United States Patent [19]

Fuston, Jr.

[11] **3,862,737**

[45] **Jan. 28, 1975**

[54] **CONCRETE FORM PANELS AND LOCKING MEANS THEREFOR**

[75] Inventor: **Brantley Fuston, Jr.**, Stockbridge, Mich.

[73] Assignee: **Hoover Ball and Bearing Company**, Saline, Mich.

[22] Filed: **Oct. 1, 1973**

[21] Appl. No.: **402,265**

[52] **U.S. Cl.** **249/196**, 249/45, 249/47, 249/189

[51] **Int. Cl.** **E04g 17/04**

[58] **Field of Search** ..... 249/44-47, 249/192-193, 195-196, 219 R, 189, 166; 52/624, 475

[56] **References Cited**

UNITED STATES PATENTS

2,297,899	10/1942	Krueger	249/196
2,748,723	6/1956	Swann	52/624
3,661,354	5/1972	Dagiel et al.	249/45
3,679,168	7/1972	Weaver et al.	249/196
3,734,451	5/1973	Tierney	249/47

FOREIGN PATENTS OR APPLICATIONS

617,153	2/1949	Great Britain	249/40

Primary Examiner—Robert D. Baldwin
Assistant Examiner—John McQuade
Attorney, Agent, or Firm—Olsen and Stephenson

[57] **ABSTRACT**

Apparatus is disclosed for use in forming concrete structures such as concrete walls and the like. The apparatus comprises panel assemblies that have channel members at the marginal edges of the panels in which locking devices are positioned for interconnecting adjacent panel assemblies. The locking devices are permanently retained in the channel members.

12 Claims, 10 Drawing Figures

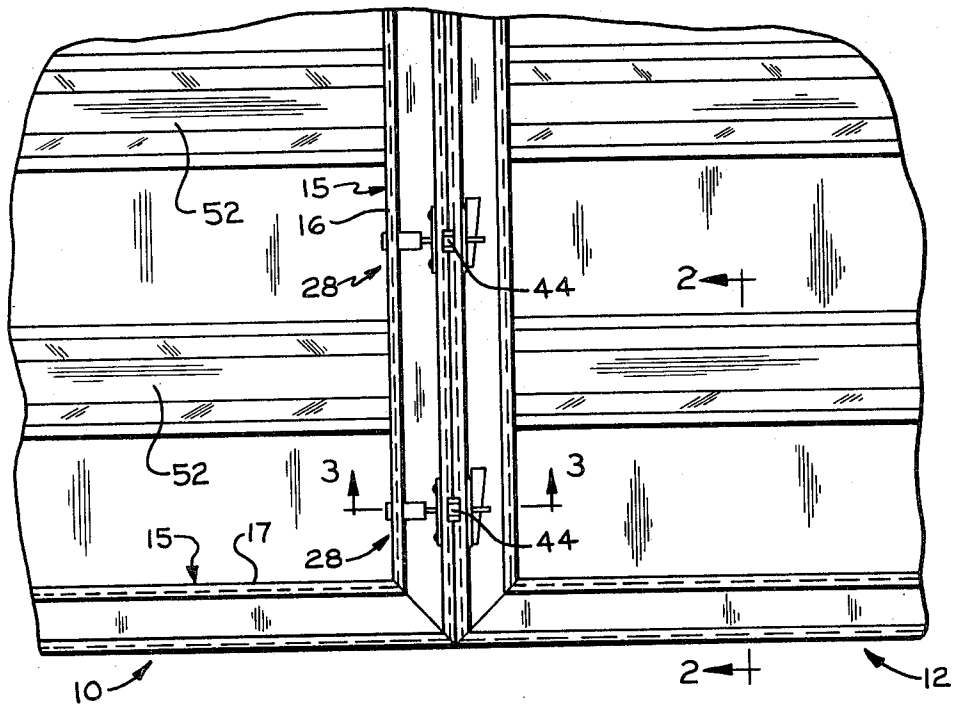
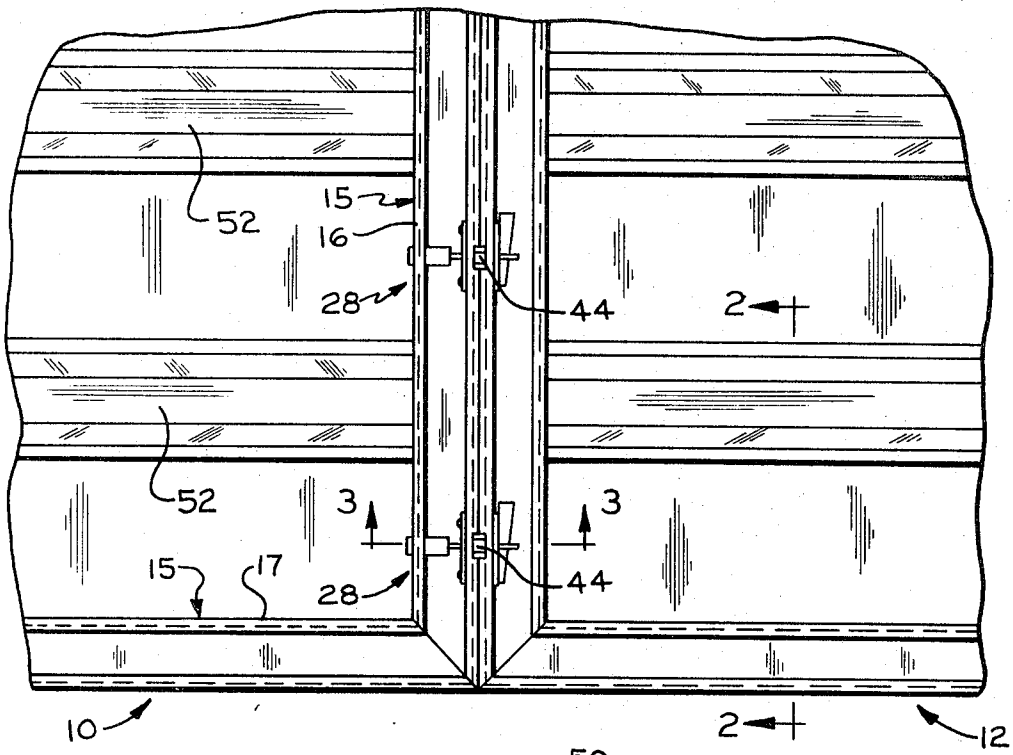


