Jan. 8, 1963 L. F. TUMEY 3,071,834

MOLDING APPARATUS

Filed March 28, 1960 4 Sheets-Sheet 1

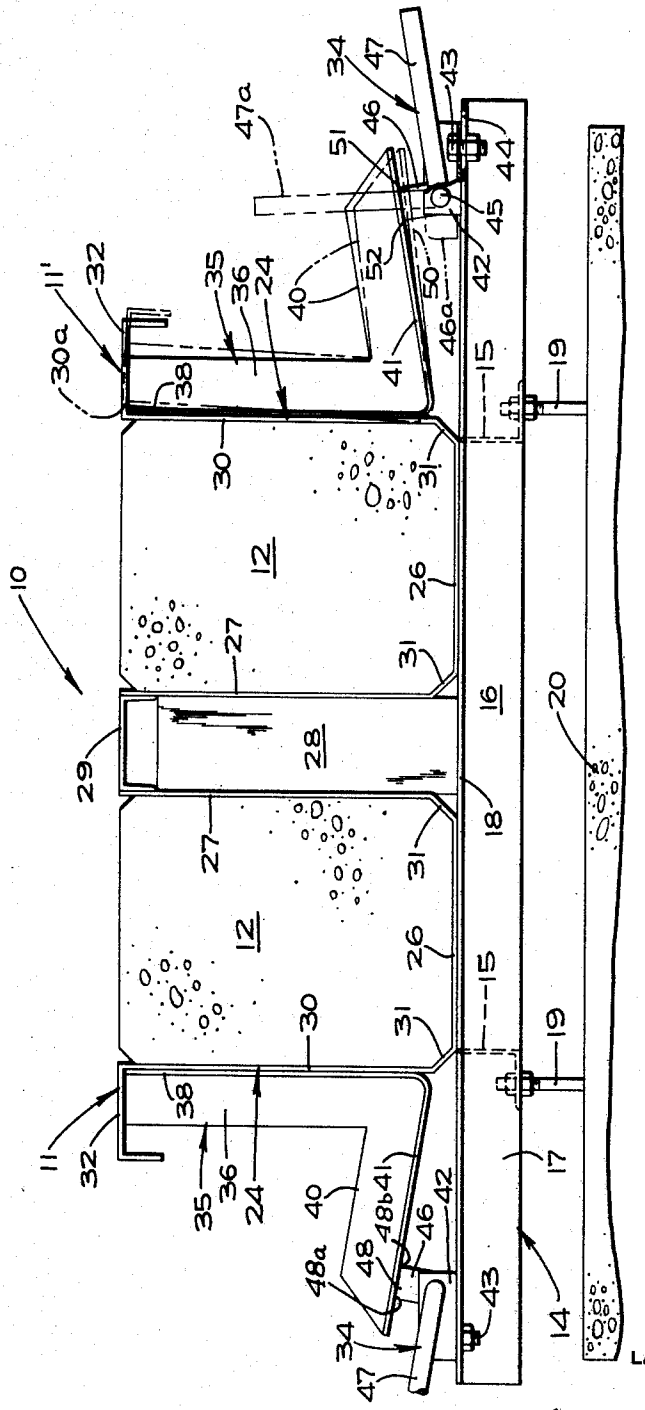


FIG. 1

INVENTOR
LAWRENCE F. TUMEY

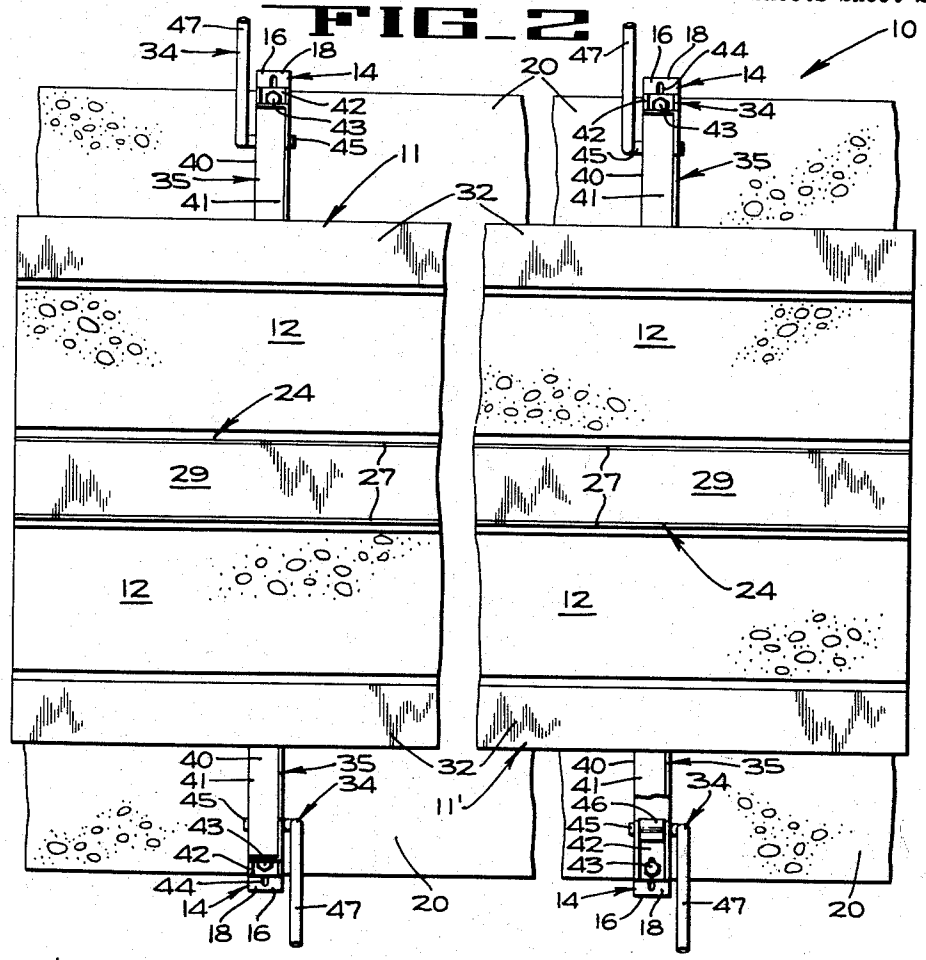
