichtenden vertikalen Strukturen (5) miteinander durch starre Verbindungsglieder (10) verbunden sind; wobei vertikale Verschalungsplatten (7) miteinander starr verbunden sind und auf den Haltern (6) gesichert sind; wobei die genannten Platten (7) Lagerrahmen mit einem Kantenprofil um den Plattenumfang herum enthalten.

14. Fahrbare Verschalung gemäß Anspruch 13, wobei die ausfahrbaren Abstützungen (8) der Heberrahmen (2) mit einem Bewegungsmotortrieb bereitgestellt sind und auf jedem Pfeiler (3) der genannten Heberrahmen (2) in Führungen (11) installiert sind, die in einem Winkel von bevorzugt 45 Grad zu den errichteten vertikalen Strukturen (5) liegen; wobei die Führungen (11) für die Bewegung der ausfahrbaren Abstützungen (8) auf den Pfeilern (3) von jedem U-förmigen Heberrahmen (2) liegen, in entgegengesetzten Richtungen von den Pfeilern (3) entlang der errichteten vertikalen Strukturen (5) angeordnet sind.

15. Fahrbare Verschalung gemäß Anspruch 13, wobei ein Rotationsantrieb einer Hülle (9) auf einem Kissen installiert ist, das auf dem oberen Ende der genannten Hülle liegt, und ein Zahnrad (12) enthält, das einen Zahnkranz (13) in Eingriff nimmt, der auf einer äußeren Oberfläche in einem oberen Teil der Hebebockstütze (1) gesichert ist.

Revendications

1. Procédé de montage d'éléments de structure verticaux de bâtiment/construction de béton armé monolithique, y compris les étapes de procédé comprenant :

- le montage des vérins de levage contenant des colonnes (1) enfermées dans des enveloppes (9) sur des structures déjà érigées ; le montage de châssis de vérin en U (2) munis de montants (3) et de supports extensibles (8) sur lesdits montants (3) ; le raccordement des montants (3) desdits châssis de vérin (2) attenants aux deux côtés des structures verticales (5) en cours de montage à l'aide de liaisons rigides (10) ;
- le montage de cages d'armature des structures verticales pour toute la hauteur d'un niveau/étage ainsi que leurs connexions avec les renforts en saillie des structures déjà érigées ;
- le montage de panneaux de coffrage (7) pour le montage des structures verticales (5) sur les montants (3) des châssis de vérin (2) ; la fixation rigide desdits panneaux (7) situés sur un même plan de façon à définir une cavité de moulage ; le réglage d'une largeur de la cavité de moulage ; et le raccordement desdits panneaux situés parallèlement de l'autre côté de la cage d'armature des structures verticales (5) en cours de montage à l'aide de dispositifs de serrage ;
- le coulage de béton dans la cavité de moulage des structures verticales (5) en cours de montage ; la communication d'un mouvement alternatif et rotatif ou uniquement rotatif aux enveloppes (9) contenant les colonnes (1) des vérins de levage ; la pose des châssis de vérin en U (2) sur les structures verticales coulées à l'aide des supports extensibles (8) après avoir atteint 30 à 40% de la résistance nominale des structures coulées ; l'extraction des colonnes (1) du vérin de levage ainsi que de ses enveloppes protectrices desdites structures coulées en laissant une cavité dans les structures coulées, suivie du remplissage subséquent des cavités formées dans les structures verticales à l'aide de béton ; et le retrait des panneaux de coffrage (7) d'une surface des structures coulées ;
- la pose des colonnes des vérins de levage sur les structures déjà coulées ; le levage des châssis de vérin en U et des panneaux de coffrage jusqu'au prochain niveau/étage ; et la répétition du cycle de montage des structures verticales.

2. La méthode selon la revendication 1, dans laquelle les structures verticales (5) sont montées simultanément pour l'ensemble du bâtiment/construction.

3. Procédé de montage d'éléments de structure verticaux multicouches de bâtiment/construction de béton armé monolithique, y compris les étapes de procédé comprenant :

- le montage des vérins de levage contenant des colonnes (1) enfermées dans des enveloppes (9) sur des structures déjà érigées ; le montage de châssis de vérin en U (2) munis de montants (3) et de supports extensibles (8) sur lesdits montants (3) ; le raccordement des montants (3) desdits châssis de vérin (2) attenants aux deux côtés des structures verticales multicouches (5) en cours de montage à l'aide de liaisons rigides ;
- le montage de cages d'armature des structures verticales multicouches (5) pour toute la hauteur d'un niveau/étage ainsi que leurs connexions avec les renforts en saillie des structures déjà érigées ;
- le montage de panneaux de coffrage (7) pour le montage des structures verticales multicouches (5) sur les montants (3) des châssis de vérin (2) ; la fixation rigide desdits panneaux (7) situés sur un même plan de façon à définir une cavité de moulage ; le réglage d'une largeur de la cavité de moulage ; et le raccordement desdits panneaux (7) situés parallèlement de l'autre côté de la cage d'armature des structures verticales multicouches (5) en cours de montage à l'aide de dispositifs de serrage ;
- le coulage de béton dans la cavité de moulage des structures verticales multicouches (5) en cours de montage ; la communication d'un mouvement alternatif et rotatif ou uniquement rotatif aux enveloppes (9) contenant les colonnes (1) des vérins de levage ; le retrait des panneaux

de coffrage (7) de la surface coulée d'un ou des deux côtés après avoir atteint une force d'arrachement des structures coulées ; le réglage de la largeur d'une cavité de moulage d'une nouvelle couche et le remplissage de ladite cavité avec une substance de moulage ;
- la pose des châssis de vérin en U (2) sur les structures verticales coulées à l'aide des supports extensibles (8) après avoir atteint 30 à 40% de la résistance nominale d'une couche de construction de base des structures coulées ; l'extraction des colonnes (1) des vérins de levage ainsi que de ses enveloppes protectrices (9) desdites structures coulées en laissant une cavité dans les structures coulées, suivie du remplissage subséquent des cavités formées dans les structures verticales à l'aide de béton ;
- le retrait des panneaux de coffrage (7) de la surface multicouche coulée de la structure coulée ; la pose des colonnes (1) des vérins de levage sur la couche de construction de base déjà coulée de la structure verticale multicouche ; le levage des châssis de vérin en U (2) et des panneaux de coffrage (7) jusqu'au prochain niveau/étage ; et la répétition du cycle de montage des structures verticales multicouches.

4. La méthode selon la revendication 3, dans laquelle des cages de formation de cavités (18) amovibles sont suspendues sur une surface intérieure des panneaux de coffrage (7) avant de remplir de béton la cavité de moulage de la couche de construction de base, et lesdites cages (18) sont retirées avant le moulage d'une dernière couche extérieure.

5. La méthode selon la revendication 3, dans laquelle des panneaux (15) sur le tablier (16) desquels des trous (17) ont été percés pour permettre l'insertion des manchons d'un matériel élastique, sont montés sur les colonnes (1) des châssis de vérin ; des barres d'armature (19) sont insérées dans lesdits trous (17) en positionnant les extrémités faisant saillie des deux côtés du plan des panneaux (15), suite au réglage d'une largeur de la cavité de moulage de la couche de construction de base ; et une cage grillagée (20) est fixée sur les barres d'armature (19) insérées après avoir retiré les panneaux (15) et avant le moulage de la couche suivante.

6. La méthode selon la revendication 4 ou 5, dans laquelle les structures verticales multicouches sont montées simultanément pour l'ensemble du bâtiment/construction.