FIG. 1



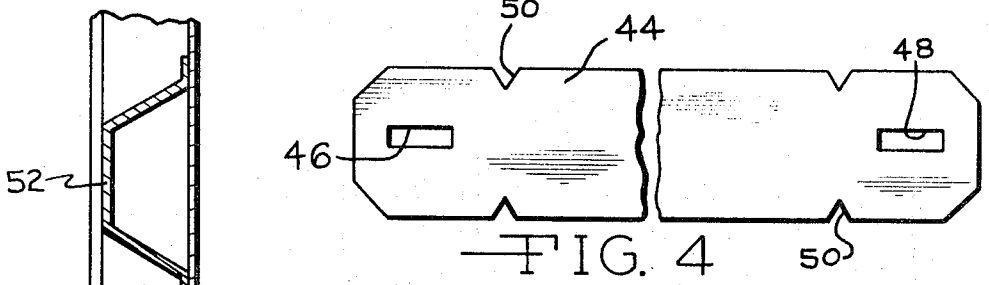
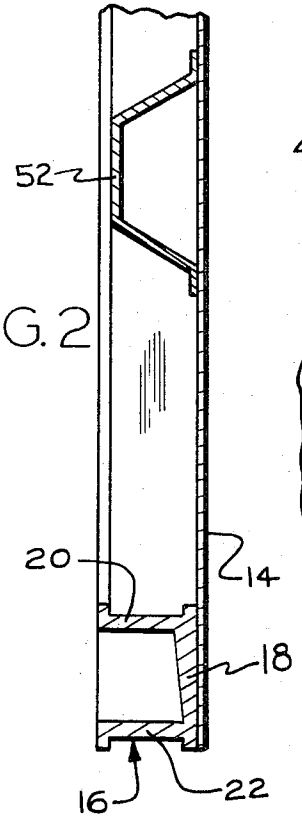