BY Hans G. Hoffmeister
ATTORNEY

Jan. 8, 1963 L. F. TUMEY 3,071,834

MOLDING APPARATUS

Filed March 28, 1960 4 Sheets-Sheet 2

FIG_2



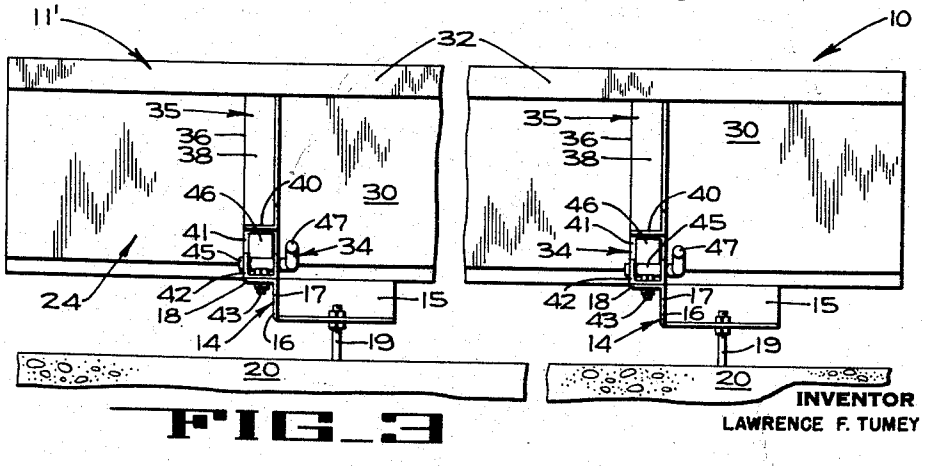


FIG_3

INVENTOR
LAWRENCE F. TUMEY

