Sept. 25, 1962 B. C. GERWICK 3,055,077

METHOD FOR THE MANUFACTURE OF CONCRETE STRUCTURES

Filed April 10, 1958

FIG_1

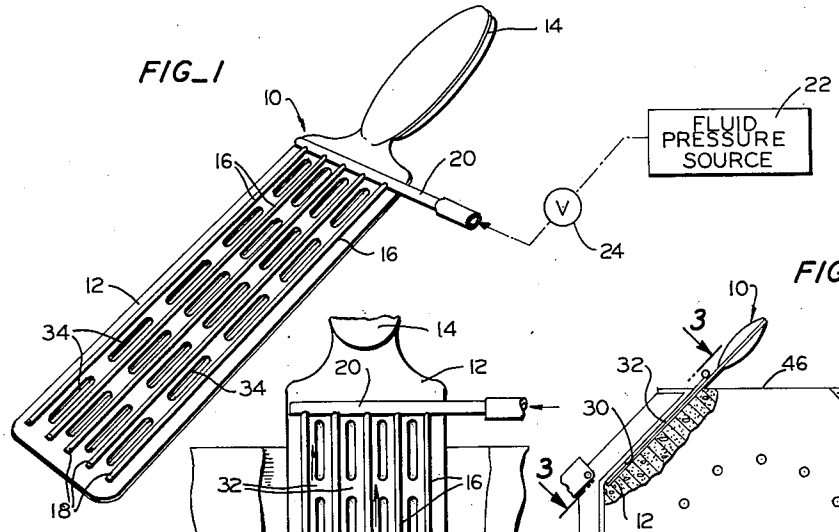


FIG_2

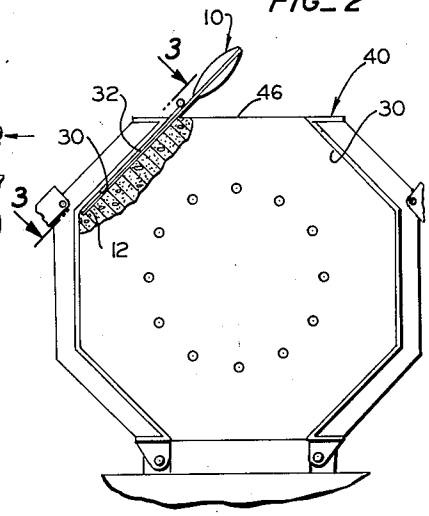


FIG_3

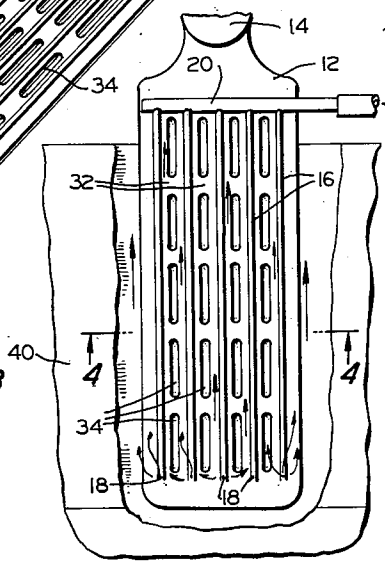
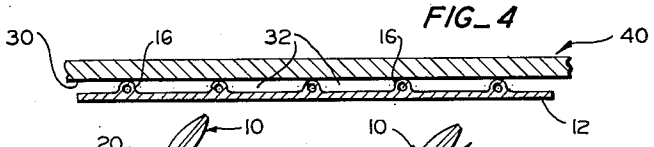


