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(54) A LOAD-BEARING STRAW-BALE WALL SYSTEM

LASTTRAGENDES STROHBALLENWANDSYSTEM

SYSTÈME DE PAROI PORTE-CHARGE DESTINÉ À DES BALLES DE PAILLE

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Description

Technical Field

[0001] The present invention relates to a single-storey load-bearing straw-bale wall system which can be used in house, office and educational buildings to be constructed in particularly rural areas.

Background of the Invention

[0002] Today, reinforced-concrete post-and-beam and brick infilling systems are commonly used in construction industry. Despite this prevalence, damage of the said members to the environment is high due to the fact that they require high energy in the manufacturing process and their recycles are problematic.

[0003] In recent years, interest for straw-bales as a building material in particularly countryside increases because of both economic and ecological reasons.

[0004] Straw-bales providing sound, heat and fire insulation and being relatively cheap are used in single-storey house, office and educational buildings being constructed in rural areas.

[0005] In addition, communities adopting ecological life in many parts of the world meet their needs for shelter by using this material.

[0006] Living spaces made of straw-bales provide building opportunity in an easy, fast way by using simple tools without requiring craftsmanship.

[0007] The construction techniques are used in two different categories, namely load-bearing with straw-bale and post-and-beam, today.

[0008] In the first category load-bearing system, straw-bales are bonded by being laid on top of one another or lapped and they also create the structural system of the building. Dead and live loads (loads such as roof, wall, snow, wind, etc.) are transferred to the foundation by means of straw walls. Difference of a straw-bale than other building materials is that it has no physical stability against load and it is subjected to elastic deformation. The most important design problem of load-bearing straw buildings that should be solved is the wall height getting shorter upon the load imposed on thereof. This problem is solved by two methods. The first method is threaded rods system. Iron bar passing through straw walls starting from the foundation in this system is connected by bolt over the roof plate which is located on the wall and continues throughout the whole straw wall and usually consists of wood. Straw walls are compressed and wall size shortens as the bolt is tightened. By means of the compression provided, the wall is not subjected to elastic deformation anymore against loads imposed onto the wall afterwards such as roof and snow and carrying integrity and physical stability of walls are ensured. In the second method, the process of compressing the walls is carried out by means of strappings which again start from the foundation and are connected to the upper roof plate from the outer and inner periphery of the wall. The compression process is created by compressing the strappings. In both methods, resistance to lateral loads is aimed by penetrating down through wooden pins to the bales. Again after both methods, the building system is completed after roughcasting and final plastering upon. The structure is completed upon the plastering makes the straw building system composite and monolithic. The plastering also protects the walls from external conditions and fire. The said systems are far from being economic and practical due to extensive use of wood. Another disadvantage of both systems is that it becomes difficult to level the alignment of the top wall in door and window openings and the pressure adjustment may differ inside the surface due to the fact that the compression process is carried out from the floor to the roof. This obstructs levelling of both on the surface and on the upper roof plate and it leads to curves.

[0009] The second category is known as post-and beam straw-bale system and the straw-bales are only used as infill not as load-bearing infill in this system. The bales have no load carrying characteristic. Reinforced-concrete, steel, wooden post and beam system compose the load-bearing structure. The said system is more expensive because the materials used and the labour expended increase compared to the load-bearing system. In the meantime, the regulation allows only the category of post and beam infill straw bale construction structurally in building construction regulations of many countries.

[0010] The Chinese patent document no. CN203716285 discloses a self-supporting straw-bale housing. The said housing comprises a foundation, a straw-bale wall body, cement or gypsum surfaces and a roof. The straw-bale wall body is vertically arranged on the building foundation, the cement or gypsum surfaces are arranged on two sides of the straw-bale wall body, and the roof is arranged on the straw-bale wall body.

[0011] The Korean patent document no. KR20120131465 discloses a straw bale wall structure and a construction method of this structure. The said straw bale wall structure comprises structural members, connectors, rice straws, decoration portions, and non-woven fabrics. The structural members are fixed to portions where walls are to be formed. The connectors are connected to the inner and outer sides of the structural members to form a filling space. The filling space is filled with the rice straws. The decoration portions cover the rice straws and the connectors. The nonwoven fabrics are installed between the connectors and the rice straws. With the invention disclosed in the Korean patent document no. KR20120131465, construction costs are reduced by not requiring high construction skills and environmentally-friendly effect is improved by using straw bales.

[0012] The international patent application WO9812399 discloses a composite structural system that uses fiber bales in conjunction with a skeletal framework to form various structurally stable building compo-

nents. The invention provides a recipe for the fabrication of composite structures or structural modules for use as or in buildings, as free standing wall systems such as fences or sound barriers, or any other structure where the use of straw bales is desired. The structures can be fabricated in place on the building site or off site in transportable sizes for relocation to the building site.

Summary of the Invention

[0013] An objective of the present invention is to realize a load-bearing straw-bale wall system which ensures that single-storey house, office and educational buildings to be built particularly in rural areas are constructed in an economic and practical way.

