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2,555,022

CONCRETE MOLDING APPARATUS

Original Filed Sept. 5, 1947

2 Sheets-Sheet 1

FIG. 1.

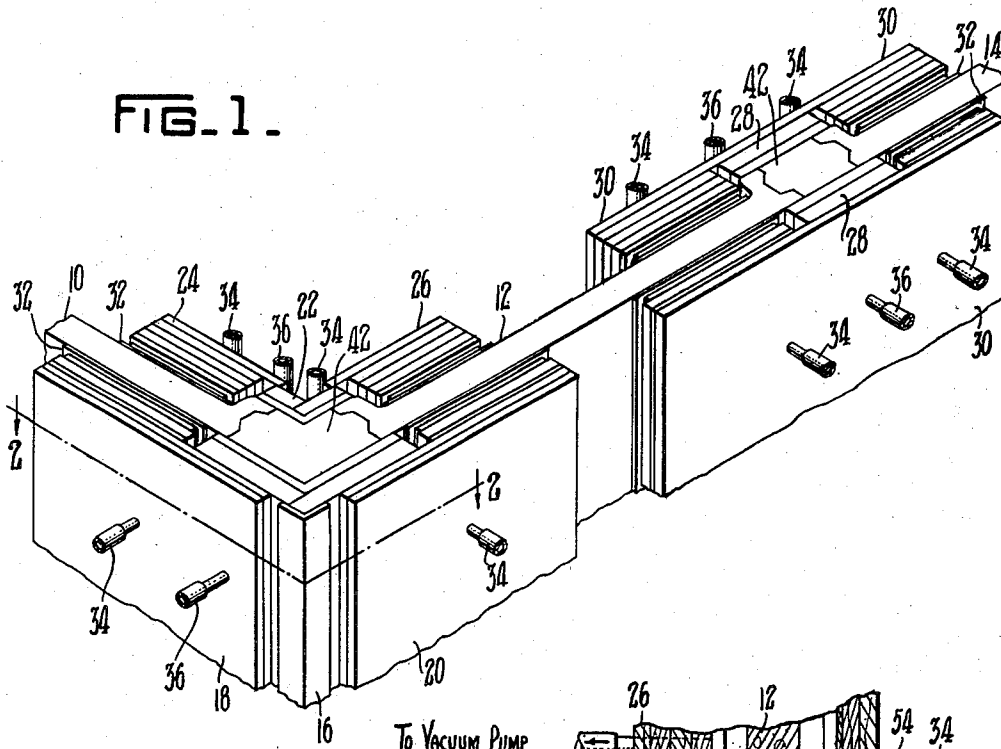
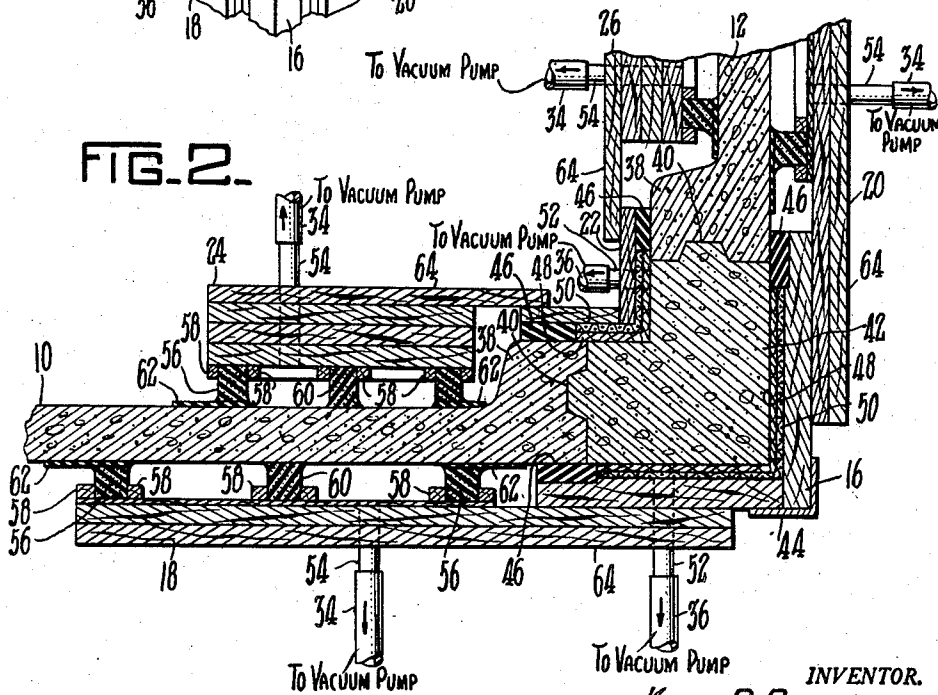


