Nov. 3, 1964 S. M. KIMBALL 3,154,833

CONCRETE WALL FORM

Filed Dec. 6, 1962 4 Sheets-Sheet 1

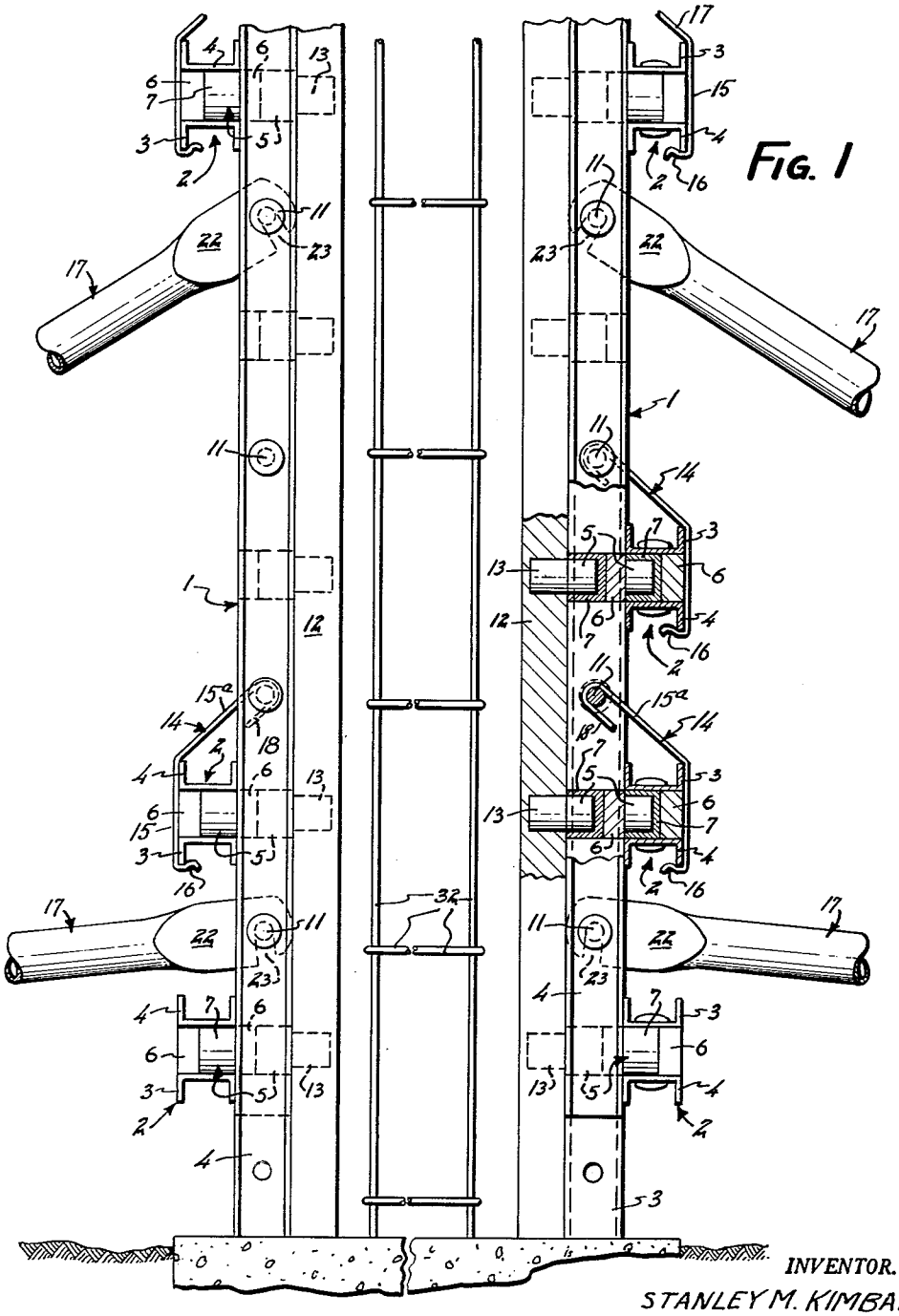


FIG. 1

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CONCRETE WALL FORM