FIG. 4

FIG. 2



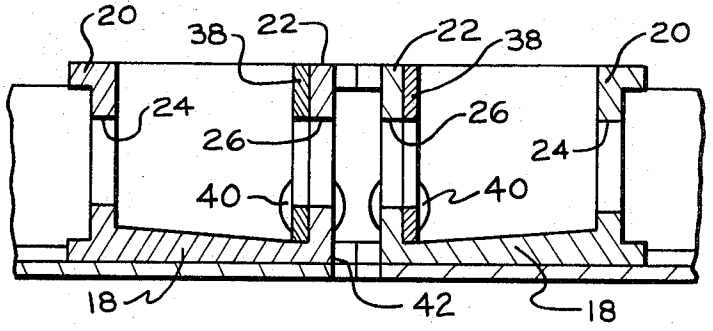


FIG. 3

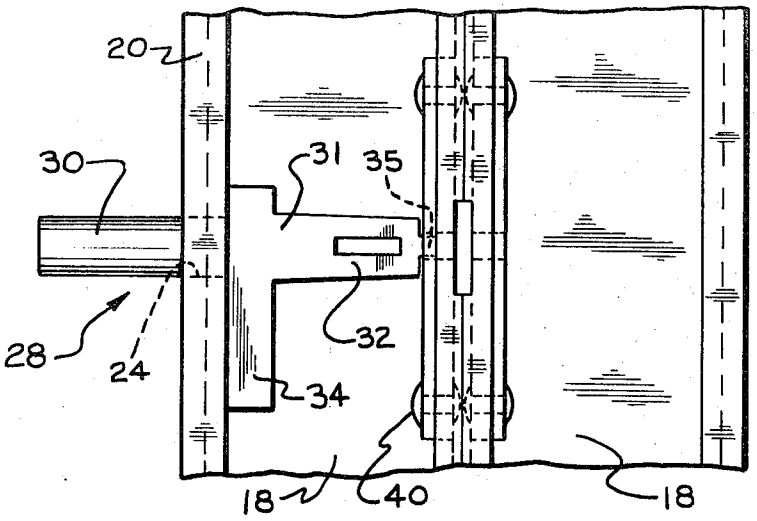


FIG. 5

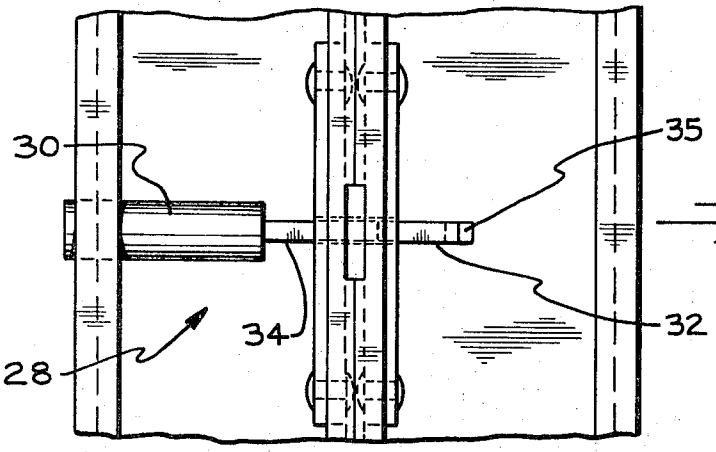


FIG. 6

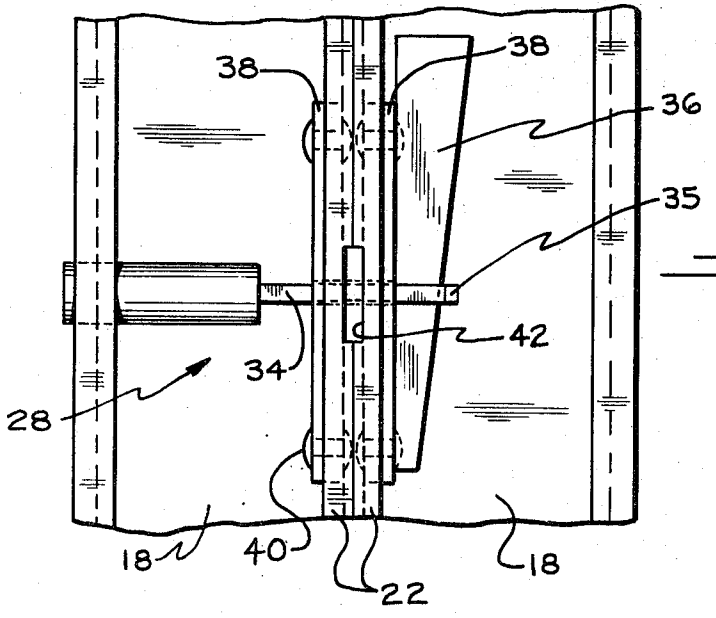


FIG. 7

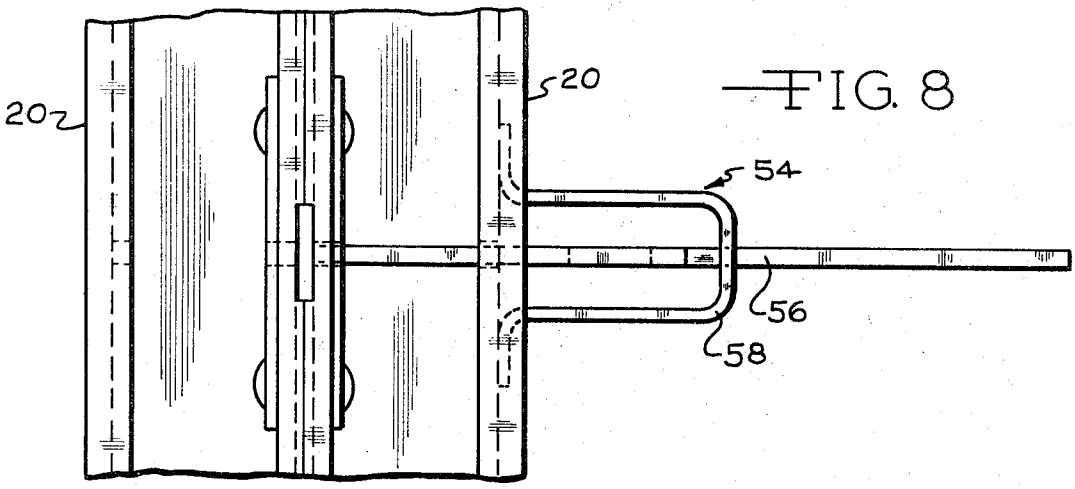


FIG. 8