FIG. 2.



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FIG. 4.

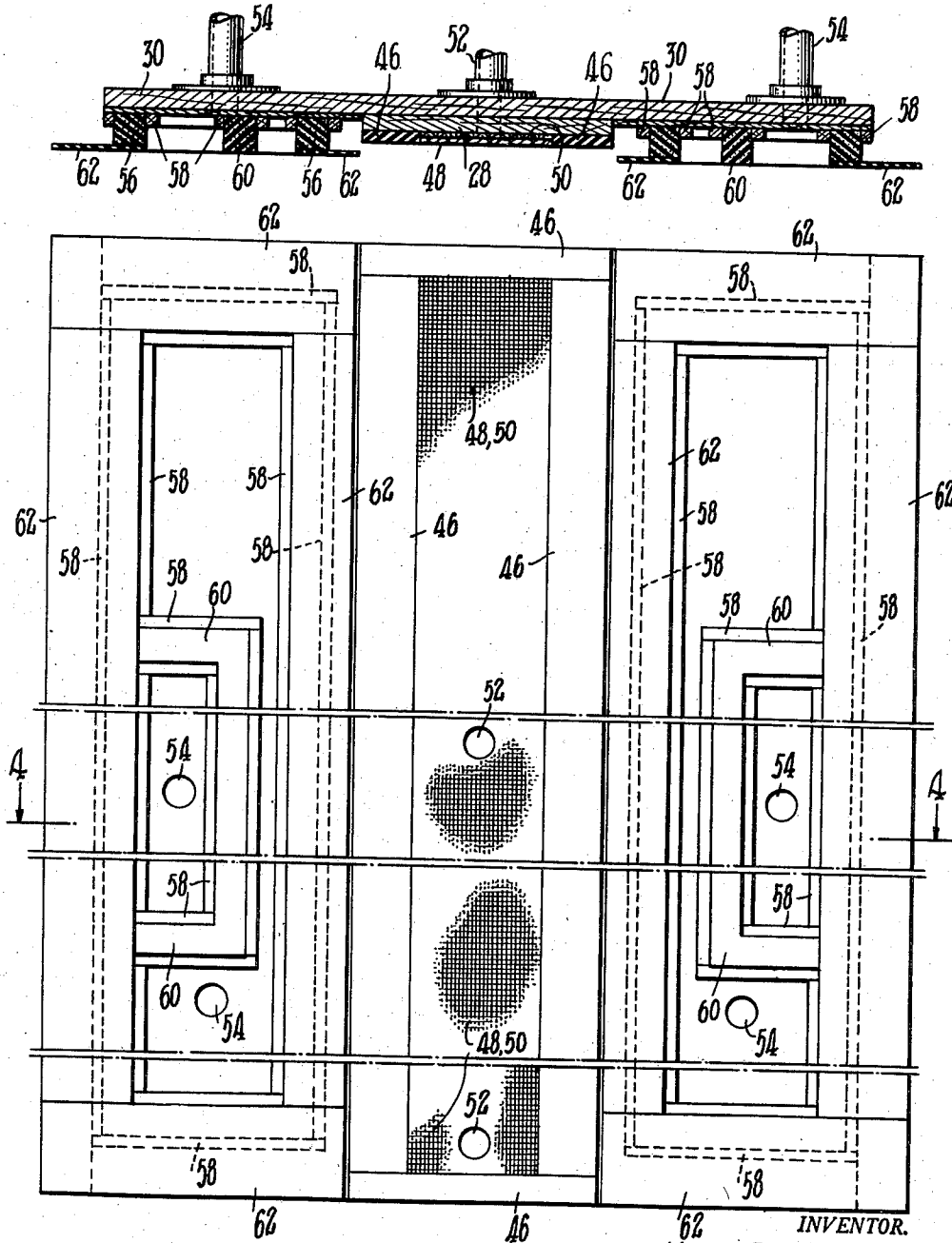


FIG. 3.