Filed Dec. 6, 1962 4 Sheets-Sheet 2

FIG. 8

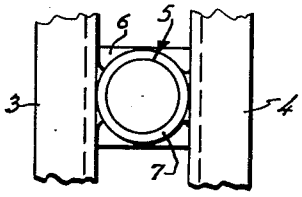
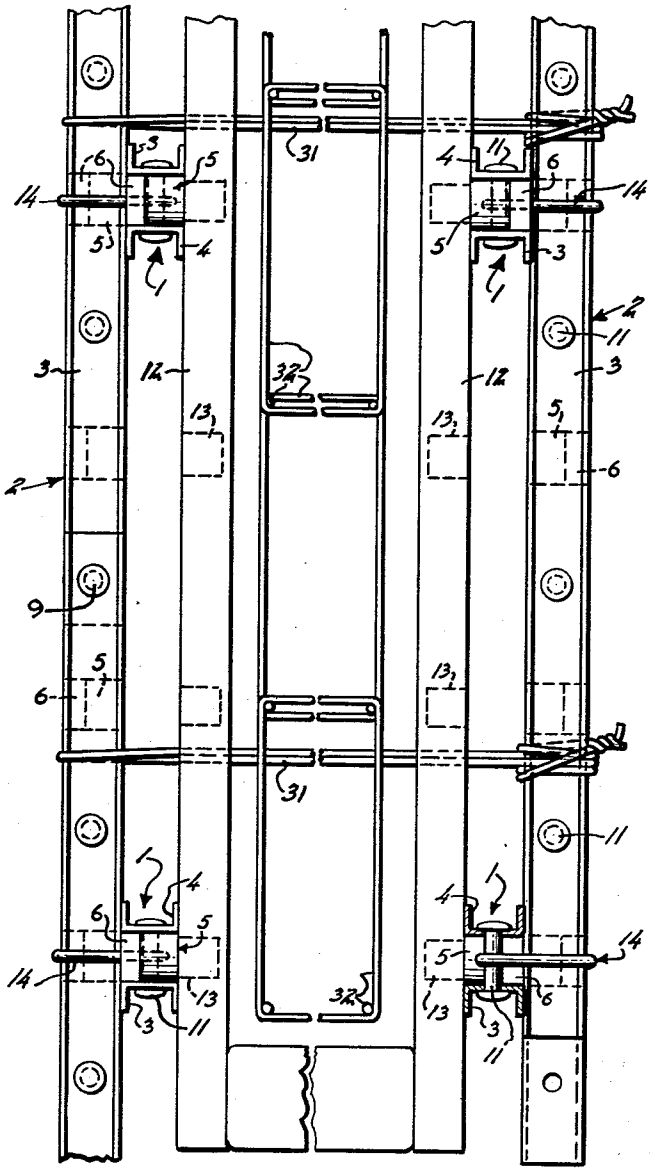


FIG. 2



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Nov. 3, 1964 S. M. KIMBALL 3,154,833