7. Un procédé de montage d'une structure de plancher - segment de structure verticale d'un bâtiment/construction de béton armé monolithique, y compris les étapes de procédé comprenant :

- le montage des vérins de levage contenant des colonnes (1) enfermées dans des enveloppes (9) sur des structures verticales déjà érigées ; le montage de châssis de vérin en U (2) munis de montants (3) et de supports extensibles (8) sur lesdits montants (3) ; le raccordement des montants (3) desdits châssis de vérin (2) attenants aux deux côtés des structures verticales en cours de montage à l'aide de liaisons rigides (10) ;
- le montage de coffrages (21) de structure de plancher et de cages d'armature, et le montage des cages d'armature des structures verticales sur toute la hauteur d'un niveau/étage en plaçant leurs raccords sur les renforts en saillie des structures déjà érigées et les renforts de la structure de plancher ;
- le montage de panneaux de coffrage (7) pour le montage des structures verticales sur les montants (3) des châssis de vérin (2) ; la fixation rigide desdits panneaux (7) situés sur un même plan de façon à définir une cavité de moulage ; le réglage d'une largeur de la cavité de moulage ; et le raccordement desdits panneaux (7) situés parallèlement de l'autre côté de la cage d'armature des structures verticales en cours de montage à l'aide de dispositifs de serrage ; le positionnement d'une partie inférieure des panneaux de coffrage au niveau d'une partie supérieure du coffrage (21) de la structure de plancher ;
- le coulage du béton de la structure de plancher, le coulage de béton dans la cavité de moulage des structures verticales en cours de montage lors de l'étape finale de la prise du béton de ladite structure de plancher ; la communication d'un mouvement alternatif et rotatif ou uniquement rotatif aux enveloppes (9) contenant les colonnes (1) des vérins de levage ; la pose des châssis de vérin en U (2) sur les structures verticales coulées à l'aide des supports extensibles (8) après avoir atteint 30 à 40% de la résistance nominale des structures coulées ; l'extraction des colonnes (1) des vérins de levage ainsi que de ses enveloppes protectrices (9) desdites structures coulées en laissant une cavité dans les structures coulées, suivie du remplissage subséquent des cavités formées dans les structures verticales à l'aide de béton ; et le retrait des panneaux de coffrage (7) d'une surface des structures coulées ;
- la pose des colonnes (1) des vérins de levage sur les structures verticales déjà coulées ; le levage des châssis de vérin en U (2) et des panneaux de coffrage (7) jusqu'au prochain niveau/étage ; et la répétition du cycle de mon-

tage des structures verticales.

8. La méthode selon la revendication 7, dans laquelle la structure de plancher et les structures verticales de l'ensemble du bâtiment/construction sont montées simultanément.

9. Un procédé de montage d'une structure de plancher - segment de structure verticale multicouches d'un bâtiment/construction de béton armé monolithique, y compris les étapes de procédé comprenant :

- le montage des vérins de levage contenant des colonnes (1) enfermées dans des enveloppes (9) sur des structures verticales déjà érigées ; le montage de châssis de vérin en U (2) munis de montants (3) et de supports extensibles sur lesdits montants (3) ; le raccordement des montants (3) desdits châssis de vérin attenants aux deux côtés des structures verticales en cours de montage à l'aide de liaisons rigides ;
- le montage de coffrages (21) de structure de plancher et de cages d'armature, et le montage des cages d'armature des structures verticales sur toute la hauteur d'un niveau/étage en plaçant leurs raccords sur les renforts en saillie des structures déjà érigées et les renforts de la structure de plancher ;
- le montage de panneaux de coffrage (7) pour le montage des structures verticales sur les montants (3) des châssis de vérin ; la fixation rigide desdits panneaux de coffrage (7) situés sur un même plan de façon à définir une cavité de moulage ; le réglage d'une largeur de la cavité de moulage ; et le raccordement desdits panneaux situés parallèlement de l'autre côté de la cage d'armature des structures verticales en cours de montage à l'aide de dispositifs de serrage ; le positionnement d'une partie inférieure des panneaux de coffrage au niveau d'une partie supérieure du coffrage (21) de la structure de plancher ;
- le coulage du béton de la structure de plancher ; le coulage de béton dans la cavité de moulage des structures verticales en cours de montage lors de l'étape finale de la prise du béton de ladite structure de plancher ; la communication d'un mouvement alternatif et rotatif ou uniquement rotatif aux enveloppes (9) contenant les colonnes (1) des vérins de levage ; le retrait des panneaux de coffrage (7) de la surface coulée d'un ou des deux côtés après avoir atteint une force d'arrachement des structures coulées ; le réglage de la largeur d'une cavité de moulage d'une nouvelle couche et le remplissage de ladite cavité avec une substance de moulage ;
- la pose des châssis de vérin en U (2) sur les structures verticales coulées à l'aide des supports extensibles après avoir atteint 30 à 40% de la résistance nominale d'une couche de construction de base des structures verticales coulées ; l'extraction des colonnes (1) des vérins de levage ainsi que de ses enveloppes protectrices (9) desdites structures verticales coulées en laissant une cavité dans les structures coulées, suivie du remplissage subséquent des cavités formées dans les structures verticales à l'aide de béton ;
- le retrait des panneaux de coffrage (7) d'une surface multicouche des structures coulées ; la pose des colonnes (1) des vérins de levage sur la couche de construction de base déjà coulée de la structure verticale ; le levage des châssis de vérin en U (2) et des panneaux de coffrage (7) jusqu'à un prochain niveau/étage ; et la répétition du cycle de montage des segments de bâtiment/construction.

10. La méthode selon la revendication 9, dans laquelle des cages de formation de cavités (18) amovibles sont suspendues sur une surface intérieure des panneaux de coffrage (7) avant de remplir de béton la cavité de moulage de la couche de construction de base, et lesdites cages (18) sont retirées avant le moulage d'une dernière couche extérieure.

11. La méthode selon la revendication 9, dans laquelle des panneaux (15) sur le tablier (16) desquels des trous (17) ont été percés pour permettre l'insertion des manchons d'un matériel élastique, sont montés sur les colonnes (3) des châssis de vérin ; des barres d'armature (19) sont insérées dans lesdits trous (17) en positionnant les extrémités faisant saillie des deux côtés du plan des panneaux (15), suite au réglage d'une largeur de la cavité de moulage de la couche de construction de base ; et une cage grillagée (20) est fixée sur les barres d'armature (19) insérées après avoir retiré les panneaux et avant le moulage de la couche suivante.

12. La méthode selon la revendication 10 ou 11, dans laquelle le coffrage (21) de la structure de plancher et les structures verticales multicouches de l'ensemble du bâtiment/construction sont montés simultanément.

13. Un coffrage mobile pour mettre en oeuvre la méthode selon la revendication 1 ou 3 ou 7 ou 9 comprenant des vérins de levage munis de colonnes (1) et de châssis de vérin en U (2) et contenant des montants (3) ; des guides (4) étant montés dans la base des montants (3), dans lesquels des supports (6) de panneaux de coffrage (7) pour structures verticales (5) sont montés afin de permettre un déplacement le long de structures verticales érigées (5) et dont le

mouvement est provoquée par un moteur d'entraînement ; dans lequel au moins l'un des montants (3) des châssis de vérin (2) est muni d'un support extensible (8) ; des enveloppes (9) pouvant réaliser un mouvement de rotation ou vertical sont installées librement sur les colonnes (1) des vérins de levage ; une extrémité inférieure de chaque enveloppe (9) est placée sur un bras latéral d'extrémité inférieure de la base de la colonne (1) correspondante ; les montants (3) des châssis de vérin (2) adjacents situés de chaque côté des structures verticales (5) à monter sont connectés les uns aux autres à l'aide de liaisons rigides (10) ; les panneaux de coffrage verticaux (7) sont connectés les uns aux autres par une liaison rigide et sont fixés aux supports (6) ; lesdits panneaux (7) contiennent des cadres porteurs munis de profils de rive autour du périmètre du panneau.

14. Le coffrage mobile selon la revendication 13, dans lequel les supports extensibles (8) des châssis de vérin (2) sont munis d'un moteur d'entraînement de déplacement et sont montés sur chaque montant (3) desdits châssis de vérin (2), dans des guides (11) situés à un angle égal de préférence à 45 degrés par rapport aux structures verticales (5) en cours de montage ; des guides (11) des supports extensibles (8) sont situés sur les montants (3) de chaque châssis de vérin en U (2) et agencés dans des directions opposées par rapport aux montants (3) le long des structures verticales (5) en cours de montage.