BY Hans G. Hoffmeister
ATTORNEY

Jan. 8, 1963 L. F. TUMEY 3,071,834

MOLDING APPARATUS

Filed March 28, 1960 4 Sheets-Sheet 3

FIG_4

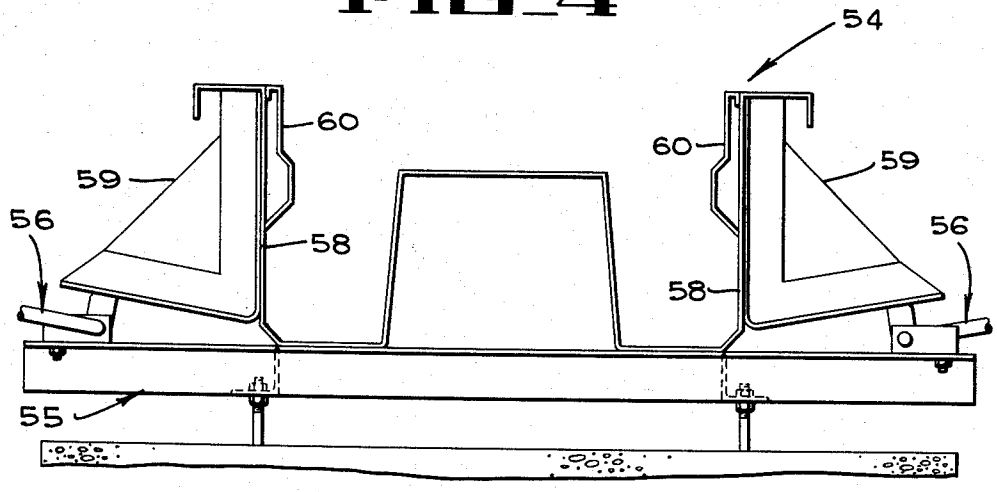
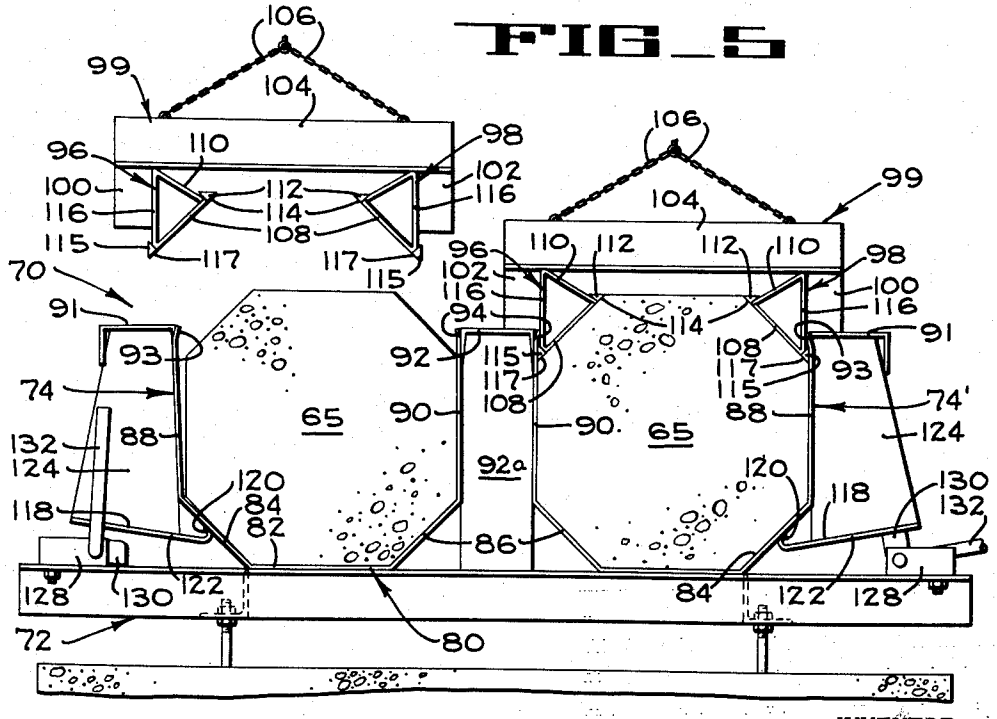


