Dec. 14, 1965 S. KIMBALL 3,222,750

INTERMITTENT VERTICAL SLIDING FORM PANEL DEVICE

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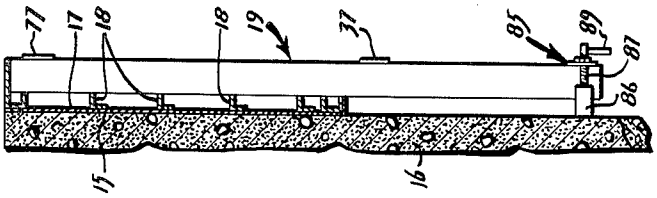


FIG. 2

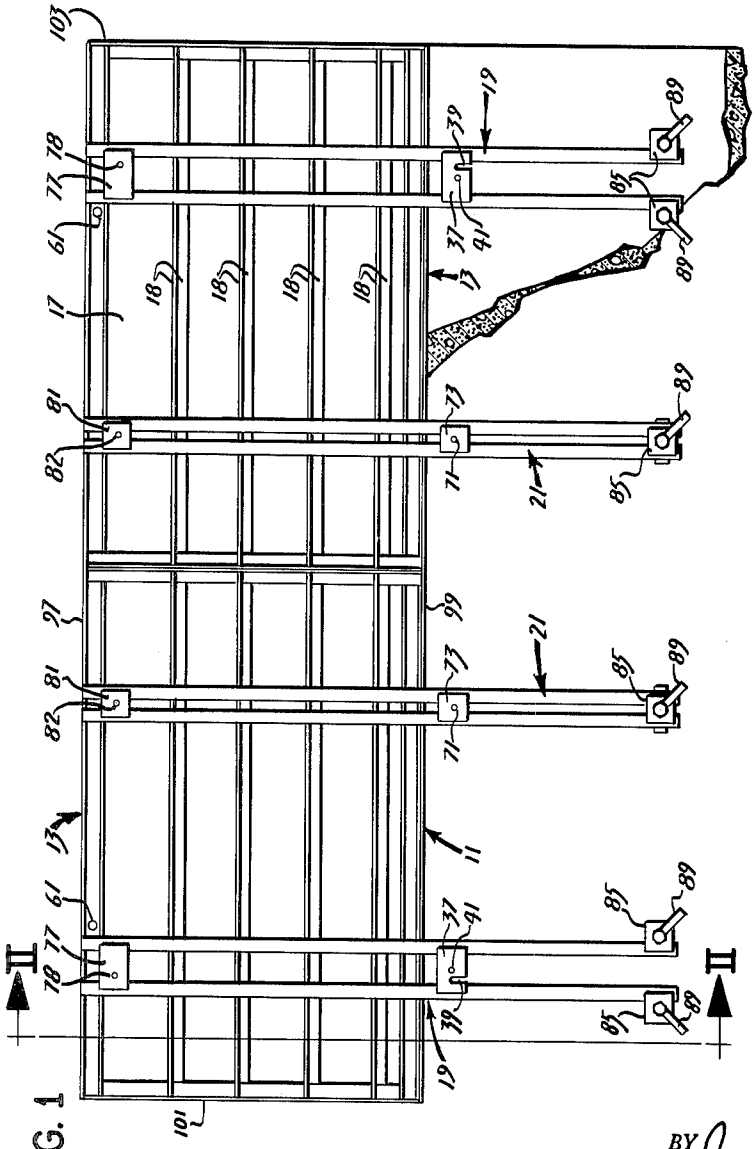


FIG. 1

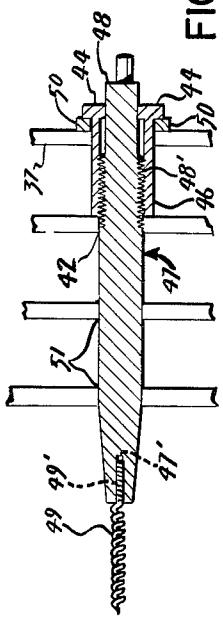


FIG. 6

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INTERMITTENT VERTICAL SLIDING FORM PANEL DEVICE

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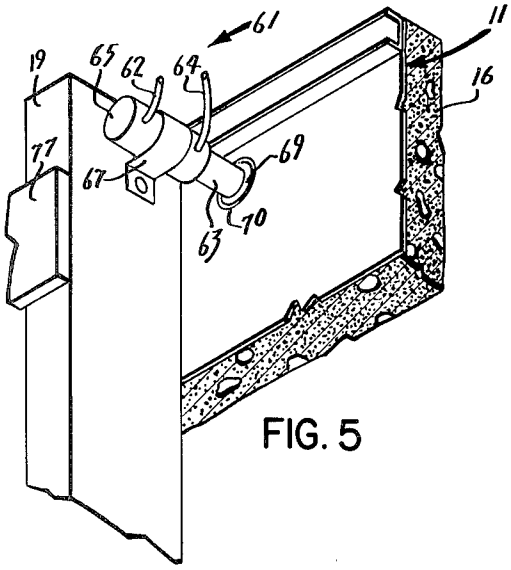