15. Le coffrage mobile selon la revendication 13, dans lequel un entraînement rotatif d'une enveloppe (9) est monté sur un plot situé sur l'extrémité supérieure de ladite enveloppe et contient une roue dentée (12) s'engrenant dans une couronne dentée (13) fixée sur une surface extérieure dans une partie supérieure de la colonne (1) du vérin de levage.

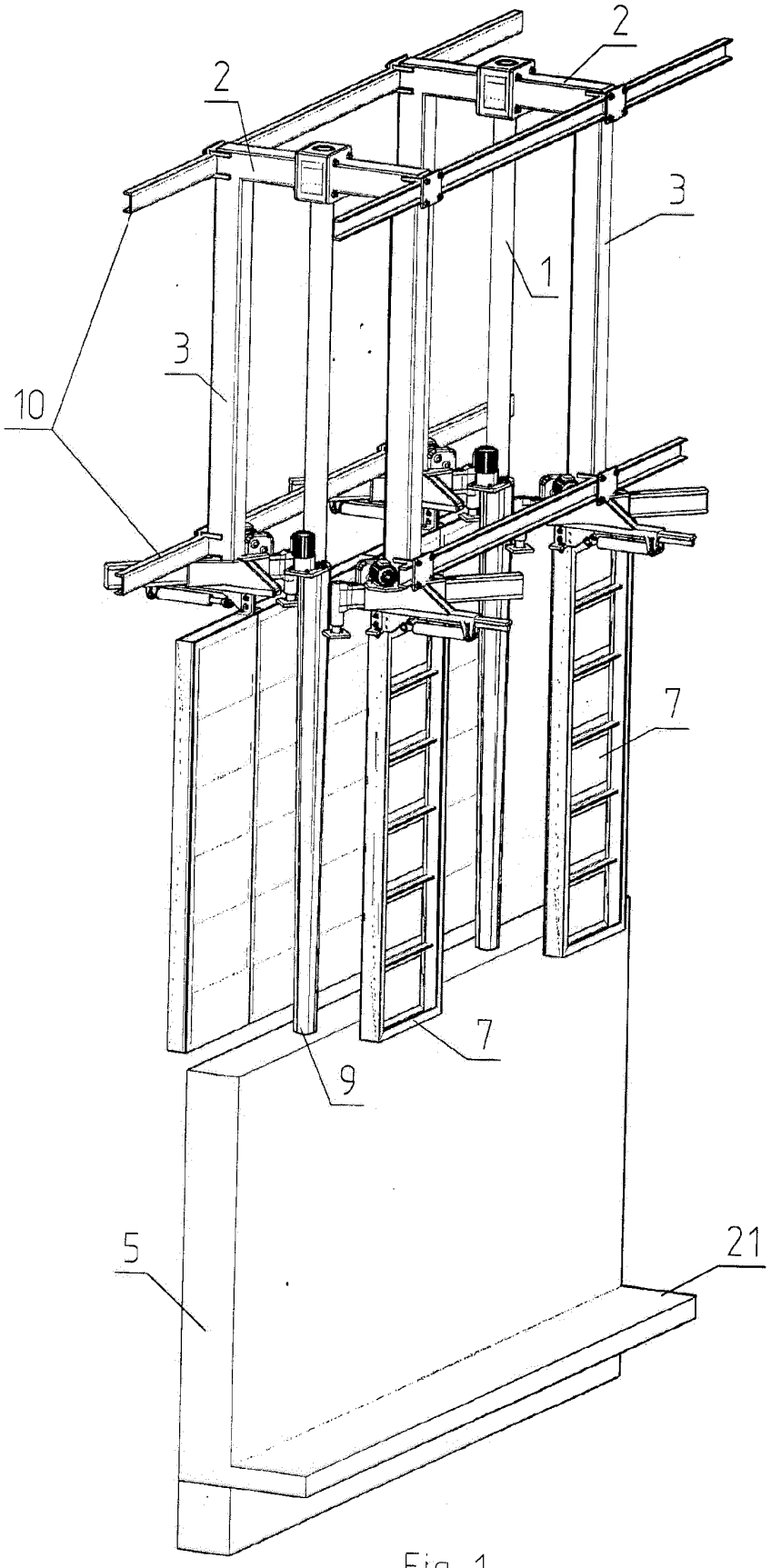


Fig. 1