FIG_5



INVENTOR
LAWRENCE F. TUMEY

BY Hans G. Hoffmeister
ATTORNEY

Jan. 8, 1963 L. F. TUMEY 3,071,834

MOLDING APPARATUS

Filed March 28, 1960 4 Sheets-Sheet 4

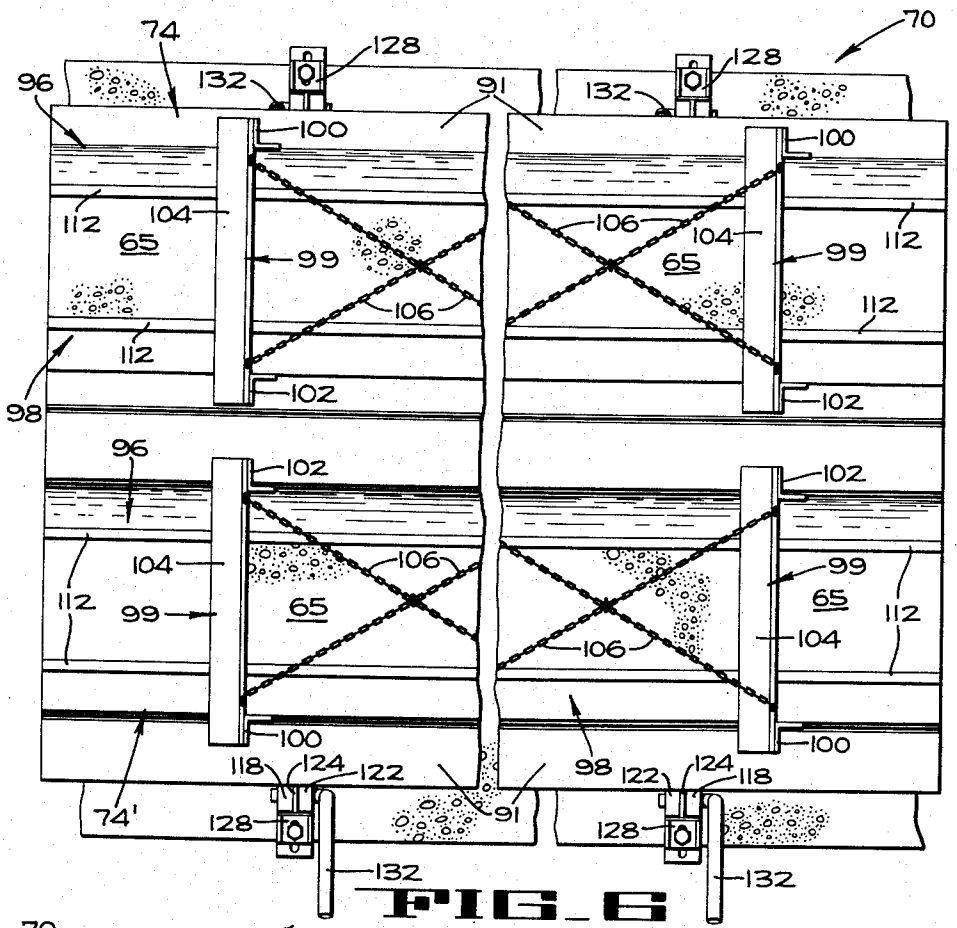


FIG_6

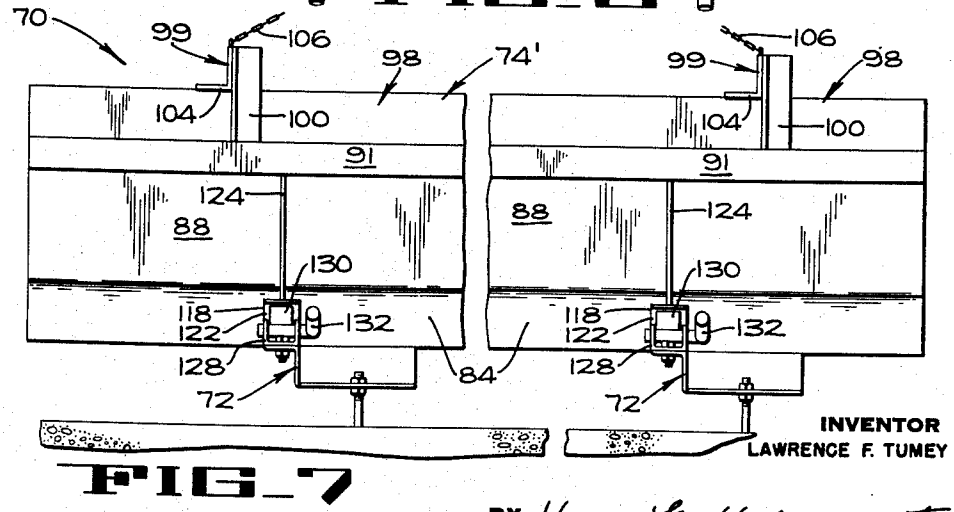


FIG_7

INVENTOR
LAWRENCE F. TUMEY

BY Hans G. Hoffmeister
ATTORNEY

United States Patent Office

3,071,834
Patented Jan. 8, 1963

3,071,834

MOLDING APPARATUS

Lawrence F. Tumey, Lakeland, Fla., assignor to FMC Corporation, a corporation of Delaware

Filed Mar. 28, 1960, Ser. No. 18,034
2 Claims. (Cl. 25—121)

The present invention relates to mold forms, and more particularly to forms for casting concrete structural members.

In the casting of concrete structural members, such as concrete piles or channel beams, mold forms are usually employed which are open at the top for reception of the fluid concrete mix. When the concrete mix has set and the molded product is to be removed from the mold, it must be possible to establish clearance between the product and the side walls of the mold. Such stripping clearance heretofore has usually been obtained by a device connected to the upper end of the mold side wall and adapted to draw the side wall away from the molded product. However, an undue expenditure of time and labor is required for the operation of a stripping device of this type.

It is an object of the present invention to provide improved molding apparatus.

Another object is to provide an improved mold which facilitates the stripping of a molded product therefrom.

Another object of the invention is to provide an improved mold which reduces to a minimum the time and labor required to strip a molded product therefrom.

These and other objects and advantages of the invention will become apparent from the following description thereof, taken in conjunction with the accompanying drawings, in which:

FIG. 1 is an end elevation, with the end wall removed, of a mold for simultaneously casting two concrete piles, one mold side wall and locking means therefor being shown in phantom in stripping position.

FIG. 2 is a partial plan of the apparatus of FIG. 1.

FIG. 3 is a partial side elevation of the apparatus of FIGS. 1 and 2.