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CONCRETE MOLDING APPARATUS

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Original application September 5, 1947, Serial No.
772,324. Divided and this application February
7, 1949, Serial No. 75,039

10 Claims. (Cl. 25—131)

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Whereas precast concrete techniques have ob-
viated the need for much of the form-work re-
quired where concrete is cast in situ, current prac-
tice still requires the site erection of forms for
perfecting the joints between such precast mem-
bers. Inasmuch as the material and labor re-
quired in the construction of forms represents
an appreciable portion of the total cost of con-
crete work, it will be apparent that the use of
prefabricated joint forms which are rapidly ap-
plicable to and removable from the structure and
capable of repeated use, will effect tremendous
savings in the building industry.

It is accordingly an object of this invention to
provide forms which can be secured to spaced
structural members by means of subatmospheric
pressures so as to bridge the gap between them
and permit the pouring of a plastic concrete com-
position and at the proper time, by removal of
such subambient pressures, release such forms or
parts thereof and transfer them to the next joint
to be formed. For many applications of the
present invention, it is preferable that the mold-
ing surface of the forms thus secured to bridge
the structural members, permit the application
of subatmospheric pressure to the plastic com-
position itself for the purpose of removing such
excess vehicle as water, to produce a more com-
pact solidified body in much shorter time than
would be possible under natural atmospheric
conditions.

According to the present invention, in forming
a joint between spaced structural members, such
members are bridged with a closure which is se-
cured to at least one of them by the application
of subatmospheric pressure, and a plastic com-
position deposited between the members and the
closure. As already indicated, the composition
may be subjected to subatmospheric pressure as
well. It is also contemplated that opposed clo-
sures be thus employed to bridge the structural
members and that such closures be secured to at
least one of the structural members. The appli-
cation of subatmospheric pressure to the com-
position may be produced through the closure or
closures, by providing them with a perforated
or foraminous surface for contact with the com-
position, which may be accomplished by covering
the open side of an otherwise closed mat with a
fabric permitting the passage of a vehicle such as
water while serving as a barrier to solid particles
of the sizes employed in the composition.

As previously set forth by the present inventor,
a substantial portion of the water added in the
production of a concrete mix for commercial use

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serves the sole purpose of producing workable
consistencies and represents an excess insofar as
the requirements for setting are concerned. It is
this excess vehicle, or a substantial portion there-
of which can be removed to advantage after the
concrete mix has been deposited, to produce struc-
tures which become self supporting soon after
deposition and which possess superior character-
istics of compactness, strength, impact resist-
ance and uniformity, as compared with concrete
structures produced by more commonly known
commercial methods.

The apparatus contemplated herein for cast-
ing a moldable plastic composition between spaced
structural members comprises a molding surface
for contact with the composition, sealing means
on the surface for engagement with a surface
portion of the members, holding means connect-
ed with the molding surface comprising a mat
having sealing means for engagement with an
adjacent surface portion of the members, and
means for applying subatmospheric pressure in-
termediate the holding means and the adjacent
surface portion. It is also intended that means
for applying subatmospheric pressure between
the molding surface and the composition be pro-
vided. A perforate molding surface of the type
hereinabove mentioned and described elsewhere
among applicant's patents and applications, may
assume the form of a fabric covering for the
open side of an otherwise closed mat, supported
with respect to the mat by spacing means such as
wire mesh or other suitable material.

