July 16, 1963 H. C. SALASSI 3,097,492

METHOD OF FORMING CONCRETE PILES IN SITU

Filed March 20, 1961

FIG. 1.

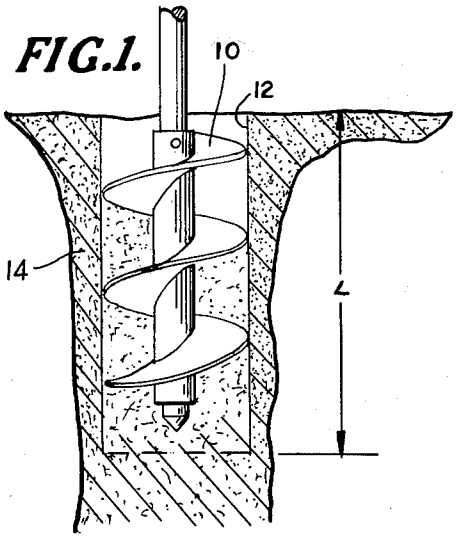


FIG. 2.

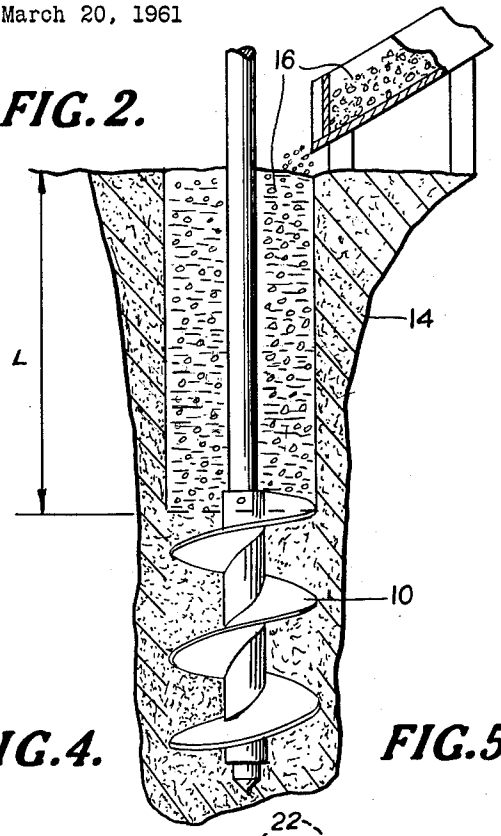


FIG. 3.

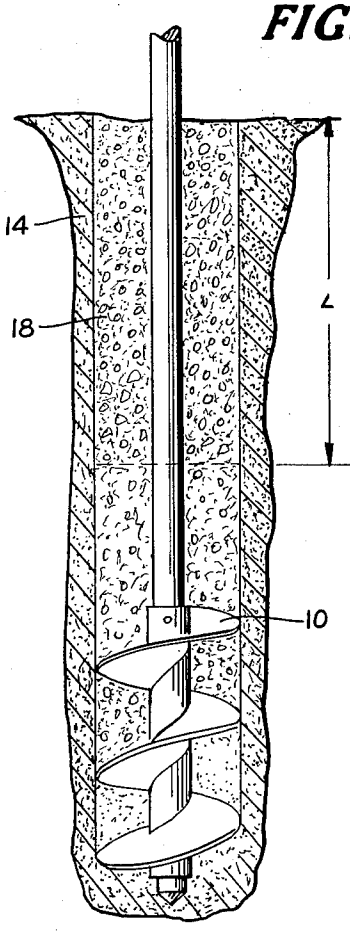


FIG. 4.