FIG. 4 is an end elevation, with the end wall removed, of a modified form of mold of the present invention.

FIG. 5 is an end elevation, with the end wall removed, of another modification of the mold of the invention, two operative positions thereof being shown for the two mold sections, respectively.

FIG. 6 is a partial plan of the apparatus of FIG. 5.

FIG. 7 is a partial side elevation of the apparatus of FIGS. 5 and 6.

Referring to the drawings, and particularly to FIGS. 1, 2, and 3, a double mold **10** is shown for use in casting two square concrete piles. The mold **10** is preferably of metal construction, and is divided into two sections **11** and **11'**, each being shown in closed-mold position and having therein a cast pile **12**. The mold **10** is supported upon a mounting base **14** constructed of a pair of angle members **15** spaced transversely of the mold **10** and extending longitudinally thereof. The base **14** includes also a plurality of transversely extending angle members **16**, each having one flange **17** secured in vertical position by any suitable means to corresponding ends of the angle members **15**, the other flange **18** of each angle member **16** being uppermost and extending horizontally. The angle members **15** are bolted to legs **19** supported upon a casting bed **20** or other suitable surface.

Two mold forms **24** are supported on the flanges **18** in spaced, parallel relation. Each of the forms **24** has a flat bottom wall **26** and vertical inner side walls **27**, the latter being interconnected at spaced intervals longitudinally thereof by a series of gusset plates **28** welded

thereto. An inverted channel member **29** rests upon the upper ends of the gusset plates **28** and is likewise welded to the inner side walls **27** of the mold forms **24** with its upper, flat face substantially level with the upper edges of the walls **27**. Each mold form **24** includes also an outer side wall **30** integral with the associated bottom wall **26**. The corners between the side walls **27**, **30** and the associated bottom wall **26** are filleted, as indicated at **31**. The upper edges of the walls **30** are turned outward to form flanges **32**.