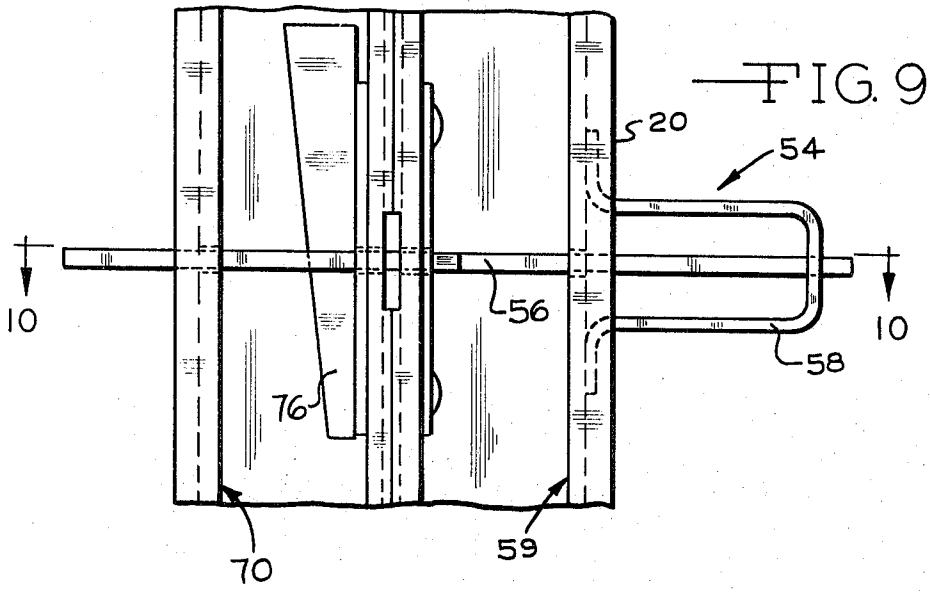


FIG. 9

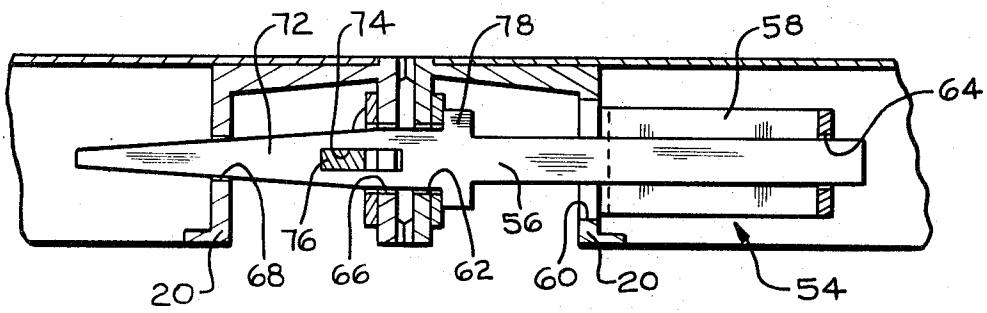


FIG. 10

CONCRETE FORM PANELS AND LOCKING MEANS THEREFOR

BACKGROUND OF THE INVENTION

The present invention relates to concrete form apparatus, especially adapted for forming concrete walls.

