

Nov. 28, 1961

D. O. McCALL
MOLD FOR CONCRETE OBJECTS

3,010,174

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2 Sheets-Sheet 1

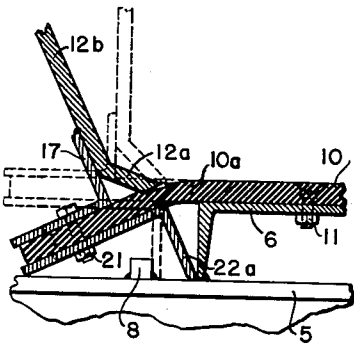


FIG. 3

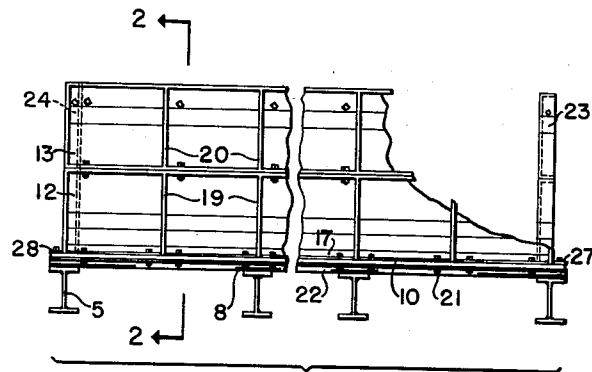


FIG. 1