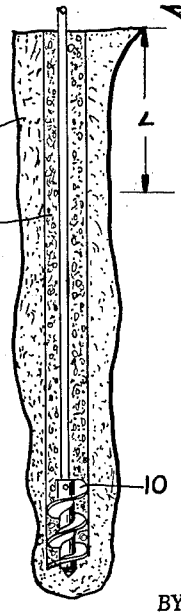
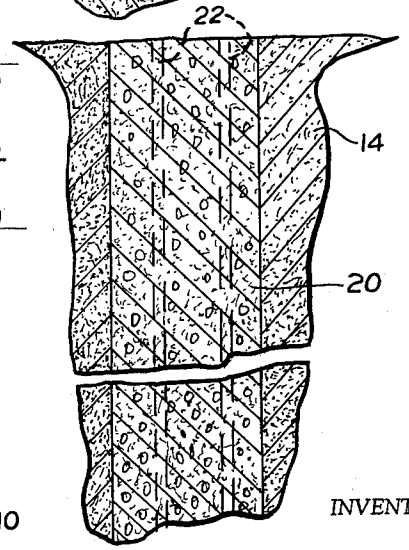


FIG. 5.



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METHOD OF FORMING CONCRETE PILES IN SITU

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This invention relates to a new and improved method of forming concrete piles in situ.

The advantages of forming concrete piles in situ are widely recognized, particularly in instances where the required pile is of a relatively great length, and a suitable preformed pile would present relatively expensive and cumbersome handling problems. This is aptly illustrated in situations where a number of concrete piles are to be placed in a remote and generally inaccessible area.

Numerous methods have been advanced for forming concrete piles in situ. Such prior art methods generally employ such features as forcing pre-mixed grout through a hollow cylindrical tool placed within a hole; or, in instances where an auger is used in the pile-forming process, the auger is operated to loosen the soil, and to some extent, to mix the soil with a pre-mixed binding agent.

While such prior art methods have enjoyed varying degrees of success insofar as the desired end result is concerned, they generally require specially constructed tools such as hollow shafts with unusual blade structures attached thereto. Additionally, the introduction of grout or the like under pressure into a hollow shaft necessitates special transporting and pumping equipment which further hampers prompt and convenient construction, as in remote areas.

An object of this invention is to provide a new and improved method of forming concrete piles in situ which is far simpler than heretofore known methods, which requires only use of conventional tools and equipment.

Another object of this invention is to provide a method of forming concrete piles in situ wherein a conventional auger is used both for mixing and drilling; the cement, water, aggregate and the like being added for mixing by the auger with the sandy soil in the upper portion of the desired hole depth. In this regard the auger acts in the manner of the blade of a concrete mixer.

Still a further object of the invention is to provide a method of forming concrete piles in situ wherein a hole is drilled by an auger to a portion of the desired pile length, cement, water and other desired materials are added as such to this upper portion of the hole, and the auger is operated to continually raise sandy soil from below this area for mixing with the constituent materials, the material being added, and the auger raising and mixing the gravel until the desired pile length and consistency is obtained.

Further objects and advantages of this invention will become evident in the specification, claims, and the accompanying drawing.

FIGURES 1–5 show in vertical section a sequence of steps in constructing a concrete pile according to this invention.

At the place where a concrete pile of predetermined length is to be formed, a hole is dug which is a fraction of the total length of the pile. For example, if a concrete pile 30 feet in length is to be formed and the desired mix composition is 1:2:1, the hole will be initially dug to a depth of about 10 feet. To this end, a standard auger is provided of a size corresponding to the diameter of the pile and is mounted on any conventional earth drilling rig (not shown). This portion of the hole, designated as L in FIGURES 1–4, provides a mixing chamber, as will become apparent.

After the hole is drilled to the depth L, and while the auger is preferably still turning, water and cement are

added to the hole L while the auger is lowered into the undisturbed sand, then raised, so that the sand, cement and water can be mixed by the auger. The auger is again lowered to a point six or eight inches lower than before, and this unmixed sand is brought to the mixing area L and more water and cement are added, as necessary. This procedure is repeated until the auger has been drilled to the required depth.

It will be appreciated that the auger serves the dual function of a drilling tool and a mixing tool; and, after the auger has drilled and mixed the sand in the portion of the hole below the area L with the constituents added to the area L, the auger is raised and lowered from top to bottom several times to ensure a thorough mixing of cement, sand, and water. The contents of the hole thereby are in the form of well-mixed mortar.