It is now a conventional practice when erecting high rise buildings to construct concrete walls by use of forms between which concrete can be poured, and when set, the forms can be raised to a higher level for repeated use. The forms include panels which can be supported in a horizontal direction by walers, and two sets of forms are positioned in parallel arrangement facing each other so that concrete can be poured between them. The parallel sets of forms are secured together, at least in part by flat tie members which remain embedded in the concrete after the forms are removed. The usual procedure adopted in the past for securing adjacent panels together has been to drive a lock wedge through a slotted end of a pin that is passed through flanges at the edges of the abutting panels, such as is shown for example in U.S. Pat. No. 3,077,653, issued Feb. 19, 1963 to Ward. This procedure leaves much to be desired, because the locking pin assemblies are frequently misplaced or lost requiring replacement. Not only is this costly because of the need for replacement parts, but unnecessary delays or inconveniences may occur during building construction which can result in greater financial loss to the building contractor than the mere loss of the locking devices.

SUMMARY OF THE INVENTION

The present invention has overcome inadequacies of the prior art, and in addition provides improvements in concrete form apparatus which simplify the assembly of the concrete forms while providing forms characterized by their relatively light weight commensurate with their strength.

According to one form of the present invention, concrete form apparatus is provided comprising a flat panel having on one side a flat surface against which concrete can be poured, and on the other side a U-shaped channel means extending around and located adjacent to the outer marginal edges. The U-shaped channel means has a base affixed to the panel so that the channel means opens in a direction away from the panel and provides inner and outer channel walls. The channel walls have holes therein in registration at spaced intervals, and locking means are positioned in the U-shaped channel means at the associated registered holes for transverse movement along the longitudinal axes of the locking means between retracted and extended positions and include structure which cooperates with the channel means for retaining the locking means against inadvertent displacement from the concrete form apparatus. Each of the locking means is operable when in its extended position to be locked into a hole of a channel member of a similar, next-adjacent concrete form apparatus.

In one form of the invention, the locking means is a locking key which has a cylindrical portion at its inner end for sliding and rotational movement in the hole of the inner channel wall, and it has a slot formation at its outer or extended end for receiving a lock wedge. A retainer portion is located in the U-shaped channel member restricting transverse movement of the key between its retracted and extended positions so as to avoid inadvertent displacement of the locking key from the U-shaped channel member. The retainer portion also functions in conjunction with the lock wedge to clamp two adjacent panels firmly together.

In another form of the invention, the locking means includes a bracket mounted on the exterior side of the inner wall of the channel means having a hole in alignment with the holes in the channel means, and the locking key which extends through these holes has a retainer portion dimensioned so that it can pass through the hole in the inner wall but not through the holes in the bracket and the outer wall thereby restricting movement of the retainer portion between the bracket and the outer wall. Thus, the locking means is retained against inadvertent displacement. This form of the invention has a longer key and stroke of movement to facilitate disassembly of connected concrete forms.

Preferably, the channel means is a U-shaped channel member that is an aluminum extrusion, and wear plates are then located on the interior surface of each outer channel wall adjacent to the holes so that the forces exerted by the wedge and the retainer portion of the key will bear against the relatively harder metal of the wear plates rather than against the aluminum extrusion. The harder plates will also better absorb wear to which the channel wall would be subjected. The panel also has reinforcing members extending transversely across the panel and secured to the U-shaped channel members. The reinforcing members as well as the channel members are aluminum extrusions to provide light weight. The vertical edges of each flat panel adjacent to the holes in the U-shaped channel members are notched so that flat tie members can be positioned in the notches, and by virtue of holes that are provided in the flat tie members, the locking means can pass through the hole in the flat tie member for securing two parallel sets of concrete form apparatus together according to desired spacing and location.