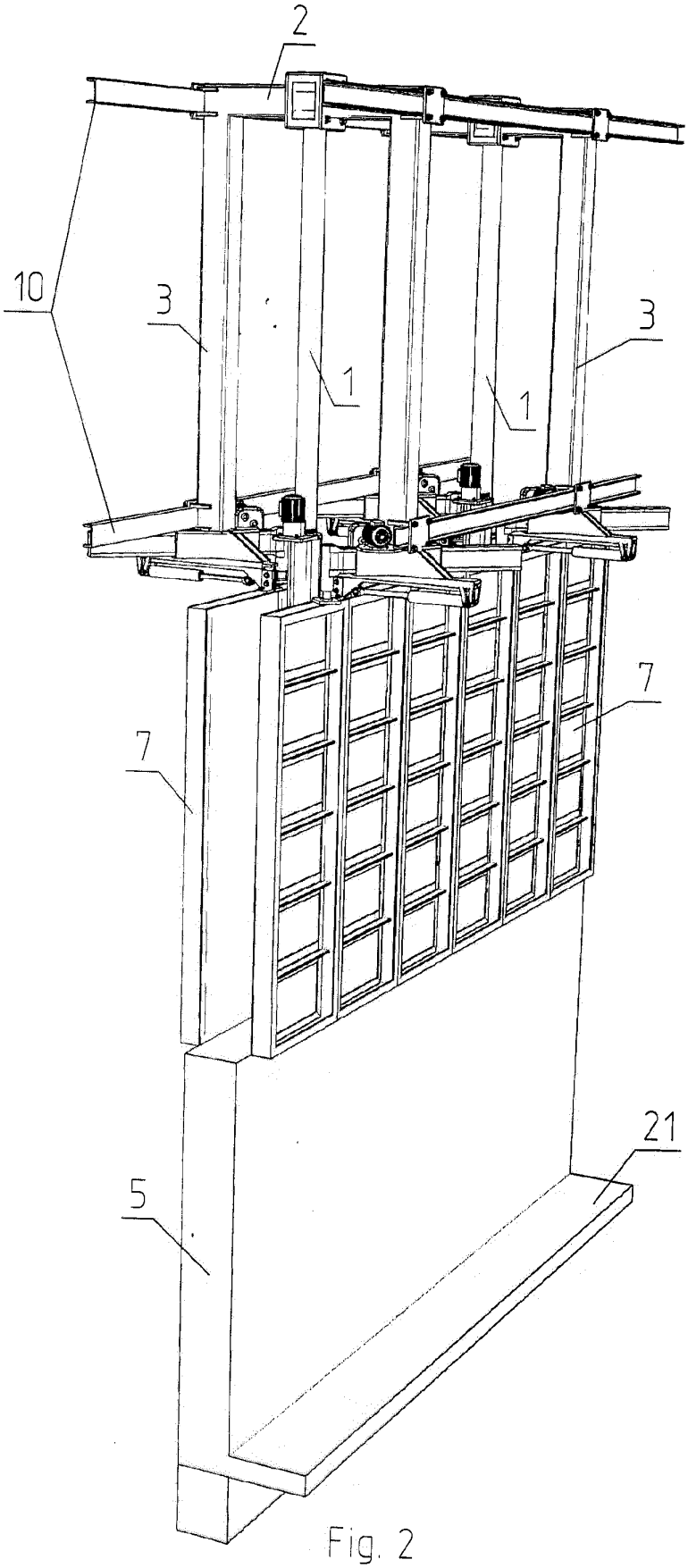


Fig. 2

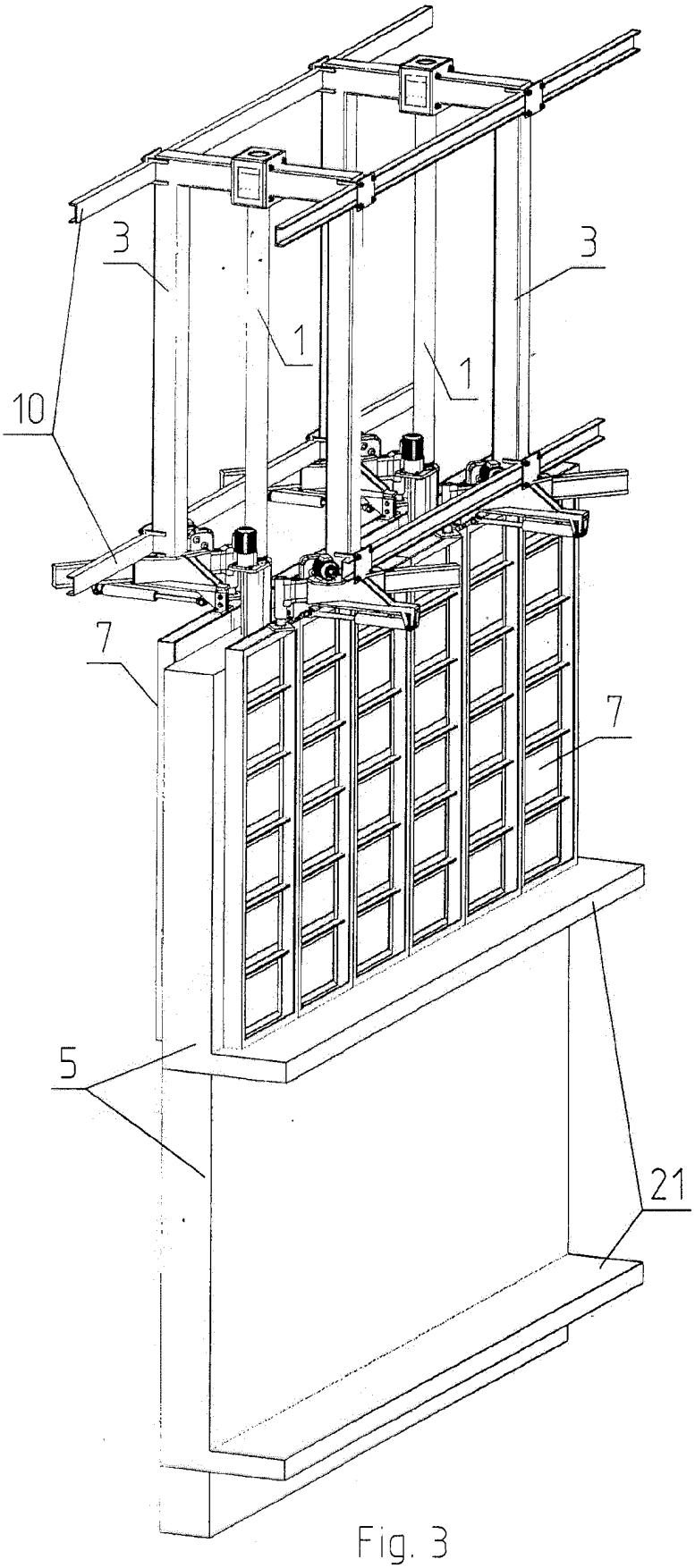


Fig. 3

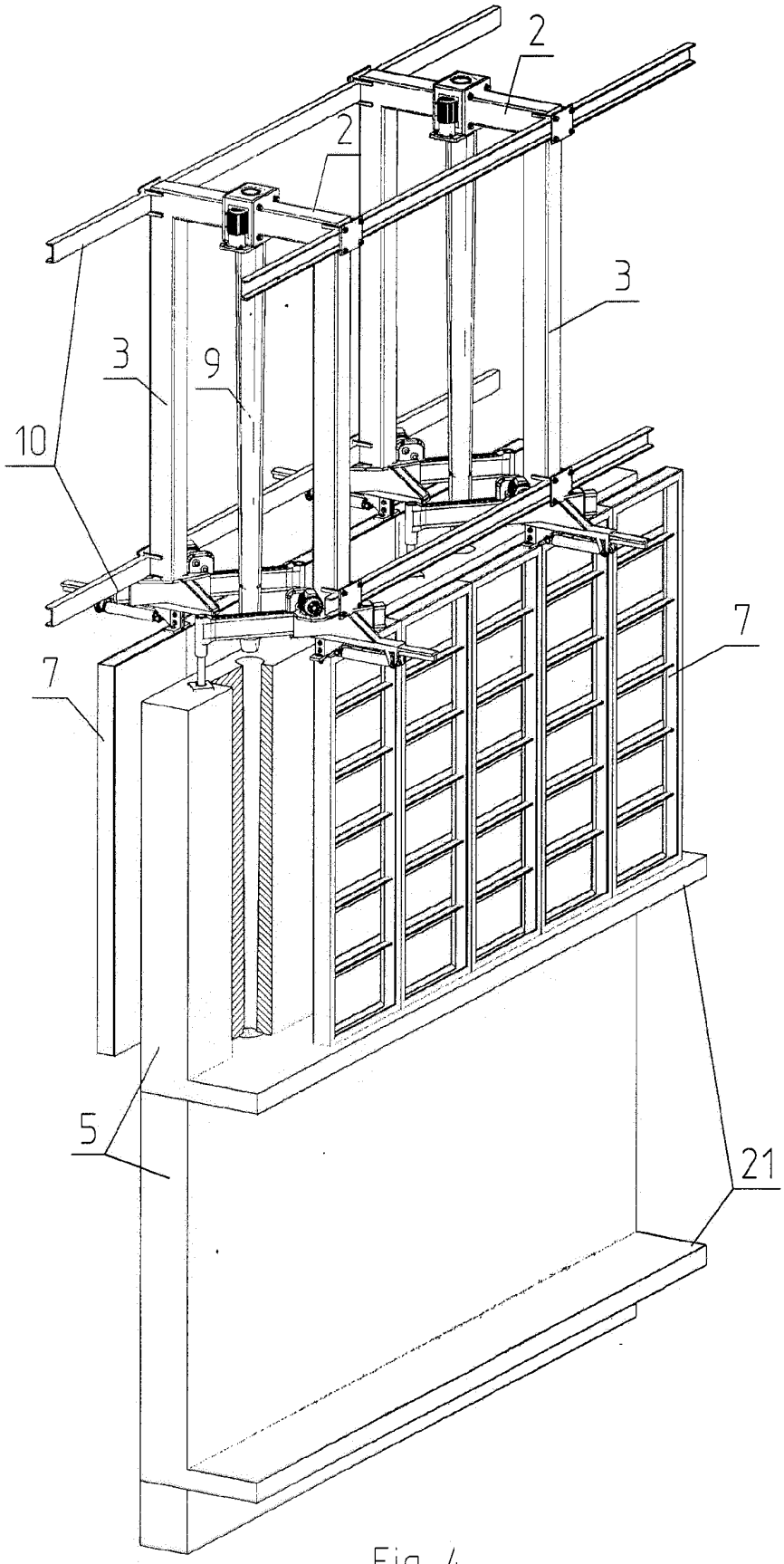


Fig. 4

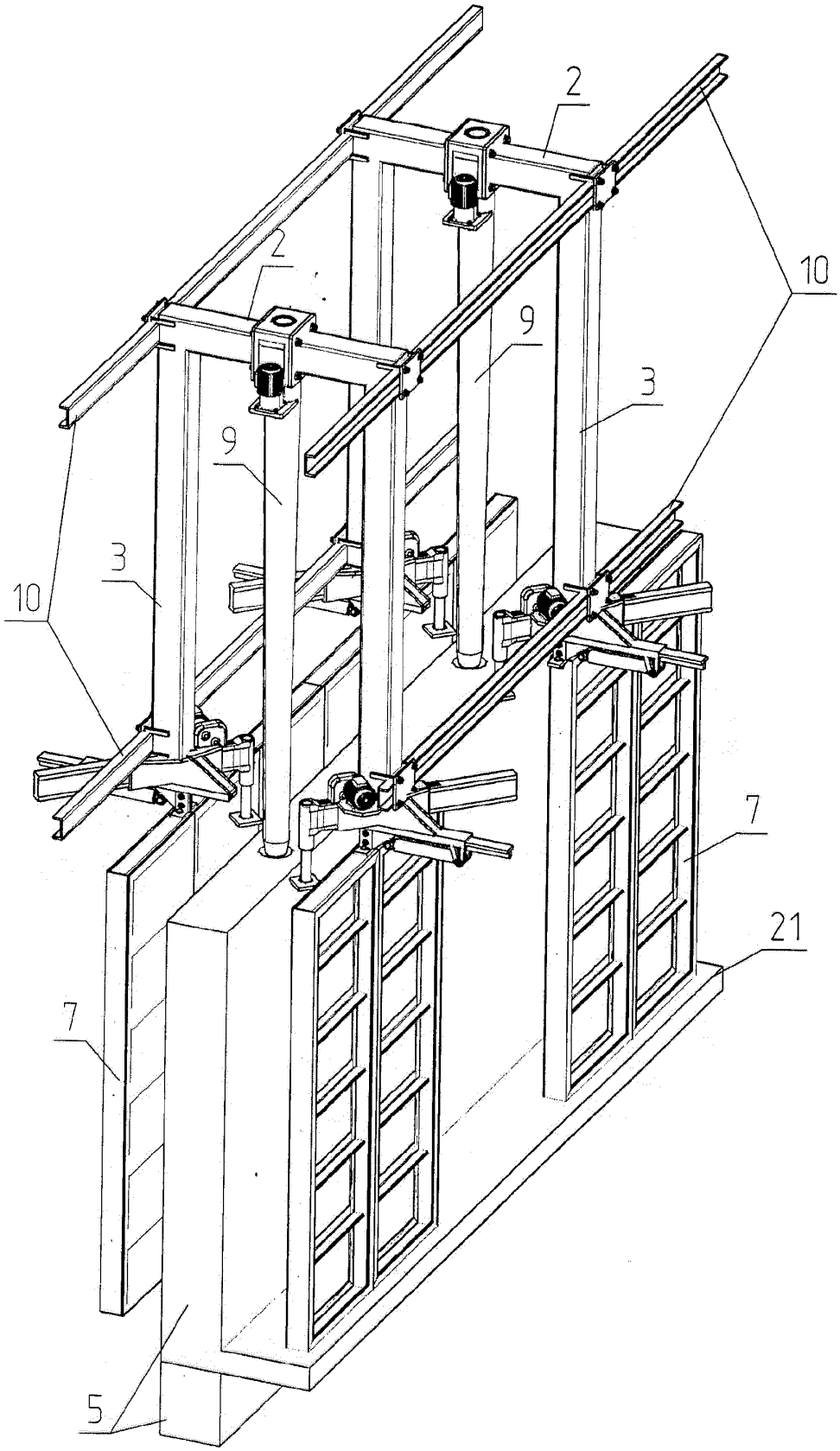


Fig. 5

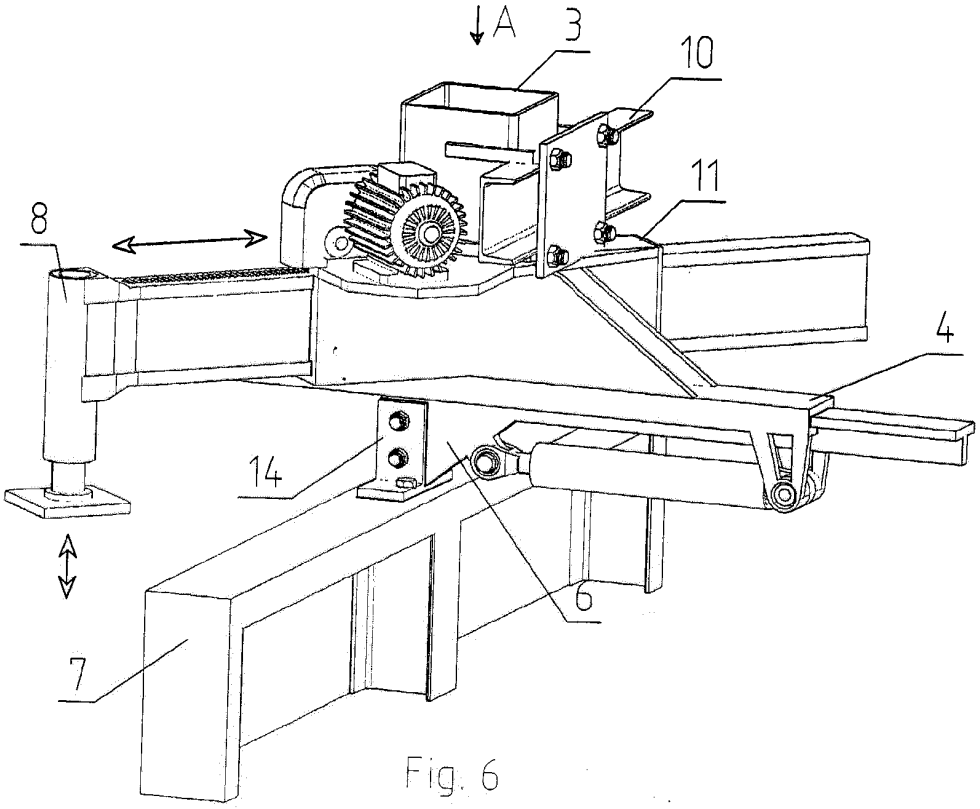