FIG. 5

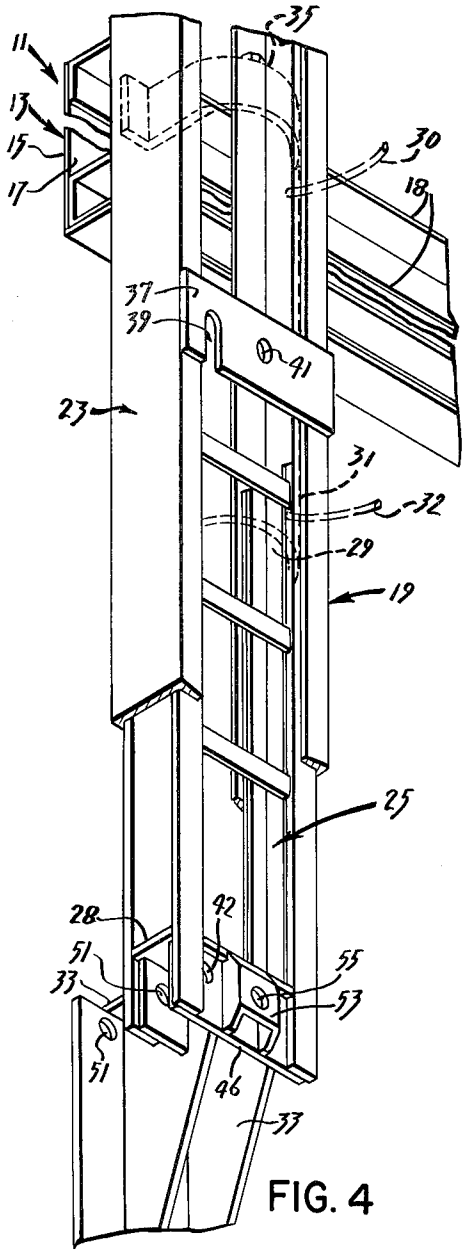


FIG. 4

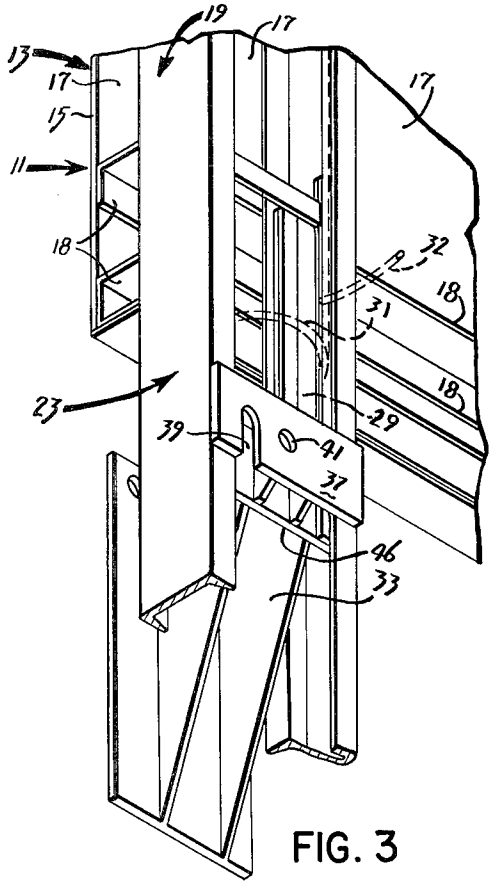


FIG. 3

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FIG. 7

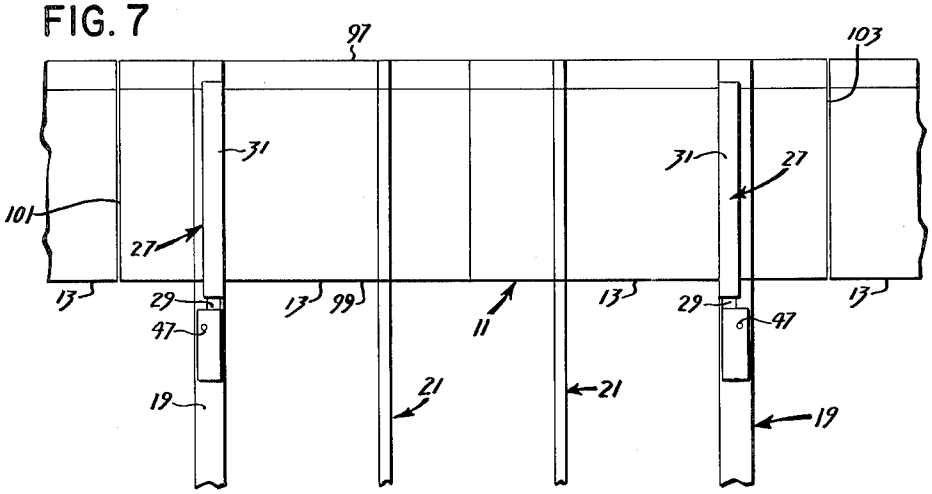