By virtue of the construction and arrangement of the locking devices, they will be retained permanently in association with their panels thereby avoiding loss, and by virtue of the light weight and design of the U-shaped channel members and the support braces, a lightweight but strong panel assembly is provided.

Thus, it is an object of the present invention to provide an improved concrete form apparatus especially adapted for use in construction of high rise buildings.

Other objects of this invention will appear in the following description and appended claims, reference being had to the accompanying drawings forming a part of this specification wherein like reference characters designate corresponding parts in the several views.

BRIEF DESCRIPTION OF THE DRAWINGS.

FIG. 1 is a fragmentary front elevational view of a first and a second concrete form apparatus embodying one form of the present invention;

FIG. 2 is an enlarged section taken on the line 2—2 of FIG. 1;

FIG. 3 is an enlarged fragmentary section taken on the line 3—3 of FIG. 1, but omitting the locking means to illustrate more clearly the structures of the two abutting U-shaped panel members;

FIG. 4 is a fragmentary elevational view of a flat tie member;

FIG. 5 is an enlarged fragmentary view showing one embodiment of the locking means in its retracted position;

FIG. 6 is a view similar to FIG. 5, but showing the locking means turned 90° and advanced to its extended position;

FIG. 7 is a similar view showing the locking device after a lock wedge has been inserted in the slot formation for securing the two abutting panels together;

FIG. 8 is a fragmentary view similar to FIG. 5 but showing another embodiment of the locking means in a retracted position;

FIG. 9 is a fragmentary view similar to FIG. 8 showing the locking means in its extended position with a lock wedge inserted in the locking means; and

FIG. 10 is a fragmentary section taken on the line 10—10 of FIG. 9.

DESCRIPTION OF A PREFERRED EMBODIMENT.

Before explaining the present invention in detail, it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practiced or carried out in various ways. Also, it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation.

Referring to the drawings, the embodiment of the invention shown in FIGS. 1–7 will now be described in greater detail. A first concrete form apparatus **10** is shown in FIG. 1 secured together with a second concrete form apparatus **12.** These two units are constructed essentially the same, and only one will be described in detail. Each concrete form apparatus has a flat panel **14** that has on one side a flat surface against which concrete can be poured, and on the other side a U-shaped channel means **15** is provided which extends around and is located adjacent to the outer marginal edge of the panel. The channel means **15** includes connected U-shaped channel members, such as the members **16** and **17.** The U-shaped channel member **16** has a base **18** affixed to the other side of the panel **14** so as to open in a direction away from the panel, and it includes the inner channel wall **20** and the outer channel wall **22.** The channel walls **20** and **22** have holes **24** and **26** in registration at spaced longitudinal intervals, and several locking means **28** are positioned in the U-shaped channel member **16** at associated registered holes for transverse movement along the longitudinal axes of the locking means for movements between retracted and extended positions, such as can be seen best in FIGS. **5–7,** inclusive. When panels approximately 8 feet high are used, at least four locking means **28** will be provided.

Each locking means **28** is a locking key which comprises a cylindrical portion **30** at its axially inner end for sliding and rotational movement in the hole **24,** a flat bar **31** suitably secured thereto and defining a slot formation at its extended end **32** and a retainer portion **34** located in the U-shaped channel member **16** for restricting transverse movement of the key **28** between its retracted position shown in FIG. **5** and its extended position shown in FIGS. **6** or **7.** The extended end **32** has a projection **35** to prevent removal of the key when in its retracted position. Thus, it can be seen that the key, when assembled and in place within the channel member **16,** cannot be lost or displaced therefrom. The key **28** will be assembled, and the portion **30** and bar **31** will be secured together in the operative position shown in FIGS. **5–7.**

The key **28** can be turned **90** degrees about its axis from the position shown in FIG. **5** and thereafter it can be advanced to the position shown in FIG. **6,** after which the lock wedge **36** can be passed through the slot formation **32** and driven in place as shown in FIG. **7** to provide a tight clamping action between the retainer portion **34** and the lock wedge **36,** thereby holding the two U-shaped channel members **18** firmly together. When the lock wedge **36** is driven in place substantial forces are exerted against the outer channel wall **22** of each concrete form apparatus **10** and **12.** Preferably, the U-shaped channel members **18** are aluminum extrusions, and to reduce wear and prolong the lives of these parts, steel wear plates **38** are secured to the outer channel walls **22** by a plurality of suitably positioned rivets **40.**