A plurality of spaced apart locking devices **34** are associated with each of the mold side walls **30**. As best shown in FIG. 1, each of the locking devices **34** comprises a substantially L-shaped bracket **35** formed of angle iron and including a first, generally vertically extending leg **36** having a flange **38** welded to the outer surface of associated mold side wall **30**, and a second leg **40** projecting laterally outward from the lower end of said first leg **36** with one flange **41** of the leg **40** in a plane which is inclined slightly from the horizontal.

A bearing bracket **42** is mounted on the horizontal flange **18** of one of the angle members **16**, below the outer end of the leg **40** of each locking bracket **35**. The bearing brackets are secured in place by bolts **43** which, as seen in the case of the mold section **11'** extends through slots **44** in said flange **18**, which slots are elongated transversely of the mold **10**, thus making it possible to adjust the bracket **42** toward or away from the associated mold form. Each bearing bracket **42** is of channel shape, and a shaft **45** mounting a cam **46** extends between and is rotatably journaled in the side walls thereof, as best seen in FIG. 3. A handle **47** is secured to one end of each shaft **45** for rotation of the associated cam **46** into a position to engage the camming surface **48** thereof with the inclined flange **41** of the associated locking bracket **35**. The camming surface **48** is provided with a toe portion **48*a*** and a heel portion **48*b***. When in such position, the cam **46** serves, through said locking bracket **35**, to support the outer mold side wall **30** in position for a molding operation. The side wall **30** when so supported is at an angle of substantially 90° with respect to the bottom wall **26** of the mold form and is substantially parallel to the associated inner side wall **27**. Each cam **46** is rotatable by the respective handle **47** into a position of disengagement from the associated flange **41**. The positions of the cam and handle upon disengagement are shown in phantom at **46*a*** and **47*a***, respectively, in FIG. 1.

Each of the mold side walls **30** is constructed so as to have a normal or open-mold position, in which it extends at an angle slightly greater than 90° with respect to the associated mold bottom wall **26**, as shown at **30*a***. Since each of the forms **24** is constructed of metal plate having some degree of flexibility and resiliency, the respective side wall **30** can readily be moved into closed-mold position by movement of the associated cam **46** into engaged position, and will, under its own inherent resiliency, return to its normal or open-mold position **30*a*** when the cam is disengaged. It is to assure that each side wall **30** can be made perpendicular to the respective bottom wall **26** when in closed position that the bearing brackets **42** are so mounted as to be horizontally adjustable, as hereinabove described.

It will be realized that any number of the locking devices **34** can be associated with each of the mold side walls **30**, depending upon the length of the latter. Two of the locking devices associated with each side wall are shown in FIG. 2.

The operation of the apparatus of FIGS. 1–3 will be described with particular reference to the mold section **11'**. The mold side wall is initially in its open-mold position shown at **30*a***, and the cam **46** is in its disengaged position shown at **46*a***, the handle **47** being in the raised

position shown at 47*a*. The handle 47 is first rotated outward and downward, rotating the shaft 45 and cam 46 to bring the toe 48*a* of the cam into engagement with the flange 41 at point 50. As rotation of the cam is continued, upward pressure is exerted against the leg 40, and the mold side wall 30 is forced inward, toward closed-mold position, with resultant flexing of the mold form in, and possibly adjacent, the fillet 31 joining the wall 30 to the bottom 26. Rotation of the cam 46 is continued until the toe 48*a* thereof reaches the point 51, at which time the cam heel 48*b* will come into contact with the flange 41 at 52. The side wall 30 will thus be locked in closed-mold position, the bearing bracket 42 having previously been adjusted laterally of the supporting angle member flange 18 so that the mold side wall 30 will be perpendicular to the bottom wall 26 when the cam heel reaches this position.

When all of the locking devices 34 have been thus operated, fluid concrete mix is poured into the mold forms 24 for casting of the two beams 12. After the concrete has set, the cams 46 of the several locking devices 34 are returned to their released positions as shown at 46*a*, by rotation of the handles 47 thereof upward and inward, as indicated at 47*a*. The mold side walls 30 will then resiliently return to their open-mold positions as shown at 30*a* and the beams 12 can be stripped from the mold.