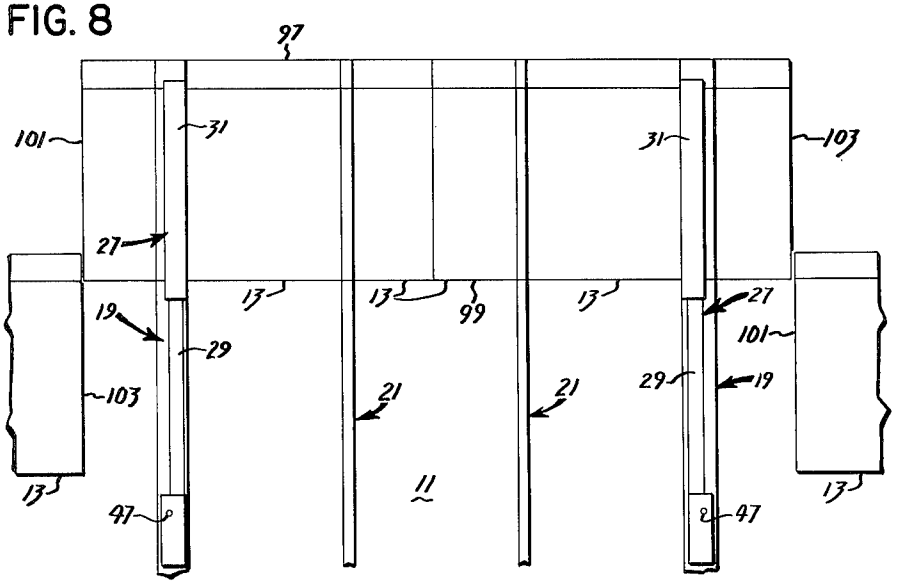


FIG. 8



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FIG. 9

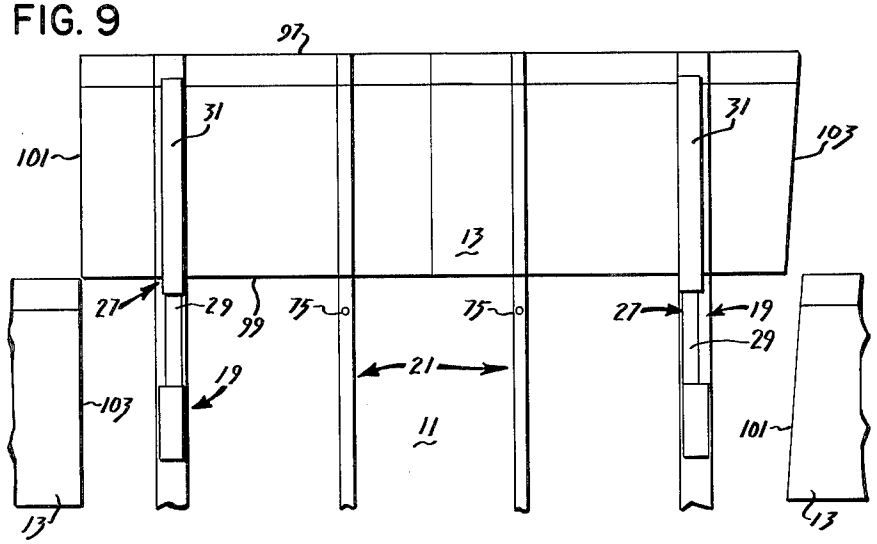
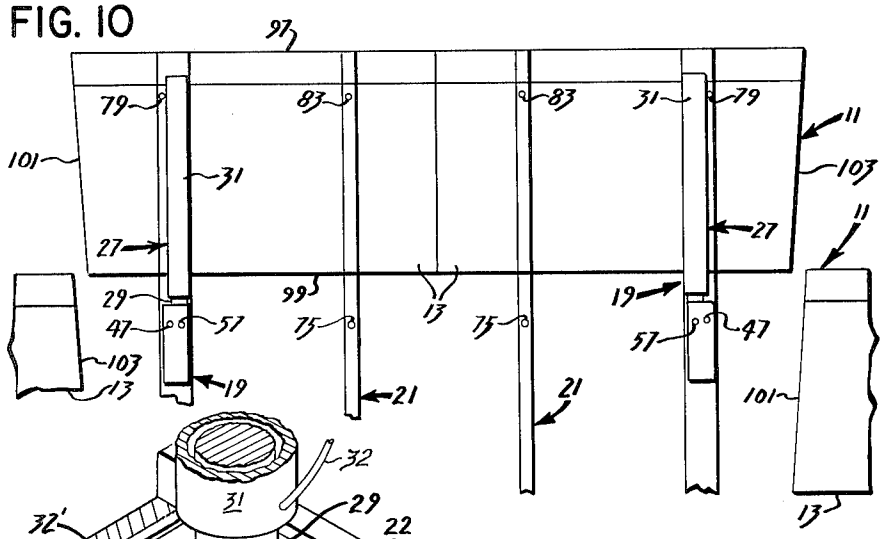