Gravel, crushed stone and the like are conveniently added to the now formed mortar as desired, and the rotating auger is raised and lowered until these materials are evenly distributed from top to bottom. As desired, reinforcing rods can be installed in the hole after the mixing operation is completed.

Referring specially to the drawings, in

FIGURE 1 the auger **10** is shown during the initial drilling operation wherein a hole **12** is drilled to a depth L in the soil formation **14** and the sand is removed therefrom, this fraction of the ultimate hole depth serving as an initial mixing chamber. Cement **16** and water are then added to the hole **12** and mixed with sand raised to this area by the rotating auger **10**.

FIGURES 2–4 show the subsequent pile forming operation, wherein the auger **10** is continually drilling into the packed sand and raising the material to the upper region L of the hole **12** for mixing with added cement and water, the mixed sand, cement and water being indicated by the reference numeral **18**. In FIGURE 4, the auger **10** is shown near the final stage of the drilling operation, where the lowermost quantity of sand has just been drilled. This sand will then be raised upwardly for mixing with the constituents added to the top of the hole **12**. The entire length of the hole **12** will then be subjected to a final mixing operation by raising and lowering the rotating auger **10** to provide a uniform consistency throughout the length of the hole **12**, adding gravel and aggregate if necessary or desired.

In FIGURE 5 the final uniformly mixed body of settable material is shown at **20**, reinforcing rods **22** have been placed in the pile, and the structure is completed.

It will be appreciated that, by virtue of forming the pile as described, the problem of introducing solids or semi-solids into the hole through a hollow shaft under pressure is obviated. The operation is simple and utterly reliable, as the quantities of water, cement and the like to be added to the hole, as well as the amount of sand to initially remove, may be readily calculated, depending on the size and composition of the pile desired. In this regard, the amount of water to be added will be determined by the water table in the particular locale. Further, the only special equipment required at the scene is a conventional earth drilling rig with a suitable auger operably attached thereto.

Throughout the specification and claims the term "sand" or "sandy soil" is used in a liberal sense to signify a type of soil that is adapted for mixing with cement and water or equivalent constituents to provide a pile structure.

It will thus be seen that the objects of this invention, together with many practical advantages, have been successfully accomplished.

It will be realized however, that the foregoing specific embodiment has been shown and described only for the

purpose of illustrating the principles of this invention and is subject to change without departure from such principles. Therefore, this invention includes all modifications encompassed within the spirit and scope of the following claims.

I claim:

1. Method of forming concrete piles in situ comprising the steps of: drilling a hole in sandy soil to a predetermined fraction of the ultimate pile depth and removing the soil therefrom, this hole constituting a mixing area; adding hydraulically settable cementitious material to the hole to form a fluid concrete mix with the underlying soil; drilling to a slightly lower depth into the underlying soil by means of a rotating auger and raising the newly drilled soil upwardly and mixing the newly drilled soil with the cementitious material thereabove by raising the rotating auger into the mixing area; repeating said drilling, raising and mixing steps in a progressive operation until the predetermined depth of the pile is reached, whereby the newly drilled soil and the cementitious material are uniformly mixed throughout the entire depth by the rotating auger, and then removing the auger from the formed concrete pile.

2. Method according to claim 1, wherein coarse aggregate is added prior to removal of the auger, and is uniformly mixed throughout the entire depth of the pile by repeated raising and lowering of the rotating auger through the pile.

3. Method according to claim 1, including the subsequent step of inserting metal reinforcing rods.

4. Method according to claim 1, wherein the cementitious material added is hydraulically settable cement and water.

References Cited in the file of this patent

UNITED STATES PATENTS

935,081	Wolfsholz	Sept. 28, 1909
1,189,108	Hildebrand	June 27, 1916
2,048,710	Ranney	July 28, 1936
2,326,045	McConnaughay	Aug. 3, 1943
2,729,067	Patterson	Jan. 3, 1956
2,782,605	Wertz et al.	Feb. 26, 1957
3,023,585	Liver	Mar. 6, 1962

FOREIGN PATENTS

237,929	Great Britain	Nov. 12, 1925