The holding means may comprise a plurality of
mats to be secured to the structural members ad-
jacent the molding surface. Marginal sealing
means on the molding surface may engage ad-
jacent surfaces of the structural members and
provide a seal between the molding surface and
the holding means as well as between the com-
position and atmosphere. The holding means
may be integral with or separable from the mold-
ing surface and the holding means may provide
portions overhanging the molding surface to
serve as a bearing for properly fixing the molding
surface during the molding operation.

It has been found in actual practice with the
apparatus of the present invention, that shortly
after subatmospheric pressure has been applied
to the composition, the separable holding means
can be removed, since the composition will be-
come self supporting so rapidly after a portion
of the excess vehicle has been removed that the
static forces tending to displace the molding sur-
face are rapidly and appreciably reduced. And

as a matter of fact, the time required for retaining the molding surface itself in position is diminished to a relatively short period because of the rapidity with which the composition becomes self supporting under the influence of the subatmospheric pressure to remove the excess water.

A more complete understanding of the invention will follow from a detailed description based upon the accompanying drawings wherein:

Fig. 1 is a fragmentary perspective illustrating the invention as applied to wall construction;

Fig. 2 is a fragmentary section taken along line 2—2 of Fig. 1;

Fig. 3 is an elevation of one of the forms shown at the right of Fig. 1; and

Fig. 4 is a section taken along line 4—4 of Fig. 3.

The precast concrete wall members 10 and 12 define a corner of the structure under consideration and an adjacent structural member 14 coplanar with one of the corner forming members 12 cooperates in forming a portion of one of the walls. An external closure 16 is shown as bridging the corner forming members, retained in position by a holder 18 applied to a portion of the member 10 and a holder 20 applied to a portion of the member 12. An internal corner closure 22 is similarly positioned to bridge the corner forming members by a holder 24 applied to a portion of the member 10 and a holder 26 applied to a portion of the member 12. These corner closures are depicted as separable from their respective holders while the closures 28 employed for producing the running joint between the elements 12 and 14 have been illustrated as unitary with their holders 30, and applied to opposite surface portions of the spaced elements 12 and 14.

Each of the holders is provided with marginal sealing means 32 to exclude atmosphere when it defines a closed chamber with the surface of the structural member to which it is applied for producing therein a subatmospheric pressure through a line 34 communicating with a suitable source of such pressure, such as a vacuum pump.

Each of the closure members is likewise illustrated as having communication with a source of subatmospheric pressure through a line 36 for withdrawing excess vehicle from a plastic composition such as concrete, which is deposited in the space defined between the opposed ends of adjacent precast structural member and the opposed closures.

The relationship of parts for forming the corner joint or column is illustrated in more detail in Fig. 2 wherein the precast structural members 10 and 12 are shown as having enlarged ends 38 containing grooves 40 in which the deposited concrete 42 will become interlocked. The closure member 16 may be formed from two sections of plywood or the like arranged at right angles and reinforced by an angle 44. The internal or molding surface of the closure 16 is bounded by a sealing member 46 of strip rubber or the like which bears upon the adjacent edge portions of the spaced precast structural members between which the joint is to be produced. The portion of the closure molding surface intermediate this marginal sealing means is faced with a woven fabric 48 pervious to water or other vehicle to be withdrawn but impervious to the solid particles of the composition being molded. The fabric is supported out of contact with the closure body by means of woven wire mesh 50 or the like so that the subatmospheric pressure produced

through a projecting nipple 52, by means of a vacuum pump connected therewith by a conduit 36, will be substantially uniformly distributed over the adjacent surface of the composition 42.