FIG. 10



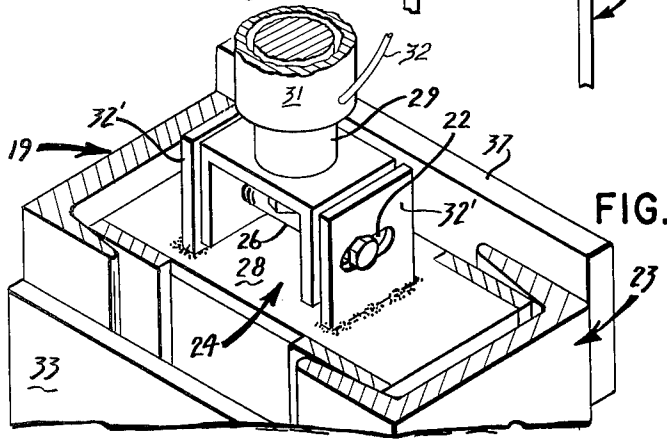


FIG. 11

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3,222,750

INTERMITTENT VERTICAL SLIDING FORM PANEL DEVICE

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Filed Aug. 21, 1961, Ser. No. 132,750
9 Claims. (Cl. 25—131)

This invention relates to a form for use when pouring concrete and the like. More particularly it is concerned with a form panel arrangement or device which is self-supporting and which may be placed and anchored in different positions without the use of additional lifting apparatus, such as hoists, cranes, A-frames, etc.

Accordingly, it is a primary purpose of the instant invention to provide an improved self-supporting and self-adjusting form panel device for use in pouring various kinds of concrete structures.

Other purposes and advantages of the invention will be more apparent from a review of the following detailed description, when taken in conjunction with the accompanying drawings, throughout which like reference characters indicate like parts, and wherein:

FIG. 1 is a rear elevational view of a form panel device made in accordance with one embodiment of this invention with a portion thereof anchored to a concrete structure;

FIG. 2 is a side sectional view of the form panel device shown in FIG. 1 when taken along line II—II thereof;

FIG. 3 is a fragmentary perspective view, with parts removed and with other parts being shown in dotted lines, of a portion of a first panel structure support unit in a substantially fully retracted position;

FIG. 4 is another fragmentary perspective view, with parts removed and with other parts being shown in dotted lines, of a first panel structure support unit, similar to that shown in FIG. 3, when in an extended position;

FIG. 5 is a fragmentary perspective view of the panel structure and discloses a piston and cylinder device which is operable to separate the form panel device from a section of previously poured and at least partially set concrete;

FIG. 6 is a fragmentary sectional view of a suitable anchor means used to anchor various portions of the form panel apparatus or device to the concrete structure with which the device is being used;

FIGS. 7, 8, 9 and 10 are schematic views disclosing the various positions assumed by the form panel structure during its use; and

FIG. 11 is another fragmentary view with parts removed of a first panel support unit and discloses the manner in which a hoisting piston and cylinder assembly is affixed thereto.

In FIGS. 1 and 2 there is shown a form panel structure 11 constructed in accordance with one embodiment of the invention. The panel structure 11 includes one or more usually elongated panel elements 13, each of which has a front face portion 15 against which the concrete 16 is placed or rests upon pouring. The panel element 13 also has a rear face portion 17 provided with stiffeners 18 suitably affixed thereto. At least one first panel support unit 19 and at least one second panel support unit 21 are attached to the stiffeners 18 and thereby to the structure 11.