[0014] Another objective of the present invention is to realize a load-bearing straw-bale wall system which ensures that house, office and educational buildings are constructed such that they will be environmentally friendly.

[0015] Another objective of the present invention is to realize a load-bearing straw-bale wall system which is structurally durable by means of its reinforced configuration.

[0016] Another objective of the present invention is to realize a load-bearing straw-bale wall system which enables the straw bales used to be compressed completely or locally as a wall in desired amount.

Detailed Description of the Invention

[0017] "A Load-bearing Straw-Bale Wall System" realized to fulfil the objectives of the present invention is shown in the figures attached, in which:

Figure 1 is a cross-sectional perspective view of the inventive system.
Figure 2 is a perspective view of the inventive system without straw-bales.
Figure 3 is a side partial cross-sectional perspective view of the inventive system.
Figure 4 is a detailed view of the straw-bales placed on top of each other.

[0018] The components illustrated in the figures are individually numbered, where the numbers refer to the following:

1. Load-bearing straw-bale wall system
2. Reinforced-concrete foundation
3. Fixing member
4. Straw-bale
5. Connection member
6. Support member
7. Tension ring
8. Compression member
9. Beam
10. Reinforcing member

[0019] The inventive load-bearing straw-bale wall system (1) comprises:

at least one reinforced-concrete foundation (2) which is located on the floor;
at least one fixing member (3) which is fixed onto the foundation (2);
a plurality of straw-bales (4) which are placed onto the foundation (2) and one another such that they will cover the foundation (2) entirely and extend to a certain height;
at least one connection member (5) which is passed through the straw-bales (4) that are placed onto the foundation (2) and one another such that at least part of it will project from the straw-bales (4), provides resistance of the straw-bales (4) to the loads imposed on thereof by being compressed, and is connected to the fixing member (3) after it passes through the straw-bales (4) located on the foundation (2);
at least one support member (6) which is placed onto the straw-bales (4) such that it will extend among the straw-bales (4) placed on one another;
at least one beam (9) which is placed onto the said straw-bales (4) such that it covers the last row straw-bales (4) located on the top;
at least one compression member (8) whereby the connection member (5) projecting from the straw-bales (4) is fixed and which enables to compress the straw-bale (4), where the connection member (5) extends out, in desired amount after the connection member (5) is fixed on thereof;
characterized in that it further comprises:
at least one tension ring (7) wherein the support members (6) pass and which tries to pull the connection member (5) passing through it.

[0020] The inventive system (1) also comprises at least one reinforcing member (10) which is fixed to the foundation (2) and the beam (9), placed onto at least one of the surfaces of the straw-bales (4) facing into the building or outside the building, and provides resistance of the straw-bales (4) to lateral loads. In the preferred embodiment of the invention, the reinforcing member (10) extends on the surface crosswise such that it will be connect to the compression members (8). In the preferred embodiment of the invention, the reinforcing member (10) is a reinforced-concrete construction rebar.

[0021] The inventive system (1) also comprises at least one locking member (not shown in the figures) which is placed onto the reinforcing member (10) and prevents the compression member (8) from moving involuntarily by being locked after the straw-bale (4) is compressed in desired amount.

[0022] The foundation (2) and the beam (9) included in the inventive system (1) preferably have a prism form such as rectangular prism, tetragonal prism made of reinforced-concrete. The foundation (2) and the beam (9)

form structural tensioning system by being connected to one another indirectly via the connection member (5), the support member (6), the tension ring (7) and the compression member (8).

[0023] The fixing member (3) included in the inventive system (1) is placed onto the foundation (2) and it enables the connection member (5) that is passed through the straw-bales (4) located on the foundation (2) to be fixed to the foundation (2). In the inventive system (1), the fixing member (3) is placed on the lower surface of the beam (9) and it enables the connection member (5) that is passed through the straw-bales (4) located under the beam (9) to be fixed to the beam (9). In the preferred embodiment of the invention, the fixing member (3) is a hook made of a strong material such as iron, steel.

[0024] The straw-bales (4) included in the inventive system (1) are placed on top of one another starting from the top of the foundation (2) until the desired height of the building being constructed is achieved. In the preferred embodiment of the invention, the straw-bales (4) are placed on top of one another such that they are lapped.

[0025] The connection member (5) included in the inventive system (1) is passed through the straw-bales (4) placed one after the other. In the preferred embodiment of the invention, the connection member (5) is passed through the straw-bales (4) by using straw-bale needle. Upon the connection member (5) is passed through the straw-bales (4), the straw-bales (4) are compressed in order that they can carry loads such as roof load, snow load imposed onto the straw-bales (4) and they are not deformed under the load. The connection member (5) passed through the straw-bales (4) ensures that the connection member (5) remains at a tension enabling to compress the straw-bales (4) upon it is connected to the fixing members (3) located on the foundation (2) and under the beam (9) and the tension rings (7) located on the predetermined support members (6) after it is passed through the tension ring (7). Also, at least part of the connection member (5) passed through the straw-bales (4) projects from at least one of the surfaces of the straw-bales (4) facing into the building or outside the building. The compression member (8) is placed onto the said projecting part of the connection member (5). In the preferred embodiment of the invention, the connection member (5) is a rope made of a polypropylene material.