FIG_4



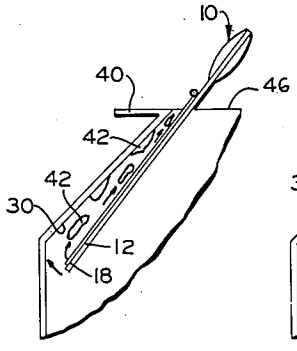


FIG_5A

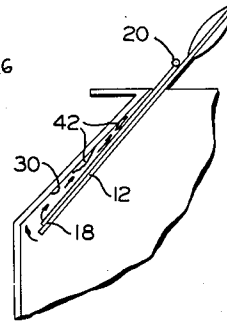


FIG_5B

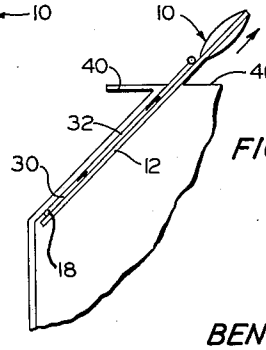


FIG_5C

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METHOD FOR THE MANUFACTURE OF CONCRETE STRUCTURES

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6 Claims. (Cl. 25—155)

This invention relates to methods for the manufacture of concrete structures.

In the forming of many prestressed or precast concrete objects, such as I and T girders and beams, octagonal concrete piling and the like, it is necessary to use mold forms having downwardly directed return surfaces. One difficulty with forms of this type is a tendency for pockets of water and air to collect adjacent the return surfaces during the curing of the concrete material. Apparently the water, being less dense than the other materials in the concrete mix, tends to rise much as the air bubbles rise until it is trapped within the concrete mix at the mold surface. Adjacent upper exposed openings of the mold, these water pockets create no problem since the mix can be agitated and smoothed by hand to provide an unmarked outer surface. However, in the areas adjacent the return surfaces of the mold, evaporation and escape of the water leave unsightly pock marks on the outer surfaces of the concrete. A further problem is that these deformities are only discovered when the mold form is removed. In prestressed concrete structures, these pock marks also are particularly objectionable in that they detract from a desired thickness of concrete over the reinforcing steel and prestressing strands extending through the concrete. Accordingly, grout filling of the pock marks and depressions is not a satisfactory solution to the problem.

In general, it is an object of the present invention to provide improved methods of forming prestressed or precast concrete objects by which pock marks and holes due to the collection of water and air adjacent return surfaces of a mold are virtually eliminated.

Another object of the invention is to provide means for carrying out the improved method of the character described which is inexpensive and easily adapted to existing manufacturing procedures.

Other objects and advantages of the invention will appear from the following description and from the drawings in which:

FIGURE 1 is a view in perspective of means useful in carrying out the invention;

FIGURE 2 is a diagrammatic representation of the use of the device shown in FIGURE 1, for example, in conjunction with the manufacture of octagonal piling;

FIGURE 3 is a view in section and elevation along the line 3—3 of FIGURE 2;

FIGURE 4 is a detail view in section along the line 4—4 of FIGURE 3; and

FIGURES 5A, B and C are a diagrammatic representation in sequence, illustrating the method of the invention.

Generally stated, the present invention is based on the discovery that if partially cured concrete adjacent return surfaces of a mold form is subjected to an upwardly rising stream of fluid, such as water or air under pressure, such stream of fluid will tend to channel undesired existing pockets of air and water to an upper exposed surface of the form where they can be eliminated. The most satisfactory results are obtained if the concrete is allowed to remain in a quiescent state after the initial pouring, or until it has achieved a stiff, partially cured state. It has been found that in such state the channelling effect produced by the upwardly rising streams of fluid is enhanced without permanent deformation of the concrete mix.

Referring to the drawings, FIGURE 1 illustrate one form of a device for injecting streams of fluid beneath the surface of partially cured concrete. As shown, the device comprises a paddle-like member **10** including a rigid substantially flat frame **12** and a handle **14**. Extending lengthwise of the frame and integral therewith are a plurality of fluid conduit means **16**, each provided with one or more apertures **18** for the escape or projection of tiny streams of air or water in a direction away from the base of the frame **12**. A main supply conduit **20** communicates with the opposite ends of the conduits **16**, and is supplied with fluid from a pressure source **22** through a suitable valve **24**. The source **22** may be either water, as from a conventional water main, or a supply of compressed air, say at 10 to 20 p.s.i. or higher pressures.