A first panel support unit 19 is shown in somewhat more detail in FIGS. 3, 4 and 11. Unit 19 includes telescoping outer and inner sections or assemblies 23 and 25 respectively. The outer assembly 23 and the inner assembly 25 are shown in a retracted position in FIG. 3

and in an extended position in FIG. 4. Panel support unit 19 includes a first fluid-operated means 27 such as a pneumatically or hydraulically operated piston member 29 and a cylinder barrel 31. As shown in FIG. 11 the rod end of the piston member 29 can be advantageously affixed by means of a clevis pin arrangement 24 to a bottom thrust plate 28 which is part of a bottom thrust unit or support 33 attached to the inner assembly 25. The clevis pin arrangement 24 includes a pin 26 removably fitted or journalled in openings 22 in the mounting plate 32' of the clevis pin arrangement 24. The openings 22 are elongated so that the panel elements 13 can move relative to the fluid-operated means 27 when the panel elements 13 are broken away and separated from the concrete 16 as discussed more fully herein.

The cylinder barrel 31 is suitably secured to a top thrust member or collar 35 which in turn is attached to the outer assembly 23. The cylinder barrel 31 includes ports (not shown) connected to fluid lines 30 and 32. When these lines are connected to their respective ports in a manner well-known in the art, they allow fluid to enter or leave the cylinder barrel 31 so as to extend or retract the fluid-operated means 27 as desired. Specifically, when the piston 29 and cylinder barrel 31 are in the retracted position, as shown in FIG. 3, if fluid is forced into the port connected to fluid line 30 and ejected from the port connected to fluid line 32, the piston rod will be ejected from barrel 31 and cause the inner and outer assemblies 25, 23 to assume an extended position as shown in FIG. 4. Conversely if fluid is forced into line 32 and ejected through line 30 the piston 29 will be retracted further into the cylinder barrel 31 and cause the inner and outer assemblies 25, 23 to telescope and assume the retracted position, as shown in FIG. 3.

Also indicated in FIGS. 1–4 outer assembly 23 is provided with an outer assembly anchor plate member 37. Anchor plate member 37 has a first slotted opening 39 and a second opening 41. Opening 39 is alignable with openings 42 and 51 in the lower extremity of the inner assembly 25 such that a portion of a first concrete anchor means 47 can removably pass through the openings 39 and the openings 42, 51 in the inner assembly 25. When the anchor means 47 is inserted in the aligned openings, the inner assembly 25 and the outer assembly 23 and, in turn, the first panel support unit 19 are anchored to the concrete into which at least a portion of the first anchor means 47 is embedded as will be discussed in more detail below.

The second opening 41 of the outer assembly anchor plate member 37 is alignable with the opening 55 in an attachment member 53 affixed to the lower extremity of inner assembly 25. Suitable attachment means such as anchor bolts 57 can be removably inserted in openings 41 and 55 to lock the outer assembly anchor plate member 37 with respect to the attachment member 53 and in turn the outer assembly 23 to the inner assembly 25 during certain retracted positions of the inner assembly 25. It should be noted as indicated particularly in FIGS. 3 and 4, that the opening 39 in the outer assembly anchor plate member 37 is advantageously in the form of an open-ended slot. This permits the outer assembly anchor plate member 37 and, in turn, the outer assembly 23 to move into the extended position without removing the first anchor means 47 from the openings 42, 51 and while the first anchor means 47 still supports the inner assembly 25 in the concrete structure.

When the fluid-operated means 27 is actuated and the appropriate anchor means are released, as will be discussed more fully hereinafter, the outer assembly 23 can be moved with respect to the inner assembly 25 and into the extended position, as shown in FIG. 4. This, in turn, will effect movement of the panel structure 11 into a

new position if the inner assembly **25** is anchored firmly such as to the concrete structure. On the other hand, if the panel structure **11** itself is anchored firmly in its raised position by a second anchor means **75** associated with support unit **21**, the first anchor means **47** associated with support unit **19** having been previously removed, and the fluid-operated means **27** is energized, the inner assembly **25** will retract into the outer assembly **23** and draw the bottom thrust member upwardly as indicated in FIG. 3.

In FIG. 5 there is shown a second fluid-operated means **61** comprised of a piston **63** and a cylinder barrel **65** for use in breaking the seal between the panel elements **13** of the structure **11** and the concrete structure with which the structure **11** is used when it is desired to separate the panel structure **11** from the concrete. As shown in FIG. 5, the cylinder barrel **65** is affixed to the first panel support unit **19** by a collar **67**, while the rod end of piston member **63** acts as or may be affixed to, an inner thrust member **69** that is adapted to be fitted in a hole **70** in a panel element **13**. The cylinder barrel **65** includes fluid port means which, upon being connected to suitable fluid lines **62** and **64** in a manner well-known in the art, allow fluid to enter or leave the cylinder barrel **65** so as to extend or retract the fluid-operated means **61** as desired in a manner similar to that discussed above in connection with the first fluid-operated means **27**. When the concrete is at least partially set, the second fluid-operated means **61** is actuated. The pressure exerted by the free end of piston **69** will be resisted by the partially set concrete. The pressure exerted by piston **69** will effect at least a partial separation or breaking away of the panel structure **11** from the concrete **16**. Where necessary, the separation of the panel structure **11** from the concrete **16** may be fully completed by wedges or the like driven in between the concrete and various parts of the panel structure **11**.