[0026] The support member (6) included in the inventive system (1) is placed such that it will extend in a horizontal plane among the straw-bales (4) placed onto one another in order to compress the straw-bales (4). In the preferred embodiment of the invention, the support member (6) is a reinforced-concrete rebar being used in constructions frequently.

[0027] The tension ring (7) included in the inventive system (1) is placed such that the pre-determined support members (6) will pass through the tension ring (7). The tension ring (7) enables to stretch the connection member (5) in order that the connection member (5) can compress the straw-bales (4). In the preferred embodiment of the invention, the tension ring (7) is a collar made of a metal material.

[0028] The compression member (8) included in the inventive system (1) is placed into the part projecting from at least one of the surfaces of the connection member (5), which is passed through the straw-bales (4), facing into the building or outside the building. The compression member (8) ensures that the straw-bales (4) where the connection member (5) projects are compressed to a desired extend upon the compression member (8) is moved by being preferably rotated after it holds the projecting part of the connection member (5). Thus, the straw-bales (4) located in areas wherein there are openings such as window openings, door openings where the straw-bales (4) are subjected to different loads or wherein there are no openings such as building corner are compressed upon the compression member (8) stretches the connection member (5). Thus, it is possible to adjust the level of the compression applied to the said straw-bales (4) by means of using the compression member (8).

[0029] In construction of the inventive load-bearing straw-bale wall system (1), the foundation (2) is placed onto the floor at first. Then, the first straw-bales (4) are placed onto the foundation (2). By passing the connection member (5) through the first row straw-bales (4) via preferably a straw-bale needle while placing the first row straw-bales (4), the said connection member (5) is connected to the fixing member (3) located on the foundation (2) upon being passed through the tension rings (7) located on certain support members (6).

[0030] The same process is also carried out for the second row straw-bales (4). The support member (6) located on the second row straw-bales (4) is wrapped by the connection member (5) over the second row straw through which the straw-bale needle is preferably passed previously. Thus, connection member (5) laterally wraps the two straw-bales (4) one after the other by the compression member (8) projecting from between two straw-bales (4) from the upper region where the support member (6) is located, the lower region where the fixing member (3) is located. Whereas the tension ring (7) located in the middle of two straw-bales (4) fixes its position by means of the support member (6) passing through thereof by acting as a sort of stretching and ensures that the straw-bale (4) and the foundation (2) are compressed efficiently from sides, above and below by rotating the compression member (8) (Figure 4).

[0031] Depending on the pre-determined height of the building, other straw-bales (4) are also placed starting from the straw-bales (4) placed onto the foundation (2) until the desired height is reached. The support member (6) is placed between two straw-bales (4) while placing the straw-bales (4) on top of one another. The tension ring (7) is placed on the pre-determined support member (6) as well by passing it through the tension rings (7). The connection members (5) are also applied for other row straw-bales (4) in a way and line such as in the first

two rows.

[0032] The straw-bales (4) located in regions wherein different load will be imposed on the straw-bale (4) such as door openings and window openings in the building obtained enables to compress the connection member (5) whereto the compression member (8) is connected is compressed to a desired extend by compressing it more or less. In the preferred embodiment of the invention, after the compressing process is carried out by means of the compression member (8), strength of the building obtained is increased by placing crosswise and/or vertical reinforcing members (10) onto at least one of the surfaces of the straw-bales (4) facing into the building or outside the building. In the preferred embodiment of the invention, the connection member (5) is prevented from effecting the compression amount of the related straw-bale (4) such by getting free from the compression member (8) involuntarily upon fixing the compression member (8) in a desired position by means of the locking member placed onto the said reinforcing member (10). Lastly, the beam (9) enabling to close the upper surfaces of the said straw-bales (4), which are open outwards, onto the straw-bales (4) located on the top in the building obtained is placed. The beam (9) holds and compresses the straw-bales (4), which are located on the upper row, from above by means of the connection member (5) connected to the fixing member (3) located on the lower surface of thereof as such in the foundation (2). Due to the fact that the connection members (5) at different rows coincide with the support members (6) at different rows, a continuous connection is created from the foundation (2) to the beam (9) from top to bottom. In the system (1), accessories operate with traction whereas straw-bales (4) operate with pressure. When the inventive wall system (1) is assembled, the system (1) is made monolithic by applying rough cast and final rendering onto the wire lath applied in the state of the art to the inner and outer surfaces of the straw-bales (4).

[0033] In the inventive system (1), compression levels of the straw-bales (4) can be adjusted as a whole wall or locally in part. Thus, problems arising from the fact that the straw-bales known in the state of the art cannot be compressed adequately or they are compressed too much are overcome. By means of the inventive system (1), it is enabled to build a durable load-bearing straw-bale wall system (1) with less material and labour for less and quickly.

[0034] Within these basic concepts, it is possible to develop a great variety of embodiments of the inventive "Load-bearing Straw-Bale Wall System (1)"; it cannot be limited to the examples disclosed herein and it is according to the claims.