CONCRETE WALL FORM

Filed Dec. 6, 1962 4 Sheets-Sheet 3

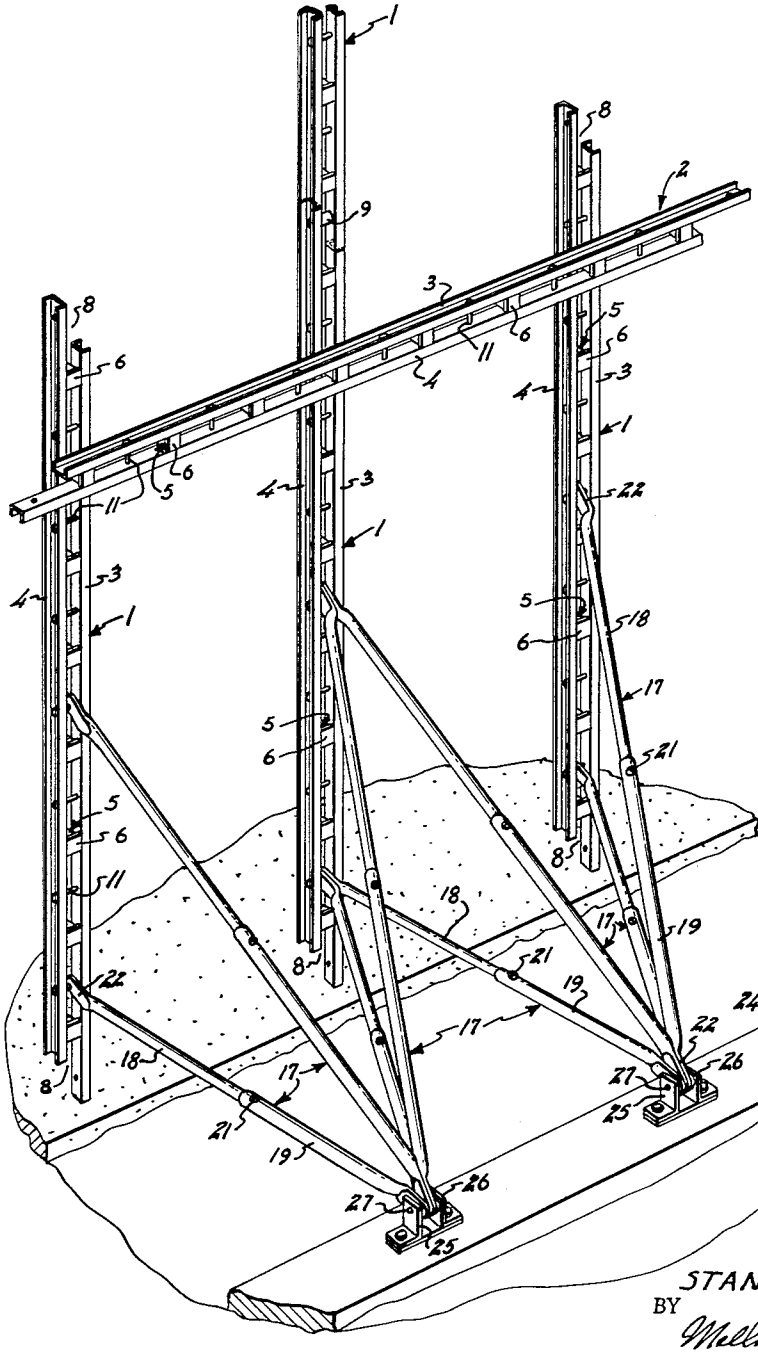


FIG. 3

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Nov. 3, 1964 S. M. KIMBALL 3,154,833

CONCRETE WALL FORM

Filed Dec. 6, 1962 4 Sheets-Sheet 4

FIG. 4

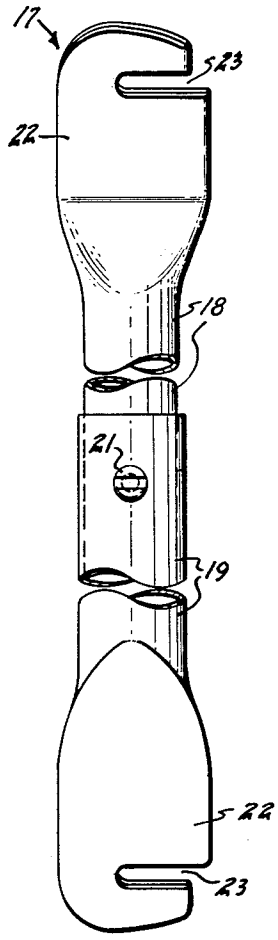


FIG. 5

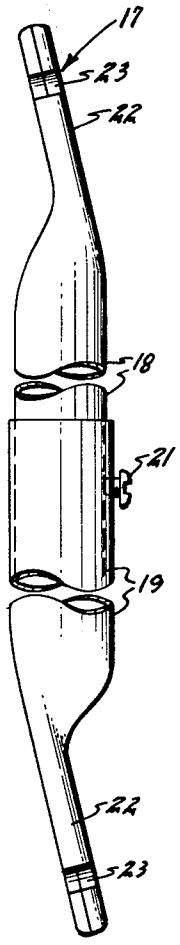


FIG. 6

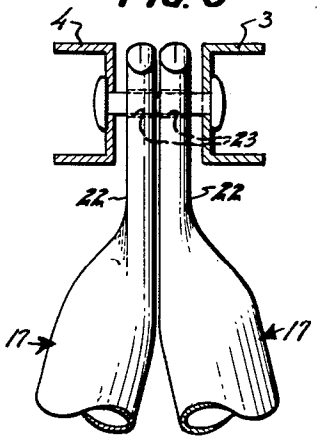
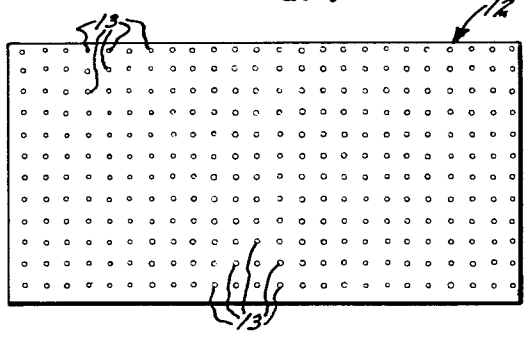