As indicated in FIG. 1 panel structure **11** is provided with a second panel support unit **21** which, unlike the first panel suport unit **19**, is a fixed, inextensible structure. The second panel support unit **21** includes a second anchor plate member **73** provided with an opening **71** for removably receiving a portion of a second anchor means **75** similar to first anchor means **47**. A preliminary first anchor plate **77** is affixed to the upper extremity of first panel support unit **19**. Plate **77** is provided with an opening **78** which is adapted to receive a preliminary first anchor means **79**. A preliminary second anchor plate **81** is affixed to the upper extremity of second panel support unit **21**. Plate **81** is provided with an opening **82**. Opening **82** is also adapted to receive a portion of a preliminary second anchor means **83**. It is to be understood that the preliminary first and preliminary second anchor means **79**, **83** are also similar in structure to first anchor means **47**.

At the bottom of the panel support units **19** and **21** are shown adjusting means **85**, including pressure screw members **87** and handles **89**, the operation of which will be discussed below.

The first anchor means **47** will now be described. Since anchor means, **75**, **79**, **83** and **47** are of similar construction a description of anchor means **47** will suffice for all. As indicated in FIG. 6 anchor means **47** generally includes an insert **49** adapted to be embedded in the concrete, as well as a removable fitting **48** provided, adjacent its outer extremity, with an exteriorly threaded portion **48'**. In one embodiment of this invention, insert **49** which protrudes from fitting **48** can be made of metal and have a helical configuration which may be referred to as a pigtail insert **49**. Insert **49** is provided at one end thereof with an externally threaded portion **49'** which is removably inserted in the internally threaded bore **47'** of the fittting **48**. Upon pouring of the concrete, it is contemplated that these pigtail inserts **49** will be embedded therein and provide an excellent anchor for the anchor means **47** when the concrete has set.

The fitting **48** is adapted to be removaby inserted through the openings **39**, **42** and **51** in outer and inner assemblies **23** and **25** and thrust unit **33**, and affixed to the pigtail insert **49** by screwing the externally threaded portion **49'** of the pigtail insert **49** into the internally threaded bore **47'** of fitting **48**. When desired, the fitting **48** can be readily detached from the pigtail insert **49** and removed from the openings **39**, **42** and **51**.

It may be desirable, particularly for use with the first anchor means **47** and the preliminary first anchor means **79**, to use a sleeve nut **44** having an insert portion **46** which passes through the first opening **39** of the first anchor plate member **37** and rests against the internal plate **42** adjacent the opening **51**. A washer **50** may also be used adjacent the first anchor plate member **37**. Before the panel elements **13** are raised, the nut **44** can be very slightly loosened so there will be no friction between the nut **44**, the washer **50** and the face of the first anchor plate member **37**. The insert portion **46** provides a snug fit in the first opening **39** until the first anchor plate member **37** is raised, which is done with a minimum of friction.

The operation of this invention is shown schematically in FIGS. 7, 8, 9 and 10 wherein a complete operational cycle is shown. It should be understood, of course, that the cycle may be started or interrupted at any portion of the cycle as is required by a particular installation condition or job need. For purposes of description, however, the operation will be described in the order of the figures of the drawings. The openings for the various anchor means, **47**, **75**, **79** and **83**, etc., have also not been shown in detail. In FIG. 7, the anchor bolt means **57** and the removable portions or fittings **48** of anchor means **79**, **83** and **75** have been removed so that the entire panel structure **11** is supported by the first anchor means **47** in the first panel support units **19**. In this particular embodiment, as can be seen, there are two first panel support units **19** and two second panel support units **21** used with each panel structure **11**. It is to be understood, of course, that the number of the support units **19** and **21** can be varied to fit the particular form panel structure **11** that is used. It is assumed that the portion of the concrete structure which rests against the face portion **15** on the panel sructure **11** has been at least partially set at this point in the operation.

The piston and cylinder means **61** is actuated so that a portion of the panel structure **11** such as the top thereof is broken loose from the concrete. Once the top of the panel structure **11** has separated from the concrete, the remainder of the panel structure **11** is ordinarily self-separating. Next, the two piston and cylinder assemblies **27** are simultaneously actuated and synchronized by injecting fluid into the two cylinder barrels **31** through lines **30** and ejecting fluid from lines **32** as to place the extensible portion of the first panel support unit **19** in the extended position. That is, the outer assemblies **23** and the inner assemblies **25** are moved in telescoping or longitudinal relationship to each other in such a manner as to raise the panel structure **11** to its new position as shown in FIG. 8. At this time, the removable portions **48** of the two anchor means **75** are inserted in the openings **71** of the two anchor plate members **73** as indicated in FIG. 9 and attached to the previously embedded portions **49** of the anchor means **75**.