Fig. 6

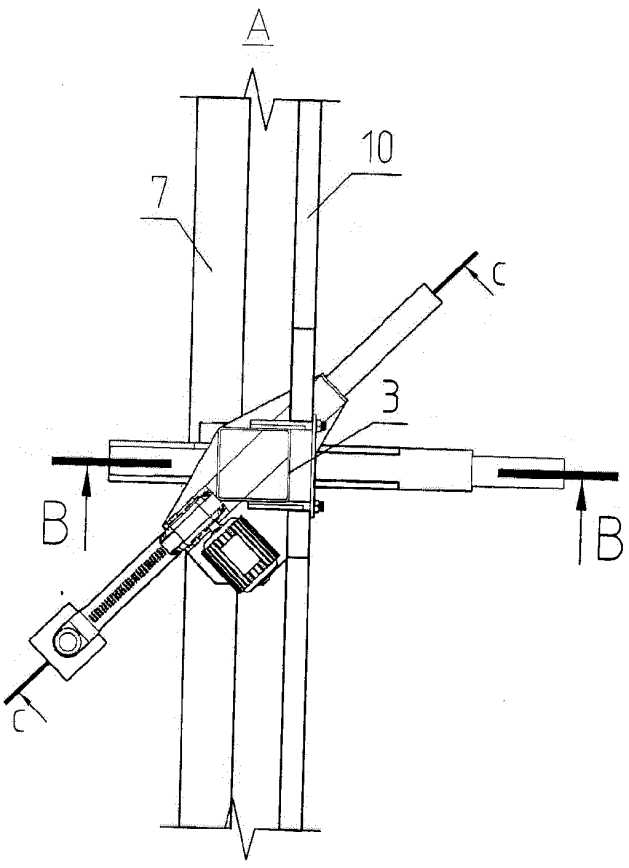


Fig. 7

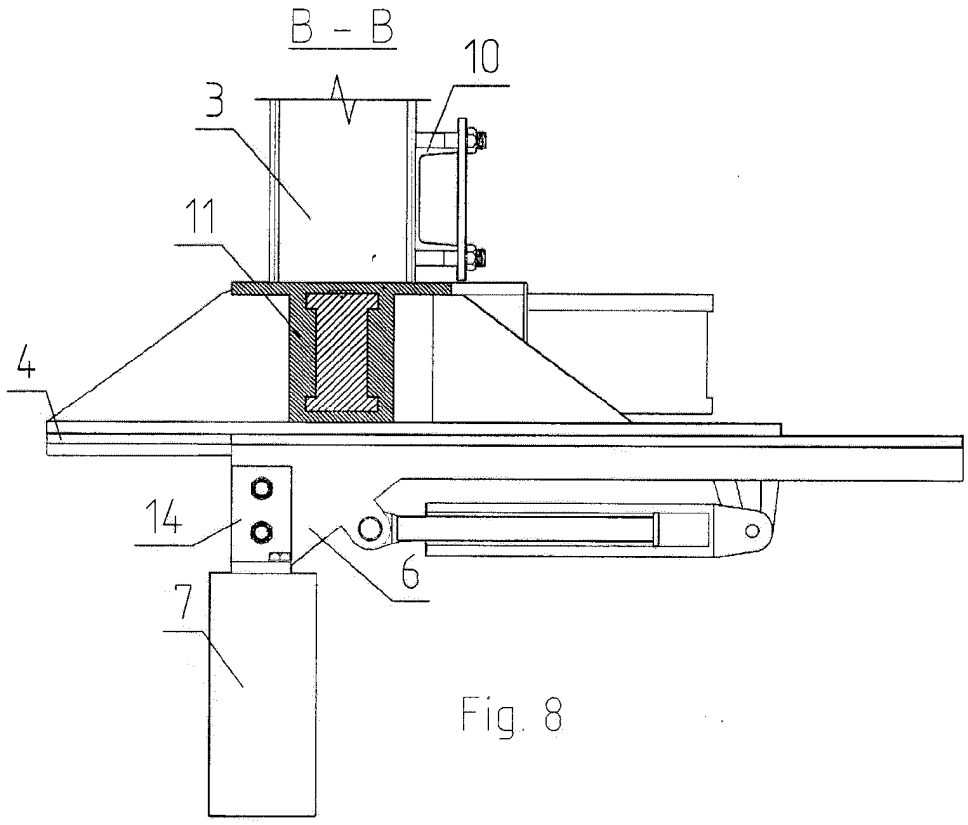


Fig. 8

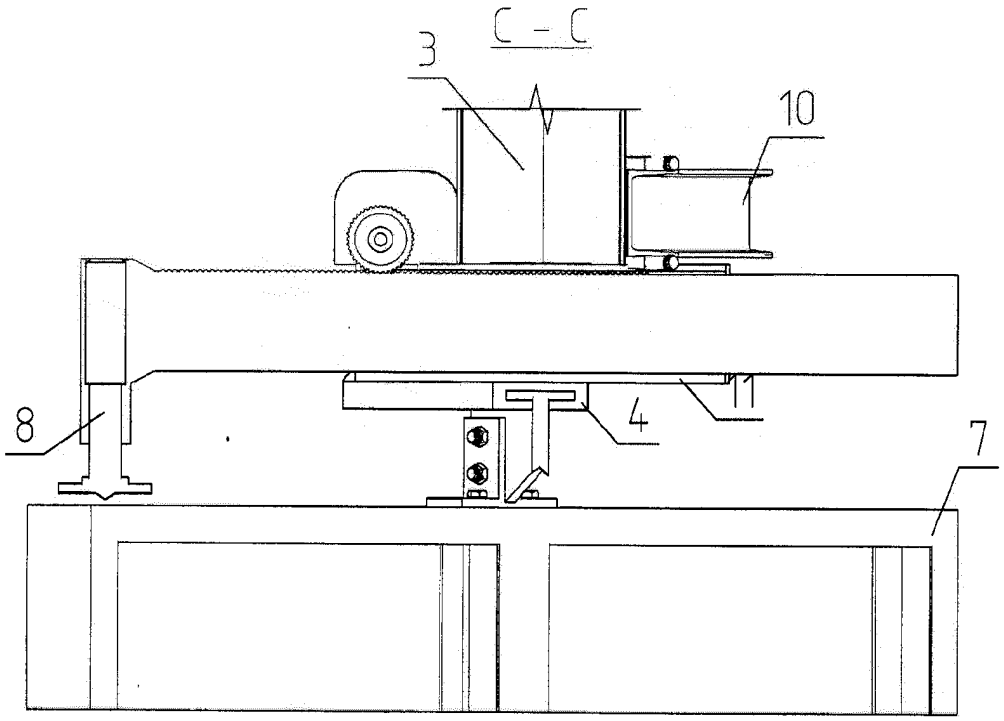
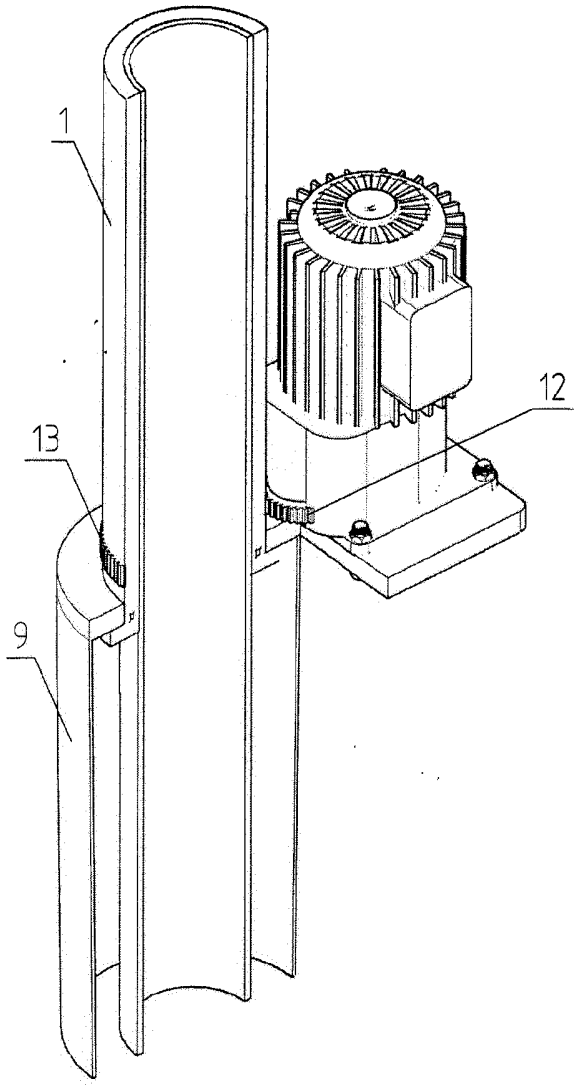