FIG. 7



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United States Patent Office 3,154,833 Patented Nov. 3, 1964

3,154,833

CONCRETE WALL FORM

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Filed Dec. 6, 1962, Ser. No. 242,803
10 Claims. (Cl. 25—131)

This invention relates to and in general has for its object the provision of a concrete wall form made up of standard components arranged to be magnetically secured and which can be readily assembled, disassembled and reused.

Normally, each side of a concrete wall form is made by erecting wooden studs along one of the lines of the concrete wall to be poured and nailing sheathing boards to the studs. Spacers disposed between the two parallel walls so formed serve to retain the walls in parallelism while the concrete is being poured and during the initial curing period thereof. When the concrete has set, the forms are dismantled, and in this process are subjected to considerable damage. Many of the components are therefore not suitable for reuse. Furthermore, the erection of forms of this character requires the services of skilled labor.

More specifically, one of the objects of this invention is the provision of a fabricated aluminum alloy girder provided along its length with permanent magnets and armatures spaced on a predetermined modulus so that a plurality of such girders can be magnetically secured in a grid formation to serve as supporting structure for the sheathing of a concrete wall form.

Another object of this invention is the provision of a sheath section provided on its surface with a grid pattern of armatures wherein the armatures are spaced in both directions on a modulus identical to the spacing of the magnets and armatures of the girders.

A further object of this invention is the provision, in combination with a grid of the character above described, of a clip for mechanically securing the cross members of the grid against sliding movement over its upright members.

Still another object of this invention is the provision, in combination with a grid structure of the character above described, of struts or bracing members for securing the grid in an upright position.

Another object of the invention is the provision of a girder of the character above described having notched or offset ends whereby the ends of two of such girders can be lap-joined to form an extended girder.

The invention possesses other advantageous features, some of which, with the foregoing, will be set forth at length in the following description where that form of the invention which has been selected for illustration in the drawings accompanying and forming a part of the present specification is outlined in full. In said drawings, one form of the invention is shown, but it is to be understood that it is not limited to such form, since the invention as set forth in the claims may be embodied in other forms.

Referring to the drawings:

FIG. 1 is a fragmentary end elevation of a concrete form embodying the objects of my invention and wherein portions thereof are broken away and other portions thereof shown in section.

FIG. 2 is a top plan view of the structure illustrated in FIG. 1.

FIG. 3 is a fragmentary perspective of the structure illustrated in FIGS. 1 and 2.

FIG. 4 is a side elevation of one of the struts or braces illustrated in FIG. 3.

FIG. 5 is a plan view of the strut illustrated in FIG. 4.

FIG. 6 is a fragmentary detail of two of the struts locked in place on one of the girders.

FIG. 7 is a plan of a section of plywood sheathing provided with magnet armatures.

FIG. 8 is a fragmentary front elevational detail of one of the magnet and armature assemblies.

The forms illustrated in FIGS. 1, 2 and 3 include a first set of spaced, parallel upright girders (strongbacks or studs) generally designated by the reference numeral 1 and a second set of spaced parallel girders (walers) overlying said first set of girders at right angles thereto and generally designated by the reference numeral 2, but which preferably are identical to the girders 1.

Conveniently, each of the girders 1 and 2 is made up of a pair of identical, spaced parallel aluminum alloy channels 3 and 4 facing away from each other and held in spaced relation with each other by an intervening permanent cylindrical bar magnet generally designated by the reference numeral 5 and by a rectangular soft iron armature and spreader 6. Both the magnet 5 and the armature 6 are cemented or otherwise bonded to each other and to their associated girders 1 and 2.

As best shown in FIG. 8, each magnet 5 is encased in a cylindrical shell 7 of nonferrous metal. The corresponding ends (north poles, for example) of the magnets are flush with one face of their associated girder with their axes normal to the length of the girder. The armature contiguous to each magnet has one of its faces flush with the opposite side of the girder. All of the magnets are identical and likewise all of the armatures are identical.