Claims

1. A load-bearing straw-bale wall system (1) used in construction of buildings, enabling to separate buildings from outer environment, comprising:

   at least one reinforced-concrete foundation (2) which is located on the floor;
   at least one fixing member (3) which is fixed onto the foundation (2);
   a plurality of straw-bales (4) which are placed onto the foundation (2) and one another such that they will cover the foundation (2) entirely and extend to a certain height;
   at least one connection member (5) which is passed through the straw-bales (4) that are placed onto the foundation (2) and one another such that at least part of it will project from the straw-bales (4), provides resistance of the straw-bales (4) to the loads imposed on thereof by being compressed, and is connected to the fixing member (3) after it passes through the straw-bales (4) located on the foundation (2);
   at least one support member (6) which is placed onto the straw-bales (4) such that it will extend among the straw-bales (4) placed on one another;
   at least one beam (9) which is placed onto the said straw-bales (4) such that it covers the last row straw-bales (4) located on the top;
   at least one compression member (8) whereby the connection member (5) projecting from the straw-bales (4) is fixed and which enables to compress the straw-bale (4), where the connection member (5) extends out, in desired amount after the connection member (5) is fixed on thereof;

   characterized in that it further comprises:
   at least one tension ring (7) wherein the support members (6) pass and which tries to pull the connection member (5) passing through it.

2. A system (1) according to Claim 1, **characterized by** at least one reinforcing member (10) which is fixed to the foundation (2) and the beam (9), placed onto at least one of the surfaces of the straw-bales (4) facing into the building or outside the building, and provides resistance of the straw-bales (4) to lateral loads.

3. A system (1) according to Claim 2, **characterized by** at least one reinforcing member (10) which extends on the surface crosswise such that it will be connect to the compression members (8).

4. A system (1) according to Claim 2 or 3, **characterized by** at least one reinforcing member (10) which is a reinforced-concrete construction rebar.

5. A system (1) according to any of Claim 2 to 4, **characterized by** at least one locking member which is

placed onto the reinforcing member (10) and prevents the compression member (8) from moving involuntarily by being locked after the straw-bale (4) is compressed in desired amount.

6. A system (1) according to any of the preceding claims, **characterized by** the fixing member (3) which is placed on the lower surface of the beam (9) and enables the connection member (5) that is passed through the straw-bales (4) located under the beam (9) to be fixed to the beam (9).

7. A system (1) according to any of the preceding claims, **characterized by** the fixing member (3) which is a hook.

8. A system (1) according to any of the preceding claims, **characterized by** the straw-bales (4) which are placed on top of one another such that they are lapped.

9. A system (1) according to any of the preceding claims, **characterized by** the connection member (5) which ensures that it remains at a tension enabling to compress the straw-bales (4) upon it is connected to the fixing members (3) located on the foundation (2) and under the beam (9) and the tension rings (7) located on the pre-determined support members (6) after it is passed through the tension ring (7).

10. A system (1) according to any of the preceding claims, **characterized by** the connection member (5) which is a rope made of a polypropylene material.

11. A system (1) according to any of the preceding claims, **characterized by** the tension ring (7) which passes through pre-determined support members (6) such that it will grip the support members (6).

12. A system (1) according to any of the preceding claims, **characterized by** the tension ring (7) which ensures that the connection member (5) is fixed in order that the connection member (5) has the tension sufficient for compressing the straw-bales (4).

13. A system (1) according to Claim 11 or 12, **characterized by** the tension ring (7) which is a collar made of a metal material.

14. A system (1) according to any of the preceding claims, **characterized by** the compression member (8) which is placed into the part projecting from at least one of the surfaces of the connection member (5), that is passed through the straw-bales (4), facing into the building or outside the building.

15. A system (1) according to Claim 14, **characterized by** the compression member (8) which ensures that the straw-bales (4) where the connection member (5) remains in between are compressed to a desired extend upon being stretched by being rotated after it is placed to the projecting part of the connection member (5).

Patentansprüche

1. Lasttragendes Strohballenwandsystem (1), das beim Bau von Gebäuden verwendet wird und es ermöglicht, Gebäude von der äußeren Umgebung zu trennen, umfassend:

wenigstens ein Stahlbetonfundament (2), das sich auf dem Boden befindet;
wenigstens ein Befestigungselement (3), das auf dem Fundament (2) befestigt ist;
eine Vielzahl von Strohballen (4), die auf dem Fundament (2) und aufeinander so angeordnet sind, dass sie das Fundament (2) vollständig bedecken und sich bis zu einer bestimmten Höhe erstrecken;
wenigstens ein Verbindungselement (5), das durch die auf dem Fundament (2) und aufeinander angeordneten Strohballen (4) hindurchgeführt wird, so dass wenigstens ein Teil davon aus den Strohballen (4) hervorsteht, das den Strohballen (4) Widerstand gegen die durch das Zusammendrücken aufgebrachten Lasten bietet und mit dem Befestigungselement (3) verbunden ist, nachdem es durch die auf dem Fundament (2) angeordneten Strohballen (4) hindurchgeführt ist;
wenigstens ein Stützelement (6), das auf den Strohballen (4) so angeordnet ist, dass es sich zwischen den übereinander angeordneten Strohballen (4) erstreckt;
wenigstens einen Balken (9), der auf die Strohballen (4) so angeordnet ist, dass er die letzten, oben liegenden Strohballen (4) abdeckt;
wenigstens ein Druckelement (8), an welchem das aus den Strohballen (4) hervorstehende Verbindungselement (5) befestigt ist und das es ermöglicht, den Strohballen (4), dort wo das Verbindungselement (5) hervorsteht, in gewünschtem Umfang zu komprimieren, nachdem das Verbindungselement (5) daran befestigt ist;
dadurch gekennzeichnet, dass es ferner umfasst:
wenigstens einen Spannring (7), durch den die Stützelemente (6) hindurchgehen und der versucht, das durch ihn hindurchgehende Verbindungselement (5) zu ziehen.