Since the concrete or other plastic composition is usually quite plastic when first deposited, its static head requires appreciable force for retention of the closures at the outset, produced in this case by the use of vacuum operated holders. For this purpose the closures 18 and 20, which may be constructed of a suitable number of layers of plywood are applied to portions of the structural members adjacent the closure by means of subambient pressures produced through a suitable number of nipples 54 and conduits 34 leading to a vacuum pump. The wall engaging surfaces of these holders carry yieldable sealing members 56 formed of sponge rubber or the like retained between suitable strips or beads 58. Similar sponge rubber supports 60 are provided intermediate the sealing members, particularly where the spans involved would otherwise produce excessive stresses upon the holder body under the subambient pressures encountered. To assure a quick and positive seal between the holders and the wall surfaces to which they are applied, even where such surfaces are somewhat rough, thin rubber sealing flaps 62 are secured to the sealing members 56 to extend therebeyond for engagement with an appreciable area of the wall, which flaps may assume the form of limp resilient and thin material such as yellow balloon rubber. Overhanging portions of these holders provide projections 64 which engage a portion of the closure to force it into its operative position when the holder is applied to the wall and its sponge rubber sealing members and supports yield under the influence of the subatmospheric pressure produced between the holder and the wall as shown in Fig. 2.

The internal corner closure 22 is likewise provided with a marginal rubber sealing gasket 46 and faced with a fabric backed with woven wire mesh or the like in the same manner as described with respect to the external closure. The internal holders 24 and 26 are in turn similar to the external holders 18 and 20 except for such physical dimensions as may vary to accommodate the configuration of particular structural members. In the case illustrated in Fig. 2, the internal holders are somewhat narrower and somewhat thicker than the external holders.

In applying the invention, with the structural members 10 and 12 in erected position, the internal and external closures are applied, the separable holders positioned to bear upon them, and subatmospheric pressure is then introduced between the holders and the structural members through the conduits and nipple provided for this purpose. This will result in securing the closures in position, whereupon the plastic mix is introduced into the form thus defined and subatmospheric pressure is applied to the mix through the perforate surfaces of one or both of the closures. As soon as a predetermined portion of the excess vehicle has been withdrawn from the mix, the composition begins to become self supporting and the static head becomes reduced sufficiently to permit discontinuance of the subatmospheric pressures applied between the holders and the structural members and the holders themselves can then be removed. In due time, the subatmospheric pressure applied to the composition through the clo-

sure or closures can also be discontinued and the closures removed.

In some instances, particularly where the thickness of the column or joint is small, it may be unnecessary to apply subatmospheric pressure both internally and externally of the concrete, in which case one of the closures may serve merely as a barrier to retain the mix in position while the subatmospheric pressure is applied to the opposite surface alone. In such a case, one of the closures may assume a simpler form.

It will be understood that the running joints or columns may be produced with similarly separable closures and holders, differing in configuration to accommodate the shape which it is desired to impart to the molded material. It is contemplated for some applications of the invention, to construct the closures and holders in a unitary fashion, as distinguished from separably, as has been depicted in Figs. 3 and 4. In these figures, the closure 28 and the holders 30 are suitably joined together by bolts, screws, or the like, so that the assembly may be applied as a unit to the spaced structural members between which it is desired to produce a molded joint. Inasmuch as the elements composing this form of the invention are similar to those described with reference to the preceding figures, they have been similarly identified and will require no extended discussion. It will be noted that the intermediate supports 60 best shown in Fig. 3 can be terminated or extended as desired to best suit the surface to which it is applied. It will be understood that the closures and holders for such running joints might well be separable in the manner described with reference to the corner joint previously described, bearing in mind that where the construction is unitary, the entire assembly must be retained in position until the composition has become sufficiently self supporting to permit its removal.

The subatmospheric pressures applicable to the plastic composition will assume values in the ranges disclosed in the Billner Patent No. 2,046,867, dated July 7, 1936, and the subatmospheric pressures applied to the holders will be as great or greater. The effective area of the holder or holders for a given closure opposed to a cooperating surface will be computed in each application to exceed that necessary to retain the form equipment and plastic composition in position for the value of subatmospheric pressure to be used.

By the term "subatmospheric" employed throughout this specification and in the claims to characterize pressures, is intended a pressure condition below that of the surrounding atmosphere, whether that atmosphere be ordinary air at natural atmospheric pressure, some fluid other than air, or some different pressure. For example, if the apparatus were employed in a pressure chamber or under water, the atmospheric pressure would be that of the medium surrounding the operation, and subatmospheric pressure would be a lower pressure.

This application is a division of application Serial No. 772,324, filed on September 5, 1947, which matured into Patent No. 2,548,935, April 17, 1951.