The removable portions or fitting **48** of the two anchor means **47** are then withdrawn from openings **51** in the inner assemblies **25** and removed from the panel support units **19** so that the panel structure **11** is supported only by the second anchor means **75**. Next the piston and cylinder assemblies **27** are again actuated by simultaneously injecting fluid into lines **32** and exhausting fluid out of lines **30** in order to bring the extensible portion of the first support panel unit **19** into its retracted position as shown in FIG. 3. FIG. 9 indicates the extensible portion in the act of being retracted.

The outer assembly anchor plate member 37 is positioned so that the opening 39 is aligned with the openings 42 and 51 while the second opening 41 is aligned with the attachment member opening 55. At this point, the removable portion 48 of the first anchor means 47 is inserted into the openings 39, 42 and 51 and attached to a previously embedded insert 49. The attachment means 57 is then inserted in the opening 55 and tightened.

Next, anchor means 79 is inserted in the opening 78 of the anchor plate 77 while the second anchor means 83 is inserted in the opening 82 of the anchor plate 81 as indicated in FIG. 10.

If necessary, the panel structure 11 may be adjusted slightly by means of the adjusting screw means 85 located at the bottom of the first panel support unit 19 and the second panel support unit 21 all as shown in FIGS. 1 and 2. Adjusting screw means 85 advantageously include a screw member 87 which is affixed to a thrust member 86. A handle 89 is adaptable to turn the screw member 87 and move the thrust member 86, which bears against the concrete structure, so as to force the first and second panel support units 19 and 21 slightly away from or toward the concrete in the vicinity of the adjusting means 85, depending upon the way in which it is motivated, in order to vary the angle of inclination of the panel structure 11 whereby it will assume the proper position for later pouring of concrete.

After the panel structure 11 is properly adjusted and aligned, the concrete is then poured and allowed to harden or set to the desired extent. At such time, the removable, non-embedded portions of the anchor means 79 and 83, the removable, non-embedded portions of the anchor means 75 and the attachment means 57 are removed with the only support for the panel structure 11 being the first anchor means 47. Then the cycle may be repeated as often as necessary.

It should be noted that this invention allows panels to be used which are self-supporting and self-adjustable. They do not require any additional apparatus, such as hoists, cranes, etc., to change their position. Panel structures 11 constructed in accordance with this invention may be used more quickly and cheaply than prior art panels. Only small crews are required to use such panels. Portions of the first and second anchor means 47 and 75 are embedded only in the immediately previous concrete pour. It is not necessary to embed any anchor means in earlier pours. All of the piston and cylinder assemblies 27 and 61 can be conveniently operated by solenoid-operated valves well-known in the art and controlled by an operator located remote from the panel structure itself. If a number of panels are used, the one operator may control the raising and positioning of all of them.

In the particular embodiments shown, the panel structure 11 has an upper edge 97 and a lower edge 99 substantially parallel to the upper edge 97. Also, the panel structure 11 has two side edges 101, 103, which, if desired, can be normal to the upper and lower edges 97, 99 and parallel to each other giving a rectangular configuration to the panel structure 11. This rectangular configuration is depicted in FIGS. 7 and 8. On occasion, it may be desirable to have one side edge 103 of the panel structure 11 at a small angle of up to about 3° with respect to the normal to the upper and lower edges 91, 93 as indicated in FIG. 9. In other circumstances, it may be desirable that the side edges 101, 103 be at small (up to about 3°) equal but opposite angles to the normal to the upper and lower edges 97, 99, thereby giving the panel structure 11 a trapezoidal configuration, as shown particularly in FIG. 10. Thus, when a number of panel structures 11 are used in side by side relationship and the panel structures 11 have at least one side edge at a slight angle with respect to the normal to the upper and lower edges 91, 93, the appropriate panel structures 11, upon raising and lowering, will fit neatly together with a minimum of adjustment.

Each panel structure 11, moreover, has a pair of first panel support units 19 substantially normal to the upper and lower edges 97, 99 of the panel member 13, and a pair of second panel support units 21 positioned between and substantially parallel to the first panel support units 19.

The panel structures 11 may be made of any suitable material, such as steel or other metals, plywood or on occasion have facings made of these materials. The panel structures 11 may, in addition, be set at any angle with respect to the vertical depending upon the slope desired for the concrete material.

