

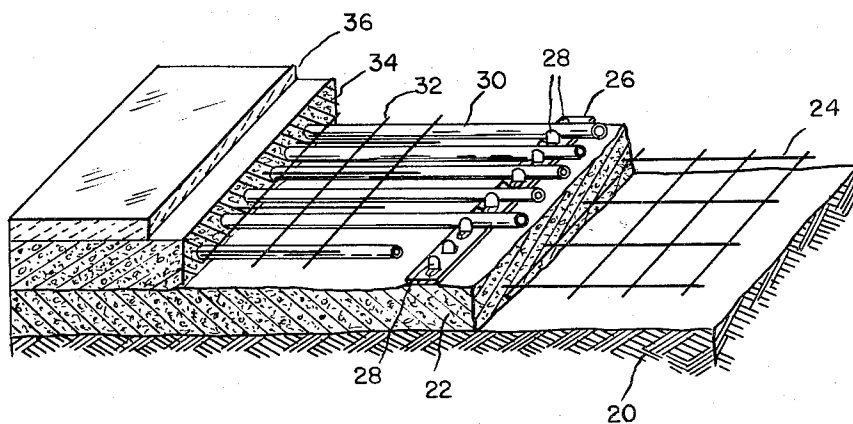
Aug. 29, 1961

C. R. BELTZ

2,997,770

METHOD FOR MANUFACTURE OF AN ENCASEMENT STRUCTURE

Filed Sept. 29, 1958



INVENTOR.

CHARLES R. BELTZ

BY

W. H. Hutton, Hubert W. Hutton

ATTORNEYS

1

2,997,770

METHOD FOR MANUFACTURE OF AN ENCASEMENT STRUCTURE

Charles R. Beltz, 500 Lakeland Ave.,
Grosse Pointe 30, Mich.

Filed Sept. 29, 1958, Ser. No. 764,099
6 Claims. (Cl. 25-154)

This invention pertains to a method for manufacture of an encasement structure wherein a member is encased in a material having a substantially different temperature coefficient of expansion in such a manner that the clearance between said member and the material is held at all temperatures to a minimum.

More specifically, this invention pertains to a method for embedding a tubing in a concrete slab for use in the manufacture of artificial ice skating rinks so that during very low temperatures the contraction of the tubing will not create voids with the concrete where water accumulation and damage can occur.

It is an essential object of this invention to change the size of the member or the material, in which it is to be embedded, having the greater temperature coefficient of expansion before the member is embedded in the material so that during the normal range of temperatures to which the material and member are subjected a minimum of clearance or voids will exist therebetween.

Another object of this invention is to provide a method and manufacture for precontracting a member before its encasement in a material having a substantially smaller temperature coefficient of expansion.

Another object is to modify the temperature of a member before it is embedded in a material having a smaller temperature coefficient of expansion so that the member is contracted due to the applied temperature while the member is being embedded in the material whereby a minimum of void space will occur between the member and the material during the normal range of temperatures experienced thereby.

Another object is to provide a method for encasing non-metallic tubing, such as plastic tubing, in concrete slabs wherein the tubing is filled with coolant to bring the tubing temperature down sufficiently to contract the tubing and then maintain this temperature while the concrete is being poured and for a predetermined time thereafter.

Another object is to provide a method for forming an ice skating rink construction wherein a concrete base having a rough finish is poured and allowed to set but not harden and then laying thereon plastic tubing containing a coolant fluid under pressure and then placing over the tubing a wire mesh and then pouring a layer of concrete over the tubing and the rough finish base to provide a compact construction wherein the tubing is pre-contracted.

These and other objects will become more apparent when a preferred embodiment of the method and manufacture is considered in connection with a broken away, perspective drawing of a concrete slab having plastic tubing embedded therein.

In the drawing is shown a broken away view of a preferred embodiment of this invention wherein a soil base 20 has formed thereon a rough finish concrete layer 22 in which is embedded a supporting wire screen mesh 24. Layer 22 supports a spacer bar 26 having upstanding ears 28 struck therefrom for supporting a series of precontracted tubes 30 made of a plastic, such as Kralastic, which is a modified styrene copolymer manufactured by United States Rubber Company. Tubes 30 have placed thereon wire mesh 32 and formed thereover a finish concrete layer 34 and coolant is supplied to the tubes to form a layer of ice 36. The tubes 30 are connected to

2

each other at their ends to form a continuous tube section.

Plastic is a desirable material for the tubes in such a construction since it withstands the corroding effects of the conventionally used coolants and is less expensive than a metal pipe.

The plastic used in such constructions has a temperature coefficient of expansion substantially greater than, and in this particular embodiment approximately ten times greater than, that of the concrete in which it is embedded. During very low temperatures, the tube in conventional constructions will contract sufficiently more than the concrete to form voids therebetween which are filled with moisture in the concrete causing tube damage and deterioration.

This invention overcomes this problem by filling the tubes 30 with a coolant prior to forming the concrete thereabout so that the tube is contracted during the hardening of the concrete. By precontracting the tube temperature elevation will simply tend to expand the tube against the adjacent concrete and a temperature drop will relieve this expansion tendency with no voids being created.