Fig. 9



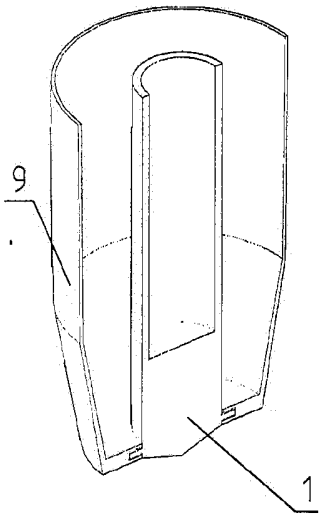


Fig. 10

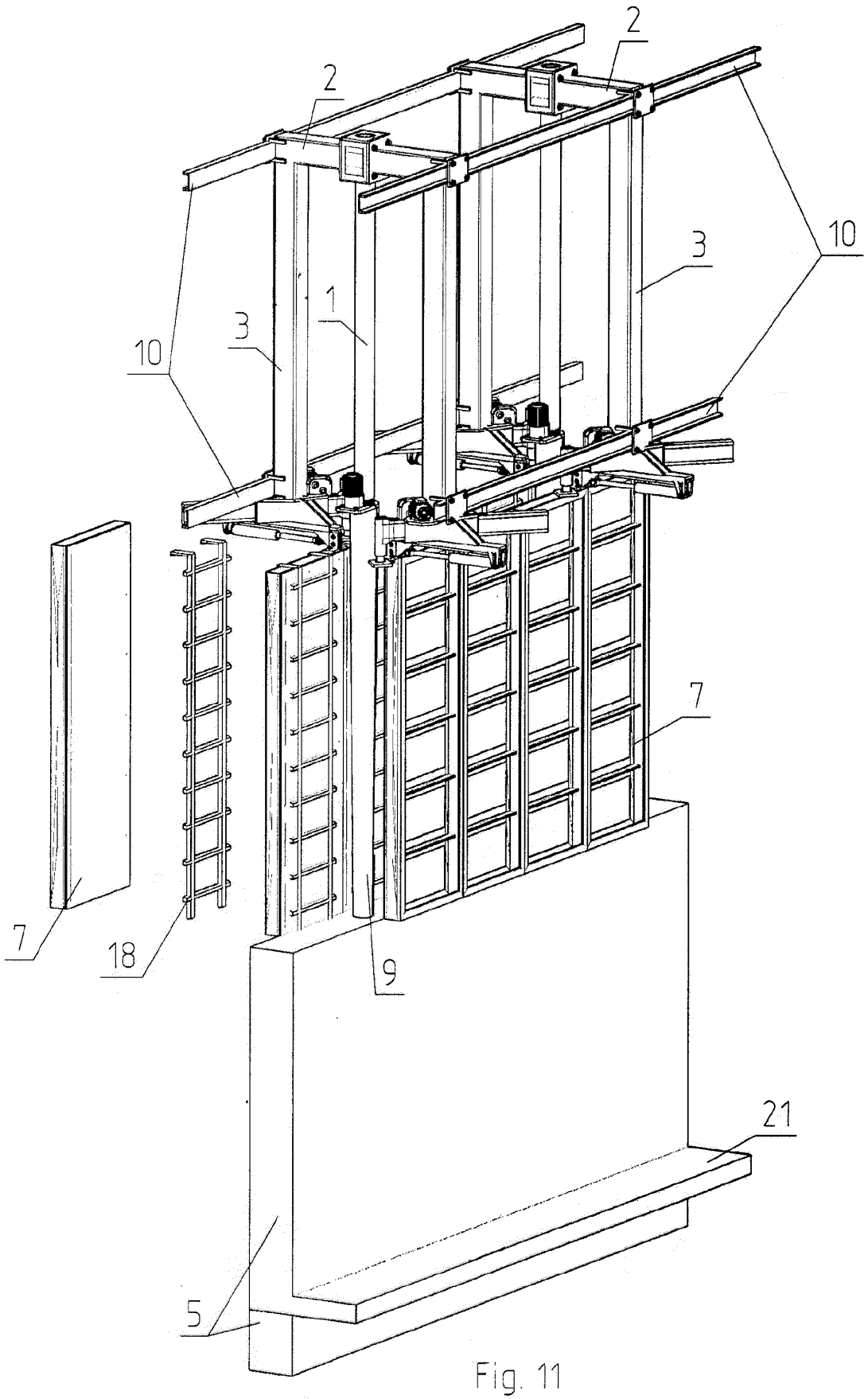


Fig. 11

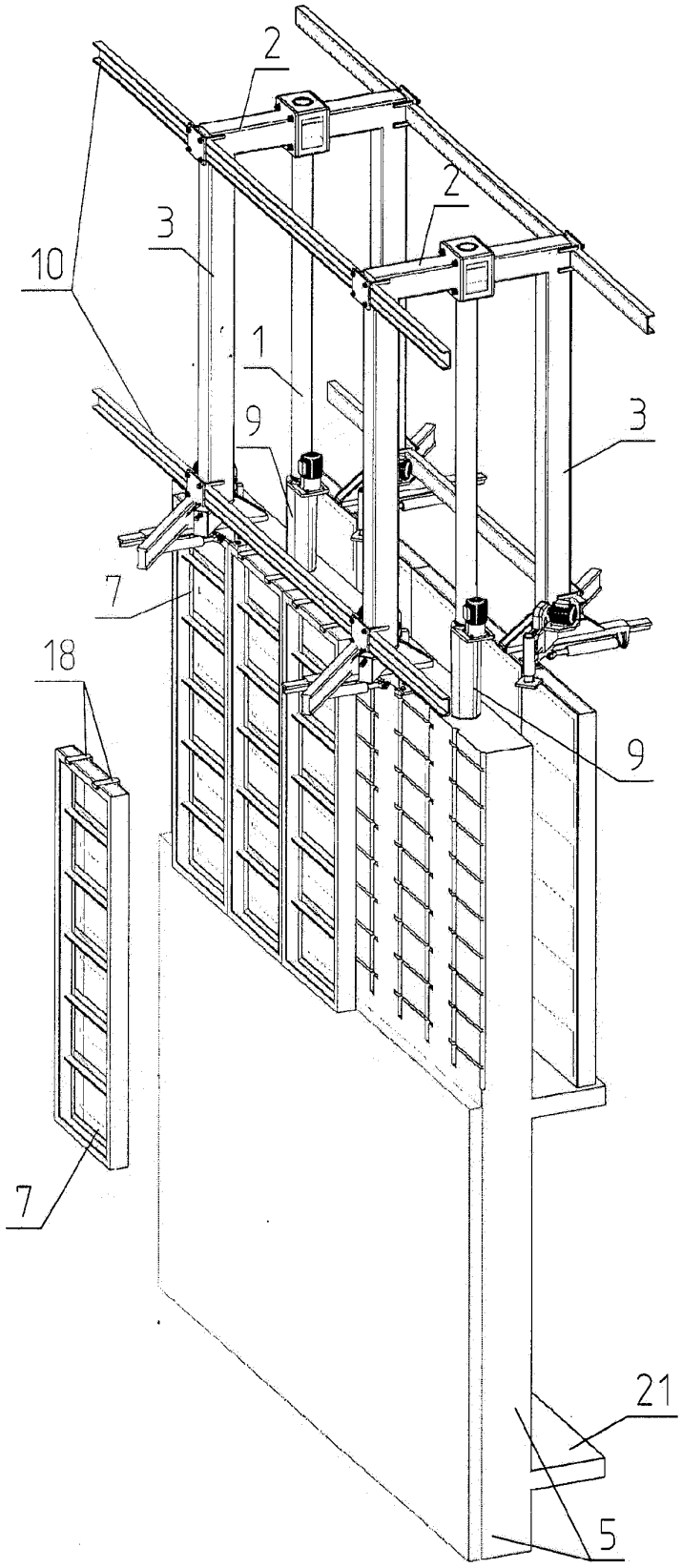


Fig. 12

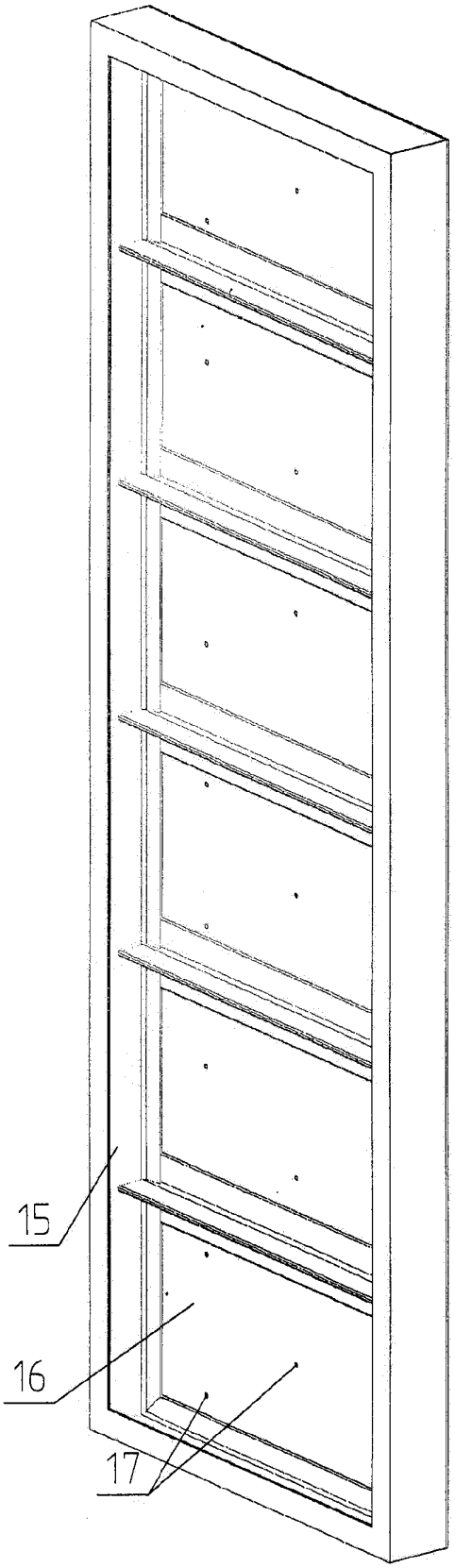