A modified form of the mold of the invention, for the casting of a channel beam, is shown in FIG. 4. A mold form 54 of inverted channel shape is mounted upon a base 55, which may be similar in structure to the mounting base 14. Locking devices 56, similar to the locking devices 34, are positioned on the mounting base 55 and are associated with the side walls 58 of the form 54 similarly to the manner in which the locking devices 34 are associated with the side walls 38 of the mold forms 11. A gusset 59 reinforces the angle bar structure of each locking device 56.

One or more members 60 are removably mounted by any suitable means on the inner surface of each side wall 58, for the formation of any desired number of shear key recesses in the side wall of the concrete beam to be cast. Removability of the members 60 is desirable, in case the mold side walls 58 do not spring back sufficiently far when in open-mold position to permit clearance of the members 60 by the cast concrete beam during removal of the latter from the form.

Operation of the apparatus of FIG. 4 is similar to that of FIG. 1, and will therefore not be specifically described.

FIGS. 5, 6 and 7 illustrate a further modification of the mold of the invention, this form being for the formation of two octagonal concrete piles 65. It comprises a mold 70 mounted upon a base 72 similar in structure to the bases 14 and 55, said mold being divided into two sections 74 and 74'. Inasmuch as said mold sections are identical in structure, only the section 74 will be specifically described. However, corresponding reference numerals are applied to both sections 74 and 74'.

The mold section 74 is comprised of a mold form 80 having a bottom wall 82, two lower corner walls 84 and 86, and two generally vertically extending side walls 88 and 90, these walls being adapted to form five of the sides of an octagonal concrete pile. The side wall 88 is at its upper end formed with an outwardly extending flange 91, and the side wall 90 is rigidly connected to the corresponding wall of the other mold section 74' by an inverted channel member 92 and a plurality of gusset plates 92*a*. The side walls 88 and 90 are provided adjacent their upper edges with opposed, inwardly projecting lips 93 and 94, respectively.

Two longitudinally extending upper mold elements 96 and 98 of triangular cross section are mounted on a plurality of frames 99, each comprising two vertical side members 100 and 102, respectively, connected together by cross members 104. The frames 99 are suspended by means of chains 106 connected to the cross members 104 and to a crane or other suitable suspension means (not shown). Each of the elements 96 and 98 has a lower inclined wall 108 adapted to form one of the upper corner walls of the octagonal pile 65, and an upper inclined wall 110, at the intersection of which walls is mounted a triangular sealing strip 112 having a lower surface 114 aligned with the wall 108. A similar triangular strip 115 is mounted at the intersection of the wall 108 with the third vertical wall 116 of each mold element, said strip 115 having a lower surface 117 in alignment with the wall 108.

An angle member 118 is secured along one of its flanges 120 to the lower corner wall 84 of the form 80, the other flange 122 of said angle member extending laterally outward from the wall 84. A plurality of reinforcement webs or gussets 124 are mounted between the flange 122 and the side wall 88 and flange 91.

A plurality of bearing brackets 128 are mounted at spaced intervals longitudinally of the base 72 below the flange 122. A cam 130 is rotatably mounted in each bracket 128 and is operated by a handle 132 connected thereto, said bearing bracket, cam, and handle being similar in construction and manner of operation to the bearing bracket 42, cam 46, and handle 47, respectively, of the modification described above in connection with FIGS. 1 to 3. When the cam 130 is in its retracted position, the corner wall 84 and side wall 88 occupy their open-mold positions due to the inherent resiliency of the metal of which they are formed. To prepare the mold 70 for use in casting a pair of columns 65, the mounting frames 99 are first lowered into positions such as that shown in the case of the mold section 74' with the side members 100 and 102 resting on the flange 91 and the channel member 92, respectively. The sealing strips 115 are at this time in register with inner surfaces of the lips 93 and 94, respectively, and mold elements 96 and 98 are in place for formation of the upper corners of the octagonal pile 65. The several cams 130 are then rotated upward and inward by means of the handles 132 and into their effective positions as shown in the case of the mold section 74'. The resultant upward pressure on the flanges 122 of the angle members 118 cause movement of the walls 84 and 88 into the closed-mold positions as shown for the mold section 74'. Pressure exerted by the lips 93 on the associated sealing strips 115 causes a shifting of the frame 99 in the direction of the lip 94, and the lips 93 and 94 then tightly engage the strips 115. Fluid concrete mix may then be poured into the complete mold form. After the concrete has set, the cams 130 are rotated back to their inoperative positions, permitting the walls 84 and 88 to spring back into open-mold positions. The mounting frames 99 are then shifted a short distance toward the respective lips 93 for disengagement of the strips 115 from the lips 94, and then moved upward to raise the mold elements 96 and 98. The cast columns 65 then can be stripped from the mold forms 74 and 74'.