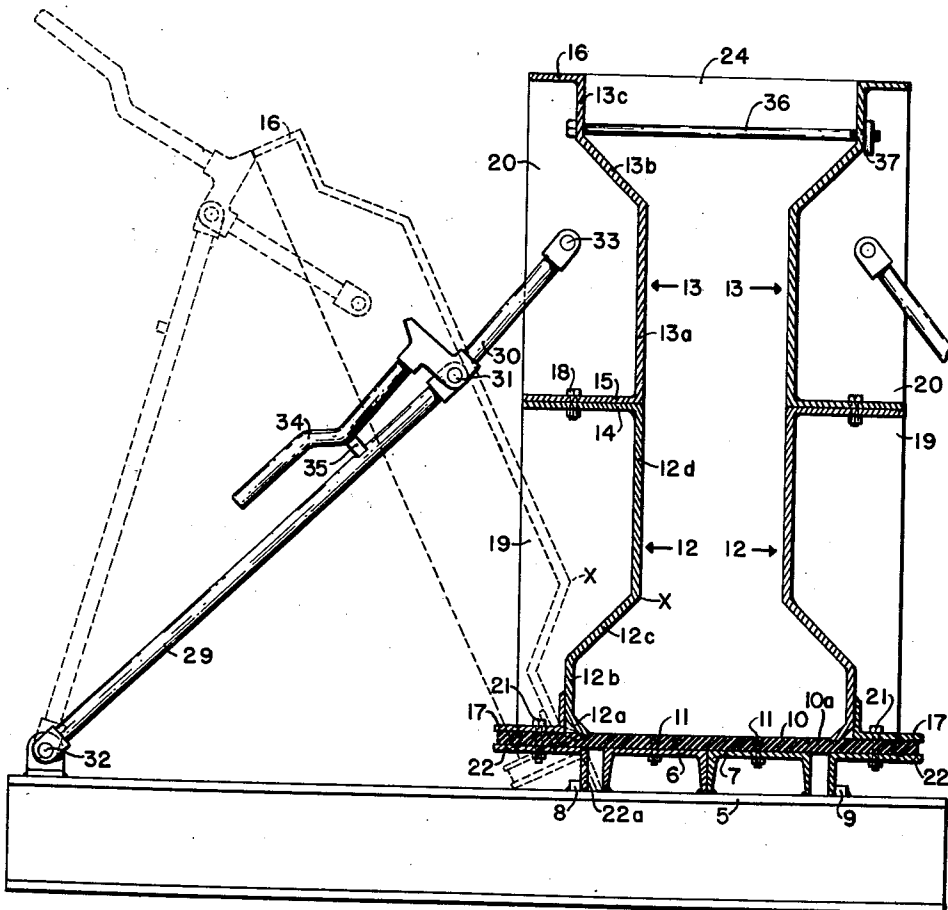


FIG. 2

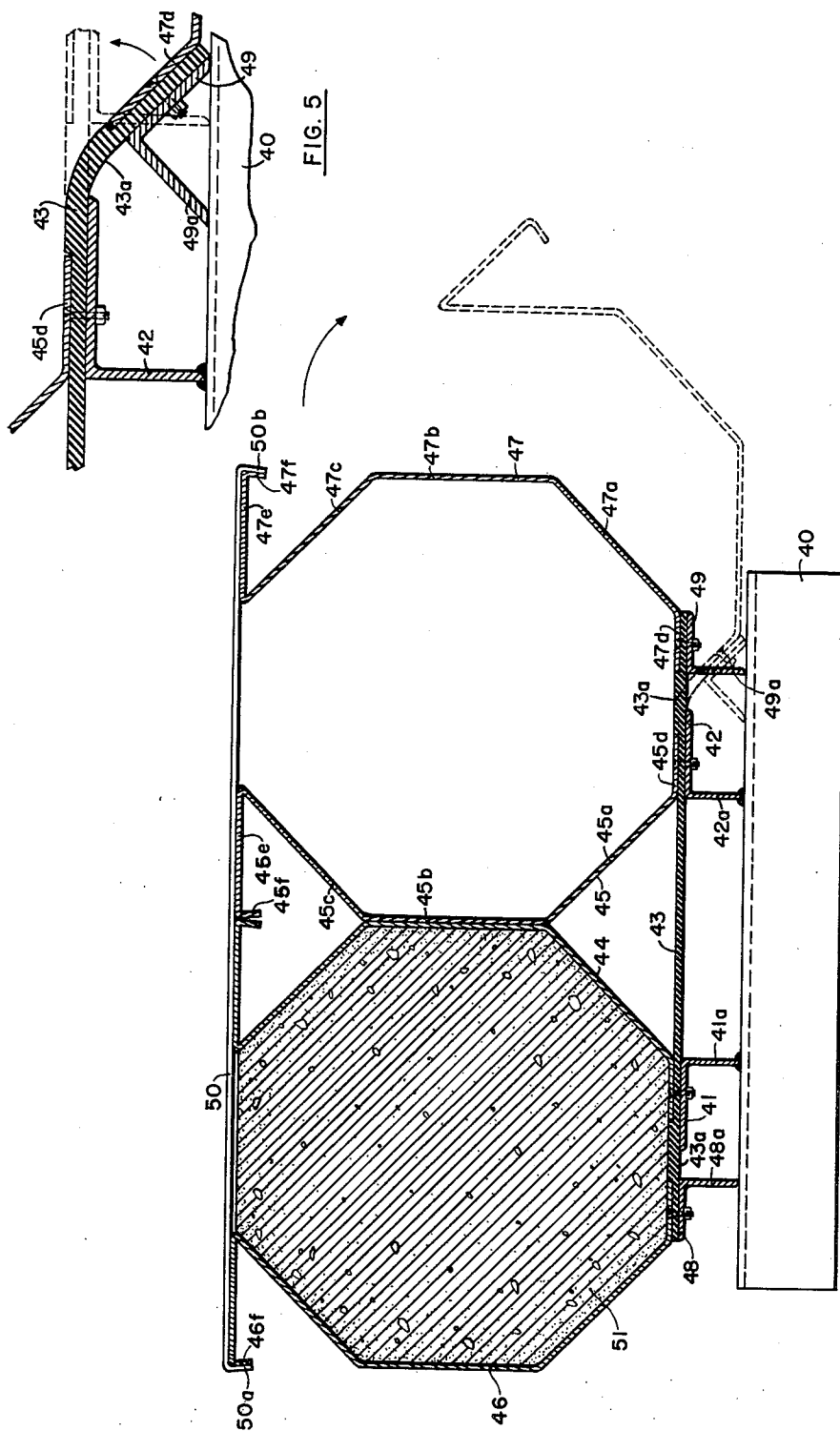
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15 Claims. (Cl. 25—121)

This is a continuation-in-part of my application Serial No. 762,371, filed September 22, 1958, now abandoned.