While the present invention has been shown in a few forms only, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the spirit and scope thereof as set forth in the appended claims, wherein

What is claimed is:

1. A form panel device for use in pouring concrete, including a panel structure having a front face portion and a rear face portion, at least one first panel support unit attached to the said rear face portion of said panel structure and adapted to both position said panel structure for the pouring of concrete and support such structure during pouring, said first panel support unit including an extensible portion comprising outer and inner telescoping assemblies, said outer assembly being directly affixed to the panel structure and said inner assembly being adapted to be removably affixed to a mass of concrete, fluid-operated means connecting said outer and inner assemblies, said fluid-operated means being operable to move said outer assembly relative to said inner assembly and said mass of concrete when said inner assembly is removably affixed to and is supported by said mass of concrete, at least one second panel support unit attached to the rear face portion of said panel structure, said second panel support unit having a non-extensible structure and being adapted to be removably affixed to the mass of concrete when the fluid-operated means is non-operative for effecting relative movement of the assemblies of said first support unit.

2. A form panel device according to claim 1 wherein said form panel structure is provided with a second fluid-operated means, said second fluid-operated means being connected to said form panel device and operable against said concrete so as to move said panel support unit and said panel structure a predetermined distance away from the mass of concrete which lies against said panel structure after said mass of concrete is at least partially set so as to break the seal between mass of concrete and said form panel device.

3. A form panel device according to claim 2 wherein said second fluid-operated means comprises a cylinder and piston, the free end of said piston being adapted to engage the concrete and the cylinder being connected to said panel structure.

4. A form panel device according to claim 1 wherein said panel structure includes an upper edge, a lower edge substantially parallel thereto and two side edges, a pair of first panel support units attached to the rear face portion of said panel structure and adjacent said side edges and said support units being substantially normal to said upper and said lower edges and a pair of second panel support units attached to the rear face portion of said panel structure and intermediate said first panel support units and said second panel support units also substantially parallel to said first panel support units.

5. A form panel device according to claim 4 wherein one of said side edges is at a small angle with respect to the normal to said upper and said lower edges of said panel structure.

6. A form panel device according to claim 4 wherein said side edges are at substantially equal and opposite small angles with respect to the normal to said upper and said lower edges, thereby giving said panel member a trapezoidal configuration.

7. A form panel device for use in pouring concrete, including a panel structure having a front face portion and a rear face portion, at least one first panel support unit attached to the rear face portion of said panel structure and adapted to both position said panel structure for the pouring of concrete and support such structure during pouring, said first panel support unit including an extensible portion comprising outer and inner telescoping assemblies, said outer assembly being directly affixed to the panel structure and said inner assembly being adapted to be removably affixed to a mass of concrete, fluid-operated means connecting said outer and inner assemblies, said fluid-operated means being operable to move said outer assembly relative to said inner assembly and said mass of concrete when said inner assembly is removably affixed to and is supported by said mass of concrete, said outer assembly including an anchor plate member provided with an opening, said inner assembly being provided with at least one opening adapted to be aligned with said anchor plate member opening, a first anchor means being partially embedded in concrete and said openings being adapted to be aligned so that said first anchor means may pass through said openings and provide support for said panel support unit, at least one second panel support unit attached to the rear face portion of said panel structure, said second panel support unit having a non-extensible structure and being adapted to be removably affixed to the mass of concrete when the fluid operated means is non-operative for effecting relative movement of the telescoping assemblies of said first support unit.

8. A form panel device according to claim 7 wherein said opening in said outer assembly anchor plate member is in the shape of an open-ended slot whereby said outer assembly anchor plate member and, in turn, said outer assembly can be moved in one direction with respect to said inner assembly and out of contact with said first anchor means while said first anchor means continues to pass through said inner assembly opening and continues to contact said inner assembly and provide support for said panel support unit.

9. In combination with a form panel structure for use in pouring concrete, a panel support unit rigidly affixed to said structure and adapted to both position said panel

structure for the pouring of concrete and support such structure during pouring, said unit including outer and inner telescoping assemblies, said outer assembly being directly affixed to said panel structure and said inner assembly being adapted to be removably affixed to a mass of concrete, means for removably affixing said inner assembly to said concrete, fluid-operated means connecting said outer and inner assemblies and being operable to move said outer assembly relative to said inner assembly and said mass of concrete, said outer assembly including an anchor plate member provided with an opening in the shape of an open-ended slot, said inner assembly being provided with at least one opening adapted to be aligned with said anchor plate member opening, said means for removably affixing said inner assembly to said concrete including a first anchor means certain portions of which are carried by said inner assembly and other portions of which are partially embedded in concrete, said openings being adapted to be aligned so that said first anchor means may pass through said openings and provide support for said panel support unit, said outer assembly anchor plate member and, in turn, said outer assembly being adapted to be moved with respect to said inner assembly while said first anchor means continues to pass through said inner assembly opening and continues to provide support for said panel support unit.

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