As best indicated in FIG. 3, the ends of the channels 3 and 4 making up each of the girders 1 and 2 are longitudinally offset as at 8 so that two such girders can be placed end to end in a lap joint and rigidly connected by a spacing bolt 9.

Connecting each pair of channels 3 and 4 of each of the girders at points midway each pair of magnets and armatures is a bolt 11. Since the bolts 11 are located midway each pair of magnets, they are spaced on the same modulus as are the magnets.

If the girders used as uprights are spaced on this same modulus, and the girders used as the cross members of the structure are spaced on this modulus the magnets of the cross members can be made to register with the armatures of the upright member, or vice versa, to thus magnetically hold the uprights and cross members in a rectangular or square grid arrangement.

The girders above described constitute one of the basic components of my wall form.

The second basic component of this form consists of a rectangular section 12 of plywood or the like, the width and length of which are multiples of the above stated modulus (FIG. 7). Embedded over the surface of the section 12 in square pattern are soft iron armatures 13, likewise located on the above stated modulus.

As a result of this construction, such section 12 can be placed over the first set of upright girders with the armatures 13 of the sections 12 in registration and magnetic contact with the magnets 5 of the upright girders.

Although considerable force is required to pull an armature away from its associated magent, considerably less force is required to slide one of these members over the other. Since the cross girders of a form structure of the character above described are often used to climb on, it is essential to provide a mechanical interlock between the cross girders and the upright girders. The third component of my concrete wall form therefore consists of the spring clips generally designated by the reference numeral 14 (FIG. 1).

Each of the clips 14 is conveniently made of spring steel wire and includes a straight vertical section 15 arranged to overlie the outer side of one of the cross girders 2. The section 15 terminates at its lower end in an

inwardly and upwardly bent catch **16** arranged to be clipped or sprung over the outer, downwardly extending flange of the lower channel **4** of the cross girder. The upper end of the clip section **15** merges with an inclined section **15***a* terminating in an open hook **18** arranged to be hooked over one of the bolts **11**. In applying the clip **14** it is first hooped over the bolt **11** and then its catch **16** is forced over the lower outer flange of the cross girder.

The fourth component of my wall structure consists of longitudinally adjustable struts or braces generally designated by the reference numeral **17** (FIGS. 3, 4 and 5) used, as best shown in FIG. 3, to support the wall form structure in an upright position.

More specifically each of the struts **17** includes a pair of telescoping tubular sections **18** and **19** arranged to be locked together in any angular and longitudinally adjusted position relative to each by a set screw **21**. Formed on the free end of each of the sections **18** and **19** is an angularly offset flat **22** and provided in each flat **22** is a transverse notch **23**.

Mounted on a plank **24** or other suitable base member are a plurality of pairs of spaced angles **25** and **26**, and extending across the upstanding legs of each pair of angles is a pin or bolt **27**. As best shown in FIG. 3, the plank **24** is spaced from the wall form in parallelism therewith, and the pairs of angles **25** and **26** are spaced along the plank on the same modulus used for spacing the magnets and armatures **5** and **6**, or some multiple thereof. Each pair of angles **25** and **26** should be located on a line normal to the plane of the wall form and bisecting a line joining two adjacent pairs of upright girders. With plank **24** and its angles **25** and **26** so arranged relative to the upright girders **1**, the upper flat **22** of one of the struts **17** can be hooked over one of the girder bolts **11** and its lower flat can be hooked over the pin or bolt **27** of the pair of angles **25** and **26**. Since each strut **17** is made from the two telescoping sections **18** and **19**, it can be adjusted lengthwise as required, and the angularity of the strut flats **22** can be adjusted to bring them into parallelism with the upright girders. In this fashion the wall form can be braced in an upright position, all as indicated in FIG. 3.

One preferred sequence of steps in erecting my wall form is first to locate the desired line of the concrete wall to be poured. The plank **24** or other base member is then properly located relative to this line. At least some of the upright girders are then positioned adjacent the wall line and braced by the struts **17** as above described. Following this, the cross girders are positioned over the upright girders with the magents and armatures thereof in magnetic engagement with each other. The remaining upright girders can be erected and then the cross girders mechanically locked to the upright girders by use of the spring clips **14**, all as above described. This having been done, the sheath sections **12** are placed against the faces of the upright girders with the armatures **13** thereof in magnetic engagement with the magnets **5** of the upright girders. Other sequences are of course possible.

A complete form is of course formed by two spaced, opposed wall forms of the character above described, this being shown in FIG. 2.