Whereas but two specific embodiments of the invention have been described with reference to the drawings, many variations will occur to those skilled in the art as they have been recognized already by the present inventor, rendering it

important that these examples should not be construed to restrict the invention beyond the scope of the appended claims.

I claim:

1. A form for casting a moldable plastic composition between spaced structural members comprising a molding surface for contact with said composition, sealing means substantially bounding said surface for engagement with a surface portion of said members, holding means connected with said molding surface comprising a mat having sealing means for engagement with an adjacent surface portion of said members, and means for applying subatmospheric pressure intermediate said holding means and said adjacent surface portion.

2. A form for casting a moldable plastic composition between spaced structural members comprising a molding surface for contact with said composition, sealing means substantially bounding said surface for engagement with a surface portion of said members, holding means connected with said molding surface comprising a mat having sealing means for engagement with an adjacent surface portion of said members, means for applying subatmospheric pressure intermediate said holding means and said adjacent surface portion, and means for applying subatmospheric pressure through said molding surface to said composition.

3. A form for casting a moldable plastic composition between spaced structural members comprising a perforate molding surface for contact with said composition, sealing means substantially bounding said surface for engagement with a surface portion of said members, holding means connected with said molding surface comprising a mat having sealing means for engagement with an adjacent surface portion of said members, means for applying subatmospheric pressure intermediate said holding means and said adjacent surface portion, and means for withdrawing excess vehicle from said composition through said perforate molding surface.

4. A form for casting a moldable plastic composition between spaced structural members comprising an angular molding surface for contact with said composition, sealing means substantially bounding said surface for engagement with a surface portion of said members, holding means connected with said molding surface comprising a plurality of mats having sealing means for engagement with an adjacent surface portion of said members, and means for applying subatmospheric pressure intermediate said holding means and said adjacent surface portion.

5. A form for casting a moldable plastic composition between spaced structural members comprising a molding surface for contact with said composition, marginal sealing means bounding said surface for engagement with a surface portion of said members, holding means connected with said molding surface comprising a mat having sealing means for engagement with an adjacent surface portion of said members, and means for applying subatmospheric pressure intermediate said holding means and said adjacent surface portion.

6. A form for casting a moldable plastic composition between spaced structural members comprising a molding surface for contact with said composition, sealing means substantially bounding said surface for engagement with a surface portion of said members, holding means integral with said molding surface comprising a mat

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having sealing means for engagement with an adjacent surface portion of said members, and means for applying subatmospheric pressure intermediate said holding means and said adjacent surface portion.

7. A form for casting a moldable plastic composition between spaced structural members comprising a molding surface for contact with said composition, sealing means substantially bounding said surface for engagement with a surface portion of said members, separable holding means connected with said molding surface comprising a mat having sealing means for engagement with an adjacent surface portion of said members, and means for applying subatmospheric pressure intermediate said holding means and said adjacent surface portion.

8. A form for casting a moldable plastic composition between spaced structural members comprising a molding surface for contact with said composition, sealing means substantially bounding said surface for engagement with a surface portion of said members, holding means having a bearing member overhanging said molding surface comprising a mat having sealing means for engagement with an adjacent surface portion of said members, and means for applying subatmospheric pressure intermediate said holding means and said adjacent surface portion.

9. A form for casting a moldable plastic composition between spaced structural members comprising a molding surface for contact with said composition, holding means connected with said

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molding surface comprising a mat for engagement with an adjacent surface portion of said members, sealing means interposed between said surface, mat and members, said sealing means including means substantially bounding said surface, and means for applying subatmospheric pressure intermediate said holding means and said adjacent surface portion.

10. A form for casting a moldable plastic composition between spaced structural members comprising a molding surface for contact with said composition, holding means connected with said molding surface comprising a mat for engagement with an adjacent surface portion of said members, sealing means for said surface, mat and members, said sealing means including means substantially bounding said surface, means for applying subatmospheric pressure intermediate said holding means and said adjacent surface portion, and means for applying subatmospheric pressure intermediate said surface and composition.

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