The invention relates to molds for casting concrete objects, said molds having at least one side wall which is movable relatively to the mold floor. The invention is especially but not exclusively applicable to casting elongated objects which have indented or narrowed portions lying farther above the mold floor than other, relatively wider or non-indented portions thereof, wherefore it is necessary to move at least one side wall away from the hardened cast object to permit the latter to be lifted from the mold. Among the cast objects which can be formed in such a mold are concrete I-beams or girders, channels, and polygonal beams or columns having bevelled or chamfered corners.

Two problems encountered with known molds which have displaceable side walls are the difficulty of achieving a water-tight seal along the bottom of the movable side wall and the inconvenience of installing and removing the side wall. Removal of the mold side wall or at least substantial separation thereof from the cast object while the latter rests on the mold floor is often desirable and is necessary whenever the cast concrete object has narrowed parts, such as chamfered faces, grooves, or indentations engaged by projections on the side wall, as is the case with concrete objects as indicated above.

When the side wall is not sealed effectively to the mold floor, liquid seeps out after the wet concrete is poured, carrying with it cement and fine aggregate, whereby some of the coarser aggregate is exposed and the hardened object presents an uneven surface; this gives it a displeasing appearance and may, in some instances, weaken the object.

Mounting and removing the side wall are obviously time-consuming operations. Prior attempts to obviate these operations were not practicable in all applications. Among prior proposals is the use of a resilient mold floor to which the side walls are fixed permanently and which can be flexed to spring the side walls apart; see U.S. patent to Moore, No. 1,140,840. Such an arrangement presents difficulties when working with large objects of considerable weight and/or when the mold side wall has deep projections and must, therefore, be moved a considerable distance to permit withdrawal of the cast object. These difficulties pertain to the support of the cast object and particularly of the heavy wet concrete and the limited flexure possible in a resilient mold floor if sharp bends and consequent structural failure are to be avoided. Moreover, only a limited flexure of such a resilient floor is in practice attainable and a large force is required to pull the side wall out from the cast object when the floor is of sufficient thickness to sustain the concrete.

It is an object of the invention to provide an improved mold for concrete objects wherein the mold side wall or walls is (are) readily sealed to the mold floor and yet easily moved, whereby seepage of moisture along the joint is avoided and a cast object of improved appearance and durability can be cast.

Another object is to provide a mold wherein one or both side walls can be swung laterally outward with little force and through a large arc, sufficient to cause the lateral inward projections on the inner face of the wall or walls to clear the vertical plane or planes through the widest part(s) of the cast object.

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A further object is to provide an improved mold having a movable side wall sealed to the mold floor which can be rapidly and simply operated, and wherein the wet concrete within the mold is afforded good support. Ancillary thereto, it is an object to provide good support for the hardened object while the side wall is swung outward to permit removal of the object from the mold.

Still further objects will become apparent from the following description.

In summary, the concrete mold according to the invention includes a floor which is formed at least in part of pliant material, such as rubberized fabric, particularly rubber belting, said floor having an inner support for the cast object, and the mold side wall is fixed to a marginal part of the pliant material in sealed relation and spaced laterally from said inner support. By thus leaving a strip of the pliant material between the inner support and the side wall free for flexure, the side wall can be swung outward to permit facile withdrawal of the cast object. According to various embodiments, either one or both of the side walls is movably attached.

According to an additional feature, the side wall is supported by a prop which is rigidly attached thereto and has a sliding engagement with a base beneath the prop.

Having indicated the general nature of the invention, reference is made to the accompanying drawings which form a part of this specification and show, by way of example, two preferred embodiments, wherein:

FIGURE 1 is a side elevation of the mold, parts being broken away and the actuating members being omitted;

FIGURE 2 is a partial transverse sectional view, taken on the line 2—2 of FIGURE 1 and drawn to an enlarged scale, the side walls being shown in solid lines in their inner, operative positions and one wall being shown in dotted lines in its outer position;

FIGURE 3 is a further enlarged, fragmentary view of a portion of FIGURE 2, showing the left side wall in solid lines in its outer position and, in dotted lines, in its inner position;

FIGURE 4 is a transverse sectional view through a mold according to a modified construction, wherein two objects can be cast and only one side wall of each mold section is movable; and

FIGURE 5 is an enlarged, fragmentary view of a portion of FIGURE 4, showing the left side wall in solid lines in its outer position and, in dotted lines, in its inner position.