Following conventional practice, tie rods or wires **31** are strung between and through the two opposed sheathing sections and secured either to these sections or to the cross girders as shown in FIG. 2 and reinforcing rods **32** placed in position.

Although the upright and cross girders **1** and **2** have been illustrated and described as being made up of a pair of opposed channels, other structural forms such as bars, angles, I and H beams can of course be used for this purpose. The essential factor here is that a girder of some sort be provided at equal spaced points with permanent magnets and armatures, and that preferably each end of each girder be notched or offset so that two such

girders can be positioned end to end and spliced in a lap joint.

Also, it is to be noted that metal sheathing can be used in place of wooden sheathing. If light-gauge steel sheathing is used, there is of course no need for providing such sheathing with spaced armatures. The justification of using metal sheathing depends upon the life thereof as against the life of wooden sheathing.

By resorting to the standard wall form components above described, wall forms of any desired height and length can be easily erected by unskilled labor. The modular disposition of the magnets and armatures permits the upright and cross girders to be definitely and readily located relative to each other and held in place without the necessity of measuring or nailing. In a sense the magnets and armatures serve as means for keying the uprights and cross members to each other only at predetermined points. Since the girder bolts **11** are all located on a predetermined modulus, and since the spring clips **14** are all standard, it is possible to apply them only at predetermined points for the purpose of mechanically locking the cross girders to the uprights at their points of intersection. In short, there is only one readily apparent way of erecting the various components of my wall form.

Another advantage of a wall form of this kind is that it can be readily dismantled without damage to its components and then such components can be reused many times.

I claim:

1. A nonferrous metal girder having at least one pair of opposed parallel sides; a plurality of permanent magnets fixed to said girder at spaced points thereon on a predetermined modulus; a plurality of armatures fixed to said girder immediately adjacent said magnets, said armatures being flush with one of said sides and the ends of said magnets being flush with the opposite side of said girder.

2. A girder of the character set forth in claim 1 having notched ends so that two such girders can be lap-joined end to end to form an elongated girder having continuous sides.

3. A nonferrous metal girder comprising: a pair of spaced, parallel structural members having at least one pair of opposed parallel sides, soft iron armatures secured to and between said structural members, said armatures being spaced on a predetermined modulus with one side of each armature flush with one of the said sides of said girder; and a permanent bar magnet fixed to said girder immediately adjacent each of said armatures, the corresponding ends of said magnets being flush with the other of said sides of said girder, the axes of said magnets being normal to said parallel sides.

4. A girder of the character set forth in claim 3 including bolts extending through said structural members, said bolts being disposed midway between each adjacent pair of magnets.

5. A girder of the character set forth in claim 3 wherein the adjacent ends of said structural members are staggered so that two such girders can be lap-joined end to end to form a girder of extended length.

6. A girder comprising: a pair of opposed, substantially identical aluminum alloy channels disposed in spaced parallelism with each other, the corresponding sides of said channels being coplanar and the webs thereof being opposed to each other; permanent magnets disposed between and secured to said channels on a predetermined modulus with their corresponding ends flush with one pair of coplanar sides of said girders so that the magnetic flux through the magnets is in a direction normal to the length of said girders; and bolts extending through the webs of said channels intermediate said magnets, said bolts being spaced on said predetermined modulus.

7. A rectangular grid structure for a concrete wall form, comprising: a first set of spaced, parallel nonferrous metal girders each having at least one pair of opposed parallel sides; a plurality of permanent magnets fixed to each of said girders at spaced points thereon on a predetermined modulus; a plurality of armatures fixed to each of said girders immediately adjacent said magnets, said armatures being flush with one of said sides of each of said girders and the ends of said magnets being flush with the opposite side thereof; and a second set of said girders overlying said first set normal thereto, and with the magnets thereof in magnetic engagement with the armatures of said first set of girders.

8. A rectangular structure of the character set forth in claim 7 wherein each girder of said first set of girders is fastened to one of the girders of said other set of girders by a spring clip.

9. A rectangular structure of the character set forth in claim 7 including a section of sheathing overlying said grid structure and provided with a plurality of armatures, said armatures being spaced on said predetermined modulus; the armatures of said sheathing being in magnetic engagement with the magnets of said first set of said girders.

10. A rectangular structure of the character set forth in claim 9 wherein the armatures of the sheathing are arranged in a rectangular grid pattern.

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