Fig. 13

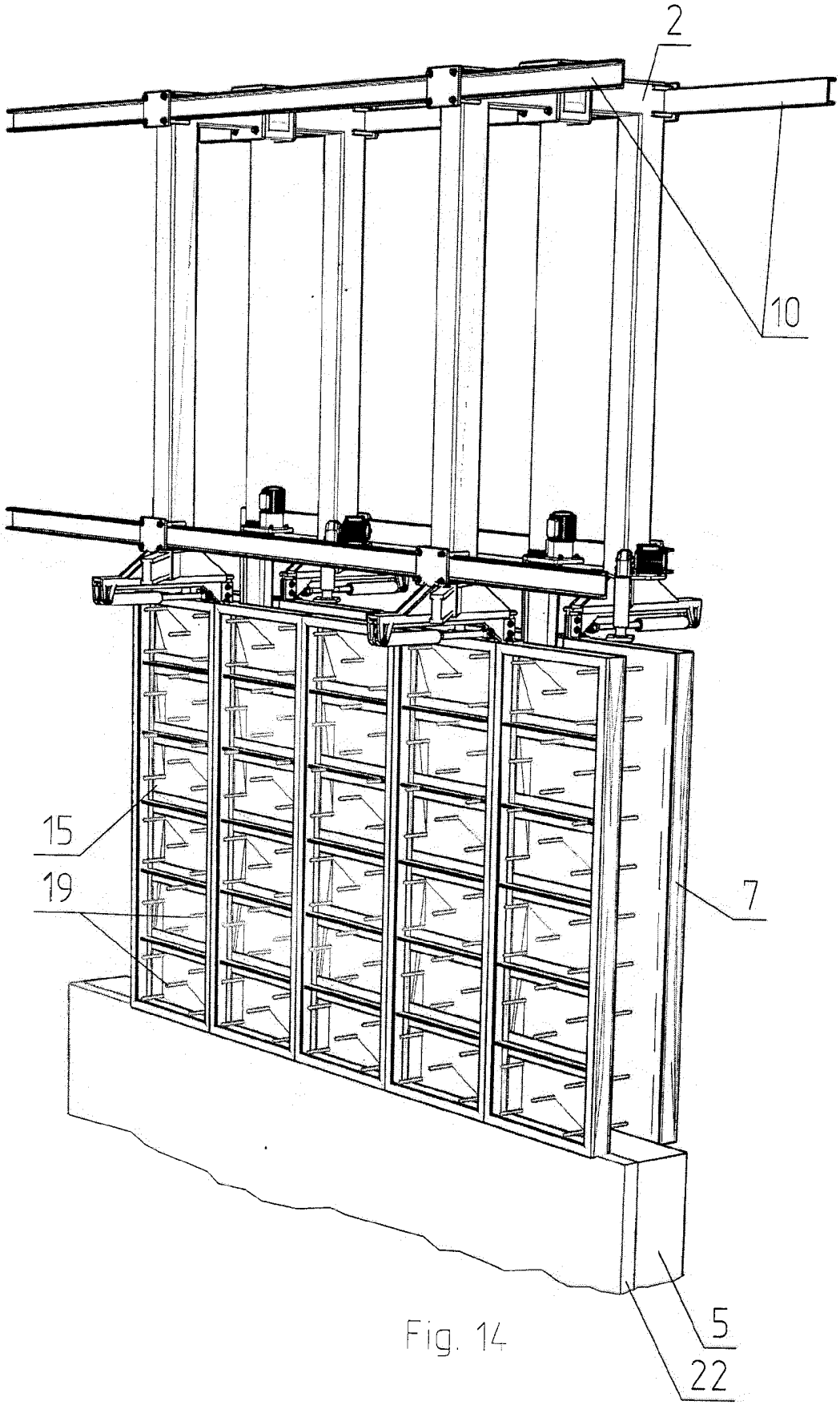


Fig. 14

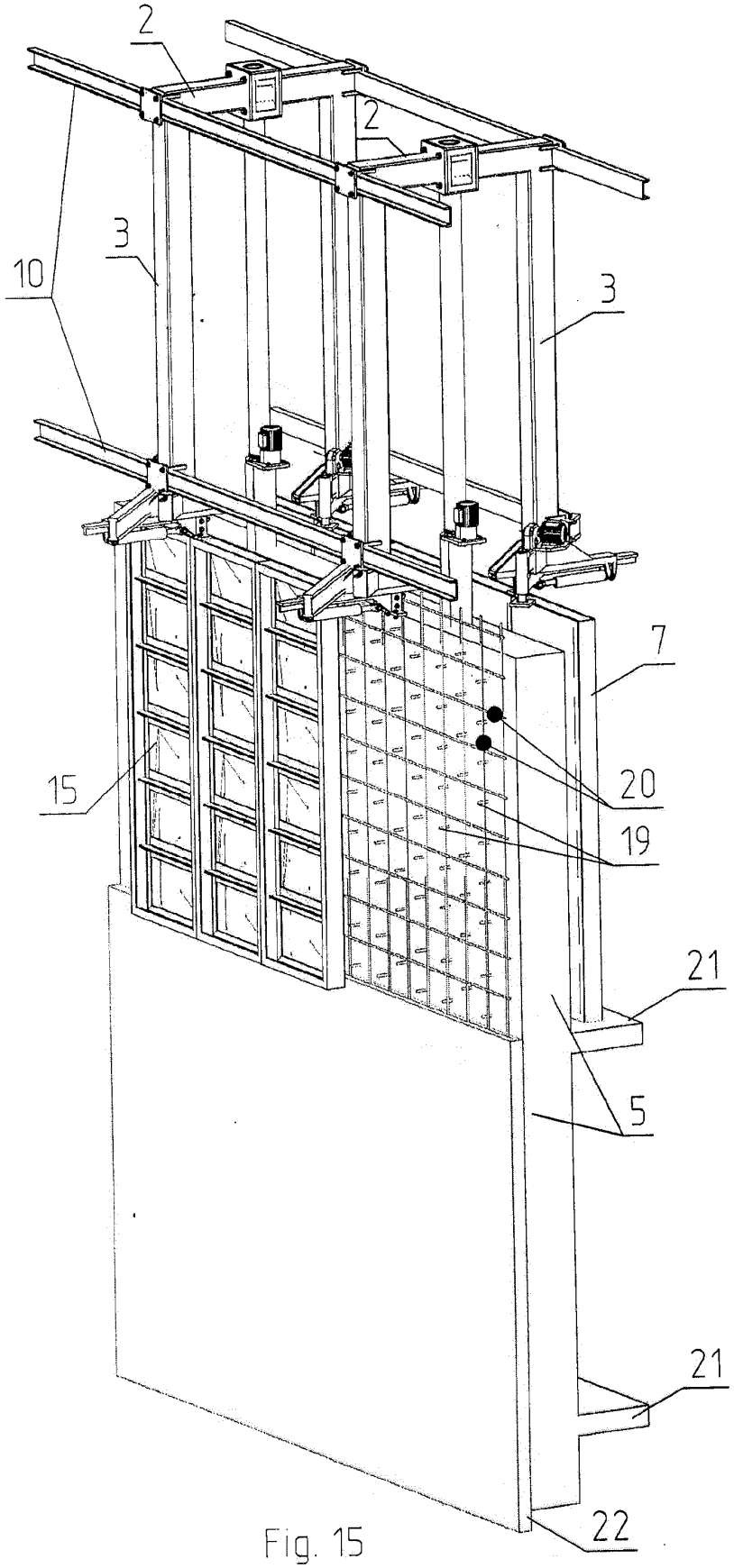


Fig. 15

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- RU 2078884 **[0003]**
- US 4076778 A **[0004]**