Referring to FIGURES 1—3, the mold has a supporting base formed of parallel, transverse I-beams 5 interconnected by longitudinal channels 6 and 7 which are welded to the I-beams and form a central or inner support for the mold floor throughout the full length thereof. Stop blocks 8 and 9 are fixed to the I-beams in laterally spaced relation to the channels by welding; their purpose will appear. A soffit 10, formed of a continuous sheet of pliant material, constitutes the mold floor. The term "pliant" is used herein to denote material which is supple and capable of being bent with ease. It may suitably be made of liquid-impervious belting, e.g., composed of textile or cords impregnated with rubber and vulcanized, possessing good flexibility and sufficient compressibility to form a liquid-tight seal when pressed against a rigid surface. The soffit has sufficient tensile strength to sustain wet concrete without significant sagging through an unsupported strip 10a adjoining the support channels 6 and 7, to which it is fixed by bolts 11, the heads of which are recessed to provide a continuously flat mold floor.

Each mold side wall is assembled from a plurality of pans, such as a lower pan 12 and an upper pan 13; the former has a horizontal, longitudinal flange 14 at the top

and the latter has a similar pair of flanges 15 and 16 at the bottom and top, respectively. A supporting angle iron 17 is welded along the bottom of the lower pan and the pans are bolted together by bolts 18. It is evident that any desired number of pans may be bolted together in this manner to assemble a mold wall of desired shape and height. In the embodiment illustrated, which is suitable for casting concrete I-beams, the inner or molding face of the wall is shaped to include vertical outer traverses 12b and 13c, vertical inner traverses 12d and 13a, inclined connecting traverses 12c and 13b, and a bottom, inwardly inclined traverse 12a. The traverses 12c, 12d, 13a and 13b jointly form an inward projection of the side wall for shaping the web of the beam; this projection prevents lifting of the beam from the mold without prior lateral displacement of the side wall. The bottom traverse 12a has a smooth, downwardly directed edge which is in sealing engagement with the soffit 10; it is preferably pressed into the latter to deform it slightly, as shown, for insuring a moisture-proof joint. The inclined traverse 12a constitutes a fillet wall and may be given any desired contour to shape the bottom corner face of the beam on a radius or chamfer. Each pan is reinforced by a plurality of vertical ribs 19 or 20, which are welded to the outer faces and the contiguous flanges 14—16 or the angle irons 17.

The side walls are fixed to the marginal parts of the soffit by bolts 21 which extend through the angle irons 17 and lower angle irons 22. The latter extend longitudinally the full length of the side wall beneath the bottom edges of the traverses 12a and constitute rigid support means for compressing the soffit against the said edges. The angle irons 22 are spaced laterally outwardly from the channels 6 and 7, leaving strip-shaped parts of the soffit unsupported therebetween.

The lower legs 22a of the lower angle irons function as props which afford vertical support and lateral stability to the side wall. These props rest slidably on the beams 5, which function as bearing members providing upwardly directed, laterally extended slide surfaces. The stop blocks 8 and 9 are positioned on the beams 5 to be engaged by the props 22a when the side wall is vertical, as shown in dotted lines in FIGURE 3. The intervals between these blocks and the vertical flanges of the channels 6 and 7 are, in this embodiment, such that the latter are engaged by the props and, hence, serve as lateral abutments when the props have been slid inward, which occurs when the mold side wall is swung outward to the solid-line position in FIGURE 3. During this movement the unsupported strips 10a of the soffit 10 between the channels 6 and 7 and the angle irons 22 flex downward, as shown. This tilting movement of the side wall must be at least sufficient to shift the point X, at the bottom edge of the inward projection, laterally outward beyond the vertical plane through the normal position of the outermost, lower wall section 12b; this clears the cast concrete girder in the mold of any obstruction and makes it possible to lift the girder from the mold.

The mold further has a pair of end walls 23 and 24 which are shaped to the cross section of the beam to be cast but are advantageously slightly taller. The said end walls are mounted between the side walls and have bottom flanges 27 and 28 by which they are bolted to the central support channels 6 and 7 against the soffit 10 to insure a liquid-tight seal.