2. System (1) nach Anspruch 1, **gekennzeichnet durch** wenigstens ein Verstärkungselement (10),

das am Fundament (2) und am Balken (9) befestigt ist, das auf wenigstens einer der Oberflächen der Strohballen (4) angeordnet ist, die in das Gebäude oder nach außerhalb des Gebäudes gerichtet sind, und das den Strohballen (4) Widerstand gegen seitliche Lasten bietet.

3. System (1) nach Anspruch 2, **gekennzeichnet durch** wenigstens ein Verstärkungselement (10), das sich an der Oberfläche quer erstreckt, so dass es mit den Druckelementen (8) verbunden ist.

4. System (1) nach Anspruch 2 oder 3, **gekennzeichnet durch** wenigstens ein Verstärkungselement (10), das ein Stahlbeton-Träger ist.

5. System (1) nach einem der Ansprüche 2 bis 4, **gekennzeichnet durch** wenigstens ein Verriegelungselement, das auf das Verstärkungselement (10) aufgesetzt ist und verhindert, dass sich das Druckelement (8) unwillkürlich bewegt, indem es verriegelt wird, nachdem der Strohballen (4) in gewünschtem Umfang komprimiert wurde.

6. System (1) nach einem der vorhergehenden Ansprüche, **gekennzeichnet durch** das Befestigungselement (3), das auf der Unterseite des Balkens (9) angeordnet ist und es ermöglicht, dass das Verbindungselement (5), das durch die unter dem Balken (9) befindlichen Strohballen (4) geführt ist, am Balken (9) befestigt wird.

7. System (1) nach einem der vorhergehenden Ansprüche, **gekennzeichnet durch** das Befestigungselement (3), das ein Haken ist.

8. System (1) nach einem der vorhergehenden Ansprüche, **gekennzeichnet durch** die Strohballen (4), die übereinander gelegt sind, so dass sie überlappen.

9. System (1) nach einem der vorhergehenden Ansprüche, **gekennzeichnet durch** das Verbindungselement (5), das sicherstellt, dass es auf einer Spannung bleibt, die es ermöglicht, die Strohballen (4) zu komprimieren, und mit den Befestigungselementen (3), die sich auf dem Fundament (2) und unter dem Balken (9) befinden, und den Spannringen (7), die sich auf den vorbestimmten Stützelementen (6) befinden, verbunden ist, nachdem es durch den Spannring (7) geführt wurde.

10. System (1) nach einem der vorhergehenden Ansprüche, **gekennzeichnet durch** das Verbindungselement (5), das ein Seil aus einem Polypropylenmaterial ist.

11. System (1) nach einem der vorhergehenden Ansprüche, **gekennzeichnet durch** den Spannring (7), durch den vorgegebene Stützelemente (6) verlaufen, so dass er die Stützelemente (6) greift.

12. System (1) nach einem der vorhergehenden Ansprüche, **gekennzeichnet durch** den Spannring (7), der sicherstellt, dass das Verbindungselement (5) so befestigt ist, dass das Verbindungselement (5) die für das Zusammendrücken der Strohballen (4) ausreichende Spannung aufweist.

13. System (1) nach Anspruch 11 oder 12, **gekennzeichnet durch** den Spannring (7), der eine Manschette aus einem Metallmaterial ist.

14. System (1) nach einem der vorhergehenden Ansprüche, **gekennzeichnet durch** das Druckelement (8), das in den Abschnitt, der von wenigstens einer der Oberflächen hervorsteht, des Verbindungselements (5) eingesetzt ist, das durch die Strohballen (4) geführt ist, und in das Gebäude oder nach außerhalb des Gebäudes gerichtet ist.

15. System (1) nach Anspruch 14, **gekennzeichnet durch** das Druckelement (8), das sicherstellt, dass die Strohballen (4), zwischen denen das Verbindungselement (5) verbleibt, bis zu einem gewünschten Ausmaß komprimiert werden, nachdem das Verbindungselement (5) durch Drehen gestreckt wurde, nachdem das Druckelement (8) in den vorstehenden Teil des Verbindungselements (5) eingesetzt wurde.