While three embodiments of the present invention have been shown and described herein, it will be understood that the apparatus is capable of further modification and variation without departing from the principles of the invention, and that the scope of the invention should be limited only by the scope and proper interpretation of the claims appended hereto.

The invention having thus been described, what is believed to be new and desired to be protected by Letters Patent is:

1. A mold for casting concrete structural elements comprising a rigid base structure, an elongated channel shaped mold mounted on said rigid base structure, said mold having a bottom wall formed of relatively flexible sheet metal with said bottom wall being attached to and stiffened along its length by said base structure, said mold having a first side wall mounted on said base structure and a second side wall formed of relatively flexible sheet metal jointed to and unitary with said bottom wall, said

rigid base structure having extension means projecting laterally past said second side wall, said second side wall being stiffened by longitudinally spaced rigid legs that extend substantially from the lower edge of the wall to its upper edge, the junction of said stiffened side and bottom walls forming a resilient hinge, said hinge normally positioning said second side wall in an open-mold position wherein the upper edges of said walls have a predetermined spacing, laterally projecting levers fixed to the stiffening legs of said second side wall and inclined at an acute angle outwardly and upwardly to said base structure, and actuating means located below said levers and mounted on said base structure extension means and in contact with said levers for flexing said resilient hinge to decrease the spacing of the upper edges of said side walls and bring said second side wall into a closed-mold position, said actuating means being laterally adjustable to adjust the closed mold position of said second side wall.

2. A mold for casting concrete structural elements comprising a rigid base structure, an elongated channel shaped mold mounted on said rigid base structure, said mold having a bottom wall formed of relatively flexible sheet metal with said bottom wall being attached to and stiffened along its length by said base structure, said mold having a first side wall mounted on said base structure and a second side wall formed of relatively flexible sheet metal jointed to and unitary with said bottom wall, said rigid base structure having extension means projecting laterally past said second side wall said second side wall being stiffened by longitudinally spaced rigid legs that extend substantially from the lower edge of the wall to its upper edge, the junction of said stiffened side and bottom walls forming a resilient hinge, said hinge normally positioning said second side wall in an open-mold position wherein the upper edges of said walls have a predetermined spacing, laterally projecting levers fixed to the stiffening legs of said second

side walls and inclined at an acute angle to said base structure, and actuating eccentric cam means mounted on said base structure extension means for rotation about axes parallel to said second side wall and contacting the under surfaces of said levers for flexing said resilient hinge to decrease the spacing of the upper edges of said side walls and bring said second side wall into a closed-mold position, said eccentric cam means being laterally adjustable toward and away from said second side wall to adjust the closed mold position thereof, and a flat heel portion formed on each of said cam means and adapted to be in contact with its associated lever when said second side wall is in closed mold-position to prevent accidental release of said cam means due to internal pressure against said second side wall.

References Cited in the file of this patent

UNITED STATES PATENTS

555,345	Smallwood	Feb. 25, 1896
607,214	Carroll	July 12, 1898
742,019	Goodwin	Oct. 20, 1903
799,493	Pfeiffer	Sept. 12, 1905
1,456,286	Snow	May 22, 1923
1,705,201	Nagel	Mar. 12, 1929
1,762,440	Howe	June 10, 1930
1,849,889	Straub	Mar. 15, 1932
2,306,107	Henderson	Dec. 22, 1942
2,495,100	Henderson	June 17, 1950
2,662,262	Wollard	Dec. 15, 1953
2,771,656	Swenson	Nov. 27, 1956
2,892,339	Flower	June 30, 1959
2,949,657	Anson	Aug. 23, 1960

FOREIGN PATENTS

435,197	Germany	Oct. 8, 1926
538,098	Great Britain	July 21, 1941