After the end walls are installed and the side walls are swung to their inner positions the latter are tied together by suitable devices, such as tie rods 36 which extend through holes in the pans 13 and engage the pans by rod heads 37 and nuts. These rods are oiled or otherwise coated prior to pouring the wet concrete to permit their withdrawal from and avoid bonding to the hardened concrete.

The side walls may be swung inward and outward by hand or by any suitable manually or power operated de-

vice. Illustrative of such devices is a pair of linked rods 29 and 30 having a pivotal connection at 31, the former being pivoted to the base beam 5 at 32 and the latter to the side wall at 33. The rod 30 has a handle 34 rigidly secured thereto so as to engage the rod 29 at an abutment 35 thereon when the pivots 31—33 are slightly out of alignment with the pivot 31 below the line joining the other two; in this condition compressive force between the latter pivots urges the handle against its abutment, whereby the mold side wall is buttressed. When the handle is raised the end pivots are first moved apart slightly—made possible by small straining of the structural parts—and thereafter the linkage acts in tension to pull the wall outward to the position shown in dotted lines, with the handle in engagement with the flange 16. Lowering the handle reverses these operations. It is to be understood that a plurality of such linkages may be provided along the length of each side wall.

Because the strip-shaped parts 10a of the soffit which are situated between the central support channels 6 and 7 and the angle irons 22 are unsupported from below and must, therefore, act in tension to support the wet concrete, it is desirable to make these parts as narrow as feasible while affording the desired flexing action. For the same reason it is desirable to use as the soffit a cord-reinforced material capable of resisting stretching, whereby the wet concrete is supported without appreciable sagging of the soffit. The pressure of the concrete against the side walls tends to spread them apart and this maintains the soffit strips taut. The stop blocks 8 and 9 prevent excessive outward movement of the side walls and excessive stress on the soffit which would otherwise unduly distend and weaken it.

It is desirable to proportion the parts as shown so that the outermost edges of the angle irons 22 rest on the beams 5 beyond the stop blocks when the side walls are swung outward, as shown in solid lines in FIGURE 3. During such outward movement the unsupported strips 10a of the soffit flex and act in tension to cause the props 22a to slide inward.

FIGURES 4 and 5 show a dual mold, each of its section having one stationary and one movable side wall, shaped to permit octagonal concrete columns to be cast. Because only one side wall in each section is movable it must be capable of movement through a greater arc than in previous embodiments. These views further illustrate other modifications which may be applied individually to the first embodiment.

Referring to FIGURES 4 and 5 in detail, the dual mold has a base 40 which may be transverse beams as before to constitute bearing members providing slide surfaces. Longitudinal support angle irons 41 and 42 are fixed to the base by welding their vertical legs 41a and 42a; they have their upper, horizontal legs directed outwardly in spaced relation above the base, as shown. A soffit 43 of pliant material, as previously described for the soffit 10, overlies these support irons for the full length of the mold to form the mold floor and extends laterally beyond these irons. Strips 43a of the soffit are unsupported. The mold has a pair of fixed, inner side walls 44 and 45 and a pair of movable, outer side walls 46 and 47. The dual mold being constructed symmetrically about the vertical, longitudinal center plane, only the side walls for the right mold section will be described.

The fixed side wall 45 includes three flat molding faces, viz., a lower, outwardly inclined traverse 45a, an outer, vertical traverse 45b, and an upper, inwardly inclined traverse 45c. It has at the bottom a horizontal support flange 45d which extends the full length of the side wall and is bolted to the angle iron 42 in engagement with the soffit to compress the latter and thereby form a liquid-tight seal. The top of the wall has a horizontal traverse 45e which is terminated in a down-turned flange 45f in engagement with a similar flange on the side wall 44.

The swingable, outer side wall 47 includes three similar

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and opposed, flat molding faces 47a, 47b and 47c, and has at the bottom a horizontal support flange 47d by which it is bolted to a longitudinal support angle iron 49 so as to compress the soffit and form a liquid-tight seal along the full length of the wall. The outer side wall further has, at the top, a horizontal traverse 47e which is terminated in a down-turned flange 47f.