Revendications

1. Un système (1) de paroi porteuse à bottes de paille utilisé dans la construction de bâtiments, permettant de séparer les bâtiments de l'environnement extérieur, comprenant :

au moins une fondation (2) en béton armé qui est située sur le sol ;
au moins un élément de fixation (3) qui est fixé sur la fondation (2) ;
une pluralité de bottes de paille (4) qui sont placées sur la fondation (2) et qui sont agencées les unes et les autres de telle sorte qu'elles recouvrent entièrement la fondation (2) et qu'elles s'étendent sur une certaine hauteur ;
au moins un élément de liaison (5) qui passe à travers les bottes de paille (4) placées sur la fondation (2) et qui est tel, avec celles-ci, qu'au moins une partie de lui dépasse des bottes de paille (4), procure une résistance des bottes de paille (4) aux charges imposées à celles-ci par compression, et est relié à l'élément de fixation (3) après son passage à travers les bottes de paille (4) placées sur la fondation (2) ;
au moins un élément de support (6) qui est placé

sur les bottes de paille (4) de telle sorte qu'il s'étende entre les bottes de paille (4) placées les unes sur les autres ;
au moins une poutre (9) qui est placée sur lesdites bottes de paille (4) de telle sorte qu'elle recouvre la dernière rangée de bottes de paille (4) située sur le dessus ;
au moins un élément de compression (8), auquel l'élément de liaison (5) faisant saillie des bottes de paille (4) est fixé et qui permet de comprimer les bottes de paille (4), l'élément de liaison (5) s'étendant selon un degré souhaité après que l'élément de liaison (5) soit fixé sur celui-ci ;

caractérisé en ce qu'il comprend en outre :
au moins un anneau de tension (7) dans lequel les éléments de support (6) passent et qui tente de tirer l'élément de liaison (5) passant au travers de lui.

2. Un système (1) selon la revendication 1, **caractérisé par** au moins un élément de renforcement (10) qui est fixé à la fondation (2) et à la poutre (9), placé sur au moins une des surfaces des bottes de paille (4) orientées vers l'intérieur ou l'extérieur du bâtiment, et qui procure une résistance des bottes de paille (4) aux charges latérales.

3. Un système (1) selon la revendication 2, **caractérisé par** au moins un élément de renforcement (10) qui s'étend sur la surface transversalement de manière à être relié aux éléments de compression (8).

4. Un système (1) selon la revendication 2 ou la revendication 3, **caractérisé par** au moins un élément de renforcement (10) qui est une barre de construction en béton armé.

5. Un système (1) selon l'une quelconque des revendications 2 à 4, **caractérisé par** au moins un élément de verrouillage qui est placé sur l'élément de renforcement (10) et empêche l'élément de compression (8) de se déplacer involontairement en étant verrouillé après compression de la botte de paille (4) selon un degré souhaité.

6. Un système (1) selon l'une quelconque des revendications précédentes, **caractérisé par** l'élément de fixation (3) qui est placé sur la surface inférieure de la poutre (9) et qui permet à l'élément de liaison (5), qui passe à travers les bottes de paille (4) situées sous la poutre (9), d'être fixé à la poutre (9).

7. Un système (1) selon l'une quelconque des revendications précédentes, **caractérisé par le fait que** l'élément de fixation (3) est un crochet.

8. Un système (1) selon l'une quelconque des revendications précédentes, **caractérisé par le fait que** les bottes de paille (4) sont placées les unes sur les autres de manière à être en chevauchement.

9. Un système (1) selon l'une quelconque des revendications précédentes, **caractérisé par le fait que** l'élément de liaison (5) qui assure qu'il reste sous une tension permettant de comprimer les bottes de paille (4) lorsqu'il est relié aux éléments de fixation (3) situés sur la fondation (2) et sous la poutre (9) et les anneaux de tension (7) situés sur les éléments de support (6) prédéterminés après qu'il soit passé au travers de l'anneau de tension (7).

10. Un système (1) selon l'une quelconque des revendications précédentes, **caractérisé par le fait que** l'élément de connexion (5) est un cordage fait d'un matériau polypropylène.

11. Un système (1) selon l'une quelconque des revendications précédentes, **caractérisé par le fait que** l'anneau de tension (7) traverse des éléments de support prédéterminés (6) de telle sorte qu'il saisit les éléments de support (6).

12. Un système (1) selon l'une quelconque des revendications précédentes, **caractérisé par le fait que** l'anneau de tension (7) assure que l'élément de liaison (5) est fixé de telle sorte que l'élément de liaison (5) ait une tension suffisante pour comprimer les bottes de paille (4).

13. Un système (1) selon la revendication 11 ou la revendication 12, **caractérisé par le fait que** l'anneau de tension (7) est un collier fait en un matériau métallique.

14. Un système (1) selon l'une quelconque des revendications précédentes, **caractérisé par le fait que** l'élément de compression (8) est placé dans la partie dépassant d'au moins une des surfaces de l'élément de liaison (5), qui passe à travers les bottes de paille (4), tournée vers le bâtiment ou vers l'extérieur du bâtiment.