In a particular method of this invention, the soil base 20 is first prepared by leveling and filling with sharp sand and tamping well; a 6" x 6" x 6# steel reinforcing mesh 24 is laid upon the leveled area; concrete is prepared by thoroughly blending a dry mixture of 1 part Portland cement, 2 parts sharp sand, and 3 parts of coarse aggregate passed through a 3/8" square opening, and then mixing with 5 to 6 gallons of water per 100 lbs. of cement used; the concrete mixture is then poured without interruption, and with no attempt to float the cement to the surface, on the wire mesh; the cement so poured is allowed to set no longer than is necessary to permit further work to proceed (approximately 24 hours); a series of spacer bars 26 is then placed on the concrete so formed; a grid of continuous parallel plastic tubing 30 on 3 1/2" centers is then positioned on the slab in the spacer bars 26; a coolant of a suitable nature is then pumped into the grid system at a pressure between 40 and 50 lbs. per square inch; a 6" x 6" x 10# steel concrete reinforcement mesh 32 is then laid upon the grid of plastic tubes 30. A second concrete mixture which is composed of substantially the same materials as the first concrete slab mixture but where the dry mixture preferably includes a common dispersing agent to reduce the water required for a given consistency and where the dry mixture ingredients should preferably net between 120 and 125 lbs./cu. ft., is prepared; the coolant temperature is then reduced to 40° F. and maintained there while the second concrete mixture is poured on top of plastic tube grid; the temperature of the coolant is then reduced to 34° F. to 38° F.; the second concrete slab 34 is then finished with a smooth surface during which time the coolant temperature is approximately 36° F. which temperature shall be maintained for the following 24 hours; at the end of the 24 hour period the coolant temperature is raised to about 40° F. and held there for one week; the coolant temperature thereafter is raised 10° F. each week until ambient temperature is reached; and one month after final cure the coolant temperature is reduced to 28° F. to 32° F. for one week.

Briefly, the method comprises, first, preparing a soil base 20 for receiving a steel reinforcing mesh 24; pouring a rough finish concrete slab 22 on top of the mesh with no attempt to float the cement to the surface of the slab; allowing the slab to set but not harden and then clamping thereon a grid of continuous parallel plastic tubing 30; pumping coolant under a pressure of 40 to 50 lbs. per sq. inch and at a temperature of 40° F. into the

tubing; placing a second steel reinforcing mesh 32 on top of the tubing grid 30 and then pouring a second concrete slab 34 on top of the mesh 32 and grid of plastic tubing 30; reducing the coolant temperature to 34° F.-38° F. and maintaining this temperature for 24 hours after which the temperature is raised to 40° F. and held for one week; raising the coolant temperature 10° F. per week until ambient temperature is reached; and one month after final cure reducing the coolant temperature to 28° F.-32° F. for one week.

The initial coolant pressure is maintained until the cement is sufficiently hardened so that the tube retains its initial shape. The temperature variations of the coolant, after the concrete slab begins to cure, aid in obtaining desired curing conditions resulting in a very uniform and stable concrete base.

The slab construction may be used for an ice skating rink base. To establish a skating surface, the rink temperature is brought down to approximately 32° F. at which time water is sprayed upon the concrete surface with the grid temperature falling to as low as 13° F. until a thick sheet of ice is formed.

This method is also applicable to instances where the embedding material has a greater coefficient of expansion than the embedded member. Under these conditions the temperature of the material is elevated to a point where it will reach its normal full expansion and then as the temperature is reduced, after the material has set and hardened, it will compress the member therein and at no time will voids form between the material and the member during subsequent temperature elevation.

The drawings and the foregoing specification constitute a description of the improved encasement structure and method for manufacture thereof in such full, clear, concise and exact terms as to enable any person skilled in the art to practice the invention, the scope of which is indicated by the appended claims.

What I claim as my invention is:

1. A method for encasing a plastic tubular member in a concrete material having a coefficient of expansion differing from said member comprising the steps of pouring a rough finish concrete base, laying said tubular member thereon, filling said member with a fluid under pressure, cooling said fluid to contract said tube, pouring a concrete layer over said contracted tube before said base has fully hardened, maintaining said temperature at or below said contracting temperature until said material has sufficiently set about said member so that said tube remains contracted and said concrete is properly set.

2. A method for encasing a plastic tubular member in a concrete material having a coefficient of expansion

differing from said member comprising the steps of pouring a rough finish concrete base, laying said tubular member thereon, filling said member with a fluid under pressure, cooling said fluid to contract said tube, placing a wire mesh onto said member, pouring a concrete layer over said contracted tube and wire mesh before said base has fully hardened, maintaining said temperature at or below said contracting temperature until said material has sufficiently set about said member so that said tube remains contracted and said concrete is properly set.

3. A method of encasing a contractable tubular member in a moldable composition material, of the type which hardens and sets, so as to minimize voids or clearances between said member and said composition material, comprising the steps of embedding said tubular member in said composition material when the latter is in a moldable condition, and while said composition material hardens and sets about said member maintaining a coolant in said tubular member at a temperature low enough to contract said tubular member, said tubular member thereafter remaining contracted by the hardened and set composition material so as to minimize clearances between said tubular member and the hardened and set composition material.

4. The method defined in claim 3 wherein said tubular member has a higher coefficient of thermal expansion than said composition material.

5. The method defined in claim 3 wherein said coolant is introduced into said tubular member before said member is embedded in said composition material and under a pressure sufficient to support said tubular member from collapse when subsequently embedded in said composition material.

6. The method defined in claim 5 wherein said tubular member has a higher coefficient of thermal expansion than said composition material.

References Cited in the file of this patent

UNITED STATES PATENTS

1,273,073	Lake	July 16, 1918
1,507,592	Funk et al.	Sept. 9, 1924
2,009,362	Mourraillie	July 23, 1935
2,291,680	Billner	Aug. 4, 1942
2,319,105	Billner	May 11, 1943
2,765,511	Greene	Oct. 9, 1956
2,769,315	Meadows	Nov. 6, 1956

FOREIGN PATENTS

41,790	Australia	Apr. 11, 1910
86,692	Norway	Oct. 28, 1955