The side walls 46 and 47 are supported by support angle irons 48 and 49, respectively, which form rigid support means and have vertical legs or props 48a and 49a resting slidably on the base 40, which functions as a prop support and presents an upwardly directed slide surface. These props are vertical, as shown in solid lines in FIGURE 4, when the side walls are in their inner, upright positions. The outer side walls are retained in these upright positions before concrete is poured by one or more tie clips 50 having at their ends down-turned flanges 50a and 50b, which engage the flanges 46f and 47f on the side walls. It will be understood that each mold section has a pair of end walls, not shown, corresponding to the end walls 23 and 24 of the first embodiment and similarly mounted on the inner support angle irons 41 and 42.

In FIGURE 4 the left mold section is shown to contain a concrete column 51 having an octagonal cross section.

The use of the mold according to the second embodiment is similar to that of the first, except that the outer side walls are retained by the tie clips 50, which are easily removed by upward movement to permit the side walls to be spread apart, that only one side wall of each mold section is swung outward to permit the cast object to be removed, and that the side walls are swung through greater arcs, sufficient to bring them to the base 40. This increased movement is made possible without widening each of the unsupported, strip-shaped portions 43a of the soffit between the wall-support angle irons 48, 49 and the interior angle irons 41, 42, by positioning the legs 41a and 42a inwards from the upper, horizontal legs, which extend laterally outwards in supporting relation to the soffit. The props can therefore slide inwards under them. This permits a longer inward motion of the props 48a and 49a, as shown in solid lines in FIGURE 5. When the side walls are thus swung outward the outer edges of the angle irons 48 and 49 rest on the base 40.

It is evident that in each embodiment the wall support, composed of the prop legs 22a, 48a and 49a, and the bearing members supporting the same, supports the movable side wall in the inner and outer positions thereof and also continuously during the outward tilting movement of the wall and lowers the bottom of the wall during such movement to effect a downward flexure of the pliant soffit.

I claim as my invention:

1. In a mold for poured concrete objects, the combination of a rigid longitudinal support; a mold floor including a pliant soffit which is fixed to said support and extends laterally outwardly therefrom; extending upwards from said mold floor, a longitudinal side wall which is fixed sealingly to said soffit in laterally outwardly spaced relation to said rigid support and is tiltable between inner and outer positions by flexure of the soffit, said soffit being unsupported between said rigid support and the wall when the latter is in its inner position; and means for supporting said wall in the inner and outer positions thereof and continuously during outward tilting movement and for lowering the part of the wall which is fixed to the soffit during such outward tilting movement to effect a downward flexure of the unsupported part of said soffit.

2. The combination according to claim 1, wherein said support means for the wall extends longitudinally in engagement with one face of the soffit outwardly from the unsupported part thereof, said wall being in engagement with the other face of the soffit opposite said support means and being fastened to said support means so

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as to compress the soffit and thereby seal the same to the wall.

3. The combination according to claim 2, wherein the said wall has a narrow edge, said edge being the part of the wall which is in engagement with said one face of the soffit and compresses the same.

4. The combination according to claim 2, wherein the said wall has a longitudinally extended flat face, said face being the part of the wall which is in engagement with said one face of the soffit and compresses the same.

5. In a mold for poured concrete objects, the combination of a mold floor; an inner, rigid, longitudinal support for said floor, said floor including a longitudinal strip of pliant material which extends laterally outwardly from said inner support; a rigid longitudinal mold side wall which extends upwards from said pliant material and is fixed in sealed relation thereto along a line spaced laterally outwardly from said rigid support, said wall being tiltable between inner and outer positions by flexure of said strip between said rigid support and the wall, said strip being unsupported when said wall is in its inner position; and means for supporting said wall in the inner and outer positions thereof and continuously during outward tilting movement and for lowering the part of the wall which is fixed to said pliant material during outward tilting movement to effect a downward flexure of said strip of pliant material.

6. The combination defined in claim 5, wherein said support means for the wall comprises: a bearing member providing an upwardly directed and laterally extended slide surface which is situated in spaced relation below said wall, and a prop rigidly affixed to said wall for tilting movement therewith and extending downwardly therefrom to said surface, said prop being supported by and in slidable engagement with said surface substantially beneath the wall when the latter is in its inner position and being slidable inwards on said surface as the wall is tilted outwards.