15. Un système (1) selon la revendication 14, **caractérisé par le fait que** l'élément de compression (8) assure que les bottes de paille (4) dans lesquelles l'élément de liaison (5) reste, sont comprimées jusqu'à un degré souhaitée lorsqu'il est étiré en étant tourné après qu'il soit placé sur la partie en saillie de l'élément de liaison (5).

Figure 1

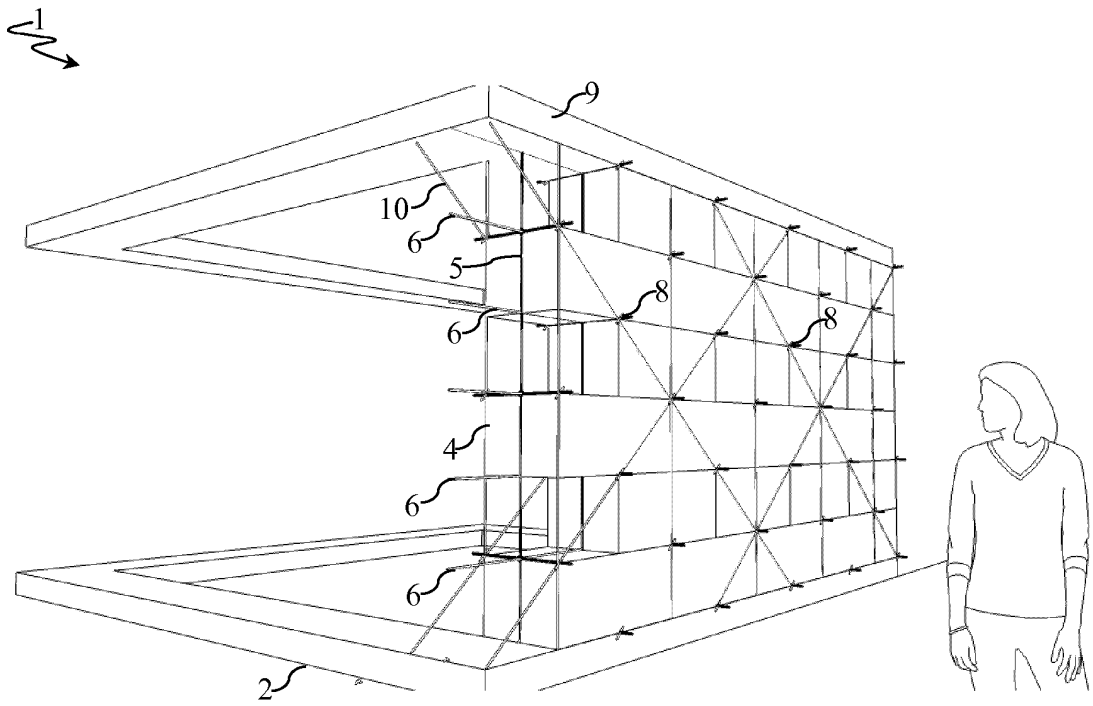


Figure 2

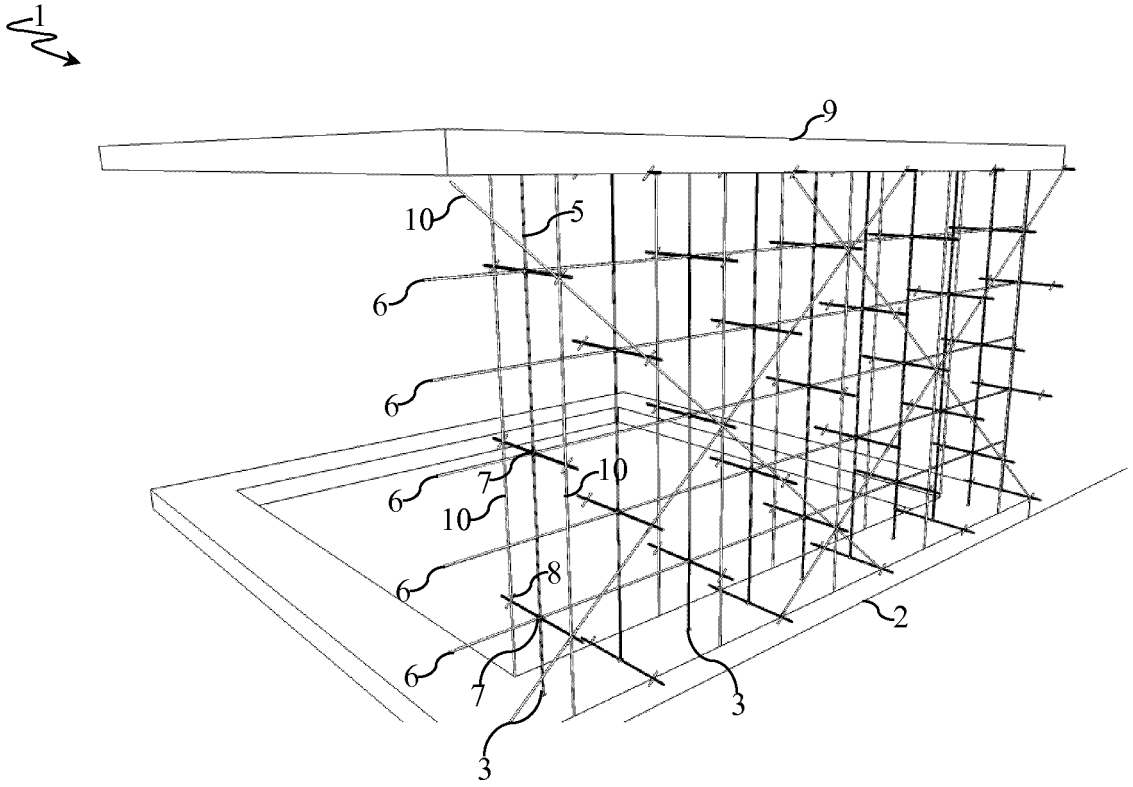


Figure 3

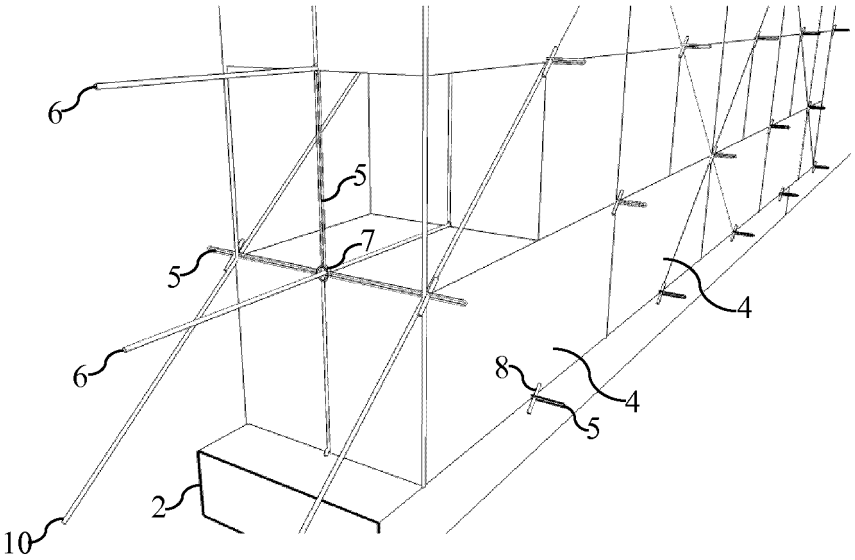
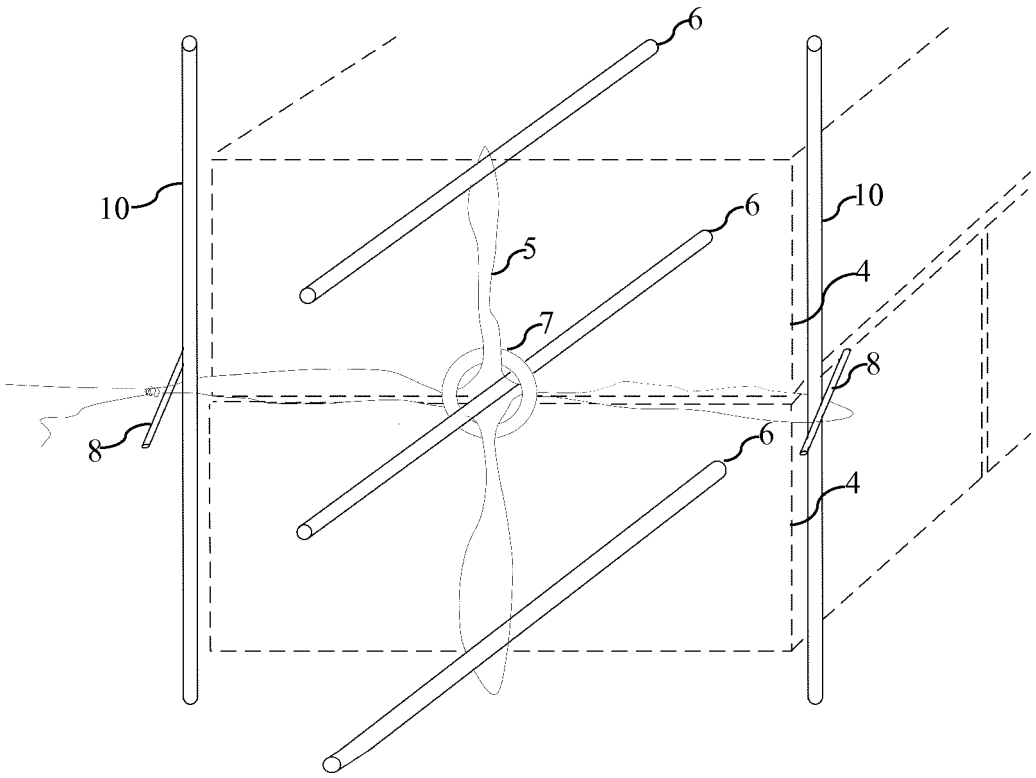


Figure 4



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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- KR 20120131465 **[0011]**
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