The exterior surface of each of the outer channel walls **22** also is provided with notches **42** through which flat tie members **44** can be positioned, and the holes **46** thereof will be located in alignment with holes **24** and **26** so that the locking keys **28** will extend through them. The hole **48** at the other end of the flat tie member **44** will be similarly secured in place between two adjacent concrete form panels positioned in parallel relationship to the concrete form apparatus **10** and **12.** After concrete has been poured between the parallel panel assemblies and has set, the panel assemblies will be removed and positioned at a higher elevation, and then the end portions of the flat tie members **44** located outside the breakaway notches **50** can be broken off allowing the middle portion of the flat tie member **44** to remain embedded in the poured concrete.

The concrete form apparatus also includes transverse brace members **52** which are secured to said other side of the panel **14** and at their ends to the vertical U-shaped channel members **16.** The transverse brace members **52** are also aluminum extrusions and are shaped to provide maximum strength commensurate with their light weight. The U-shaped channel members similarly are extruded according to a shape which will give high strength commensurate with light weight. In this respect, it is to be noted that the base **18** has greater thickness adjacent to the inner channel wall **22** than adjacent to the outer channel wall **20** so that the channel members can better accommodate the bending movements to which they may be subjected in use.

Attention is next directed to FIGS. **8–10** for a more detailed description of a second embodiment of the locking means. In this form of the invention the locking means **54** comprises the locking key **56** which is a flat metal stamping formed from suitable sheet or bar stock and a bracket **58** that is secured to the inner wall **20** of the U-shaped channel member **59.** The locking key **56** when in its retracted position of FIG. **8** extends through aligned holes **60** and **62** in the U-shaped channel member **59** and through the hole **64** in the bracket **58,** and when its extended position also through the holes **66** and **68** in the U-shaped channel member **70.** The locking key **56** has in its extended end **72** a slot **74** for receiving the lock wedge **76.** It also has a retainer portion **78** which is dimensioned with respect to hole **60** so that it can pass through hole **60** but not through holes **62** and **64,** thereby retaining the locking key in channel

member 59. The locking key 56 is initially installed before the bracket 58 is secured to the channel member 59, thus being permanently attached to channel member 59.

The second embodiment of the invention has an added feature in that the length of the extended end 72 and the stroke of the locking key 56 is such that the extended end 72 can be struck by a hammer or similar tool at its remote end to move the locking key 56 from its extended position to its retracted position after the lock wedge 76 has been removed. Thus, this form of the invention facilitates rapid disassembly of the concrete form apparatus.

It is claimed:

1. Concrete form apparatus comprising a flat panel having on one side a surface against which concrete can be poured and on the other side a U-shaped channel means extending around and located adjacent to the marginal edges of the panel, said U-shaped channel means having a base affixed to said other side of said panel so that the channel means opens in a direction away from said panel and provides inner and outer channel walls, said channel walls having associated holes therein in axial alignment at spaced longitudinal intervals, and locking means positioned in said U-shaped channel means extending through associated aligned holes for transverse movement with respect to the channel means between retracted and extended positions, each said locking means being operable when in its extended position to provide an extended end which projects beyond the marginal edge so that each locking means can be locked in a hole of a channel means in a next adjacent concrete form apparatus, and each said locking means including a retainer portion extending cross-wise thereof and located for movement in said U-shaped channel means for abutment against said outer channel wall when the locking means is in said extended position and for operable abutment relative to said inner channel wall when the locking means is in its retracted position so as to preclude removal of said locking means from said U-shaped channel means.

2. The concrete form apparatus that is defined in claim 1, wherein each said locking means has a slot in its extended end for receiving a lock wedge.

3. The concrete form apparatus that is defined in claim 1, wherein said U-shaped channel means comprises an aluminum extrusion of U-shape, and wear plates of relatively harder metal secured at said holes to the interior surface of said outer channel wall.

4. The concrete form apparatus that is defined in claim 1, wherein said U-shaped channel means comprises an aluminum extrusion of U-shape, and said base is thicker at said inner channel wall than at said outer channel wall.

5. The concrete form apparatus that is defined in claim 1, wherein the exterior surface of said outer channel wall has notches formed therein in a direction perpendicular to said flat panel, said notches being located at the holes in the outer channel wall so that flat tie members each with a hole therein can be positioned at each of the holes in said outer channel wall and each associated locking means when in its extended position can pass through the hole of the flat tie member.