As will be apparent from FIGURES 2 to 4, when the device **10** is inserted into a concrete mix and positioned inwardly adjacent a return surface, such as the upper mold surface **30**, the fluid escaping from the openings **18** will be constrained into the flow paths **32** between the conduits **16** as indicated by the arrows in FIGURE 3. Desirably the frame **12** of the device is also provided with a plurality of perforations or openings **34** to facilitate movement of the paddle-like portion of the device through the stiff concrete. The openings **34** also provide transverse flow paths allowing some water or air to escape into the area behind the paddle, so that the zone of action of the upwardly rising stream of fluid issuing from the conduits **16** is substantially enlarged.

In carrying out the method of the invention, concrete is poured into a suitable mold, such as the octagonal piling form **40**, and allowed to remain in a quiescent state until partially set. For most concrete mixes, a curing period of about 10 to 20 minutes (usually about 15 minutes) will suffice. The device **10** can be employed to initially agitate and knead the mix adjacent the return surfaces **30** of the mold, with the interrupted openings **34** permitting a certain freedom of movement of the paddle through the mix. In a preferred procedure, the paddle portion **12** of the device is first positioned well inwardly of the return surface **30**, as illustrated in FIGURE 5A. It will be noted that in this position the stream of fluid rising from the openings **18** tends to channel through the mix and carry with it the pockets **42** of entrapped water and air. The device is now slowly rotated into an outermost position in which the upper surfaces of the conduits **16** engage the inner or return surface **30** of the mold. In this position the fluid stream is forced upwardly with considerable pressure, increasing the upward channeling action of the entrapped air and water pockets. The device **10** can now be gradually removed, as illustrated in FIGURES 5B and C, so as to insure a desired complete elimination of the water pockets **42**. Thereafter the upper exposed surface of the mix, at **46**, can be worked and smoothed by hand to provide an unmarked exterior surface.

From the above description of an exemplary procedure and embodiment, it will be apparent that the present invention makes possible a simplified means of treating concrete mixes during their curing to form precast or molded objects that are virtually free of exterior deformations caused by entrapped water or air. Moreover, the procedures of the present invention are readily adaptable to existing manufacturing operations, as the equipment required is inexpensive and makes use of readily available sources of supply.

Various embodiments and differing applications of the invention than those described may also be employed without departing from the spirit and scope of the invention. For example, the fluid outlets **18** need not be provided only in the lower extremities of the conduits **16** but may be provided at other spaced positions, or continuous-

ly along the length of the conduits. Likewise the width of the frame **12** may be much greater than its length, in contrast to the particular structure disclosed. Accordingly it should be understood that the disclosures and description herein are purely illustrative and are not intended to be in any sense limiting.

I claim:

1. A method of forming a molded concrete structure with a prepared upper return surface comprising the steps of pouring concrete into a mold having an upper return surface, allowing the poured concrete to remain in a quiescent state until partially set, slowly kneading a subsurface volume of the concrete adjacent said return surface while passing an upwardly rising stream of fluid through said volume, said kneading step including a straining of said volume commencing inwardly of said surface and proceeding slowly to said surface.

2. The invention according to claim 1 passing a plurality of upwardly rising independent fluid streams through said volume.

3. A method as in claim 1 wherein said upwardly rising stream of fluid originates adjacent lower portions of such return surfaces.

4. A method as in claim 1 wherein said concrete is allowed to set prior to the action of said stream of fluid for a period of from ten to twenty minutes.

5. A method as in claim 1 wherein said fluid is air.

6. A method as in claim 1 wherein said fluid is water.

References Cited in the file of this patent

UNITED STATES PATENTS

823,457	Wilson	June 12, 1906
1,911,966	Pickop	May 30, 1933
1,961,388	Pickup	June 5, 1934
2,055,514	Whiting	Sept. 29, 1936
2,411,317	Day	Nov. 19, 1946
2,476,551	Johnson	July 19, 1949
2,528,643	Dubbs	Nov. 7, 1950
2,638,655	Creskoff	May 19, 1953
2,674,775	Willson	Apr. 13, 1954
2,841,856	Gelbman	July 8, 1958

FOREIGN PATENTS

52,667	Netherlands	June 15, 1942