7. In combination with the elements recited in claim 6, stop means secured in fixed relation to said bearing member and positioned for engagement by said prop to limit the outward movement thereof as the side wall is tilted inwards.

8. In combination with the elements recited in claim 6, abutment means secured in fixed relation to said bearing member and positioned for engagement by said prop to limit the inward movement thereof as the side wall is tilted outwards.

9. The combination according to claim 8 wherein said inner rigid support extends downwards to said bearing member and constitutes the said abutment means.

10. The combination according to claim 6 wherein said inner rigid support is fixed to said bearing member and includes a part which extends upwards from the bearing member to the mold floor, said rigid support extending thence laterally outwards in spaced relation above the slide surface of the bearing member, whereby said prop can slide beneath said laterally outwardly extending part of said rigid support.

11. The combination according to claim 6 wherein said support means for the wall includes, additionally, a part extending outwardly in fixed angular relation to the prop when the wall is in its inner position and engageable with said bearing member when the wall is in its outer position for limiting outward movement of the wall.

12. The combination as defined in claim 5 wherein said pliant material is a cord-reinforced, rubberized, compressible, liquid-impervious material.

13. A mold for casting elongated concrete objects comprising, in combination: a base providing an inner, longitudinal, rigid support, and a laterally extended bearing member having an upwardly directed slide surface; a mold floor formed at least in part by a longitudinal soffit of pliant, compressible, cord-reinforced, liquid-impervious material which is secured to the top of said inner support

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and extends laterally outwards therefrom; a pair of rigid mold side walls extending upwards from said mold floor, at least one of said side walls being tiltable between inner and outer positions and having a molding face shaped to provide at an upper part thereof a projection extending inwardly beyond the vertical plane through a lower part thereof, said one wall being fixed in sealed relation to said soffit laterally outwardly from said inner support, there being a longitudinal strip of said soffit between said one wall and said rigid support which strip is unsupported when said one wall is in its inner position; a prop fixed rigidly to said one wall for tilting movement therewith and extending downwardly beneath the soffit to and supported by said bearing member for inward sliding movement on said surface when the tiltable wall is tilted outwards, whereby said one wall is supported continuously and lowered during outward tilting movement thereof, thereby effecting a downward flexure of said unsupported soffit strip; and end walls for said mold.

14. A mold according to claim 13, wherein said soffit extends across the full width of the mold floor, extending laterally beyond both margins of said inner support, and both said mold side walls are tiltable outwardly and provided with props.

15. A dual mold for casting a pair of elongated concrete objects comprising, in combination: a base providing a central, longitudinal, rigid support and bearing members extending laterally to each side thereof, said bearing members having upwardly directed slide surfaces; a mold floor comprising a longitudinal strip of pliant material extending laterally from both sides of said central support above said bearing members; a central mold wall extend-

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ing upwardly from said mold floor above said central support; a pair of outer mold side walls extending upwardly from said mold floor and fixed in sealed relation to said pliant material outwardly from and in spaced relation to said central support on opposite sides thereof, said outer walls being tiltable between inner and outer positions by flexure of strips of said pliant material between said central support and the respective outer walls, each said strip being unsupported when the adjacent wall is in its inner position; means supporting each said outer wall in the inner and outer position thereof and continuously during outward tilting movement thereof and for lowering the part of the wall which is fixed to the pliant material during such outward tilting movement to effect a downward flexure of the adjoining strip of pliant material; and a pair of end walls for each of the mold sections defined by a movable wall and said central mold wall.

References Cited in the file of this patent

UNITED STATES PATENTS

1,084,355	Moore	Jan. 13, 1914
1,140,840	Moore	May 25, 1915
1,399,485	Johnson	Dec. 26, 1921
2,306,107	Henderson	Dec. 22, 1942
2,495,100	Henderson	Jan. 17, 1950
2,582,161	Randall	Jan. 8, 1952
2,771,656	Swenson	Nov. 27, 1956
2,783,521	Vondrous et al.	Mar. 5, 1957

FOREIGN PATENTS

704,744	France	Feb. 24, 1931
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