6. The concrete form apparatus that is defined in claim 1, wherein said U-shaped channel means includes U-shaped channel members mounted at each marginal edge of the flat panel and connected at their ends, and transverse brace members are mounted on the flat panel and are connected at their ends to said U-shaped channel means.

7. The concrete form apparatus that is defined in claim 6, wherein said U-shaped channel members and said transverse brace members are aluminum extrusions.

8. Concrete form apparatus comprising a flat panel having on one side a surface against which concrete can be poured and on the other side a U-shaped channel means extending around and located adjacent to the marginal edges of the panel, said U-shaped channel means having a base affixed to said other side of said panel so that the channel means opens in a direction away from said panel and provides inner and outer channel walls, said channel walls having associated holes therein in axial alignment at spaced longitudinal intervals, and locking means positioned in said U-shaped channel means extending through associated aligned holes for transverse movement with respect to the channel means between retracted and extended positions, each said locking means being operable when in its extended position to provide an extended end which projects beyond the marginal edge so that each locking means can be locked in a hole of a channel means in a next adjacent concrete form apparatus, each said locking means being a locking key that includes (1) a cylindrical portion at its inner end for sliding and rotational movement in the hole in the inner channel wall, (2) a slot formation at its extended end for receiving a lock wedge, and (3) a retainer portion located in said U-shaped channel means for abutment with said channel walls thereby restricting transverse movement of the key between said retracted and extended positions so as to avoid inadvertent displacement of the locking key from the U-shaped channel means.

9. Concrete form apparatus comprising a flat panel having on one side a surface against which concrete can be poured and on the other side a U-shaped channel means extending around and located adjacent to the marginal edges of the panel, said U-shaped channel means having a base affixed to said other side of said panel so that the channel means opens in a direction away from said panel and provides inner and outer channel walls, said channel walls having associated holes therein in axial alignment at spaced longitudinal intervals, and locking means positioned in said U-shaped channel means extending through associated aligned holes for transverse movement with respect to the channel means between retracted and extended positions, each said locking means being operable when in its extended position to provide an extended end which projects beyond the marginal edge so that each locking means can be locked in a hole of a channel means in a next adjacent concrete form apparatus, said locking means including a locking key that has a slot in said extended end for receiving a locking wedge when the locking key is in its extended position, said locking key having a retainer portion for abutment against the channel means to limit the extent of projection of the locking key beyond said marginal edge, and a bracket mounted on the exterior side of said inner wall and having a hole in alignment with the holes in said channel means through which said locking key extends, said hole being limited in size so that said retainer portion will abut against the bracket when the locking key is in

its retracted position so as to avoid inadvertent displacement of the locking key from the U-shaped channel means.

10. The concrete form apparatus that is defined in claim **9**, wherein said channel means includes an extruded U-shaped channel member which defines said base and inner and outer channel walls, and wear plates of relatively harder metal secured to the interior surface of said outer channel wall at said holes.

11. In combination, a first concrete form apparatus comprising a vertical flat panel having on one side a flat surface and on the other side a U-shaped channel member located adjacent to the vertical marginal edge of the panel, said U-shaped channel member having a base affixed to said other side of said panel so that the channel member opens in a direction away from said panel and provides inner and outer channel walls, said channel walls having holes therein at spaced longitudinal intervals, the holes in one channel wall being in alignment with associated holes in the other channel wall, and locking keys positioned in said U-shaped channel member at associated aligned holes for transverse movement between retracted and extended positions, each key having portions adapted for sliding movement in the associated holes in the channel walls and a retainer portion extending cross-wise between said portions, said retainer portion being adapted to abut against one or the other of said channel walls so as to restrict transverse movement of the key between retracted and extended positions, the outer end portion of each key having a slot formation for receiving a lock wedge and a second concrete form apparatus constructed the same as said first concrete form apparatus and positioned with its flat panel in the same plane as that of the flat panel of said first concrete form apparatus with a vertical marginal edge in abutment with said vertical marginal edge of the first-named panel, said extended end of each key passing through the corresponding hole of the U-shaped channel member of the second concrete form apparatus, and a lock wedge press-fitted into each said slot formation so as to secure the first and second concrete form apparatus together.

12. The combination that is defined in claim **9**, wherein said vertical marginal edges have notches therein at said holes in the outer channel walls, and a flat tie member passes through the associated locking key passes.

* * * * *