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Matsushita

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[54] **CONSTRUCTION PILE HAVING FLUID INJECTION MEANS**

[75] Inventor: **Kunijiro Matsushita,** Toyokawa, Japan

[73] Assignee: **Kumagai Gumi Company Limited,** Fukui-shi, Japan

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[52] **U.S. Cl.** **61/53.74,** 175/67

[51] **Int. Cl.** **E02d 7/24,** E21b 7/18

[58] **Field of Search** 61/53.74, 81, 82; 175/67, 175/69; 37/62, 63, 78

[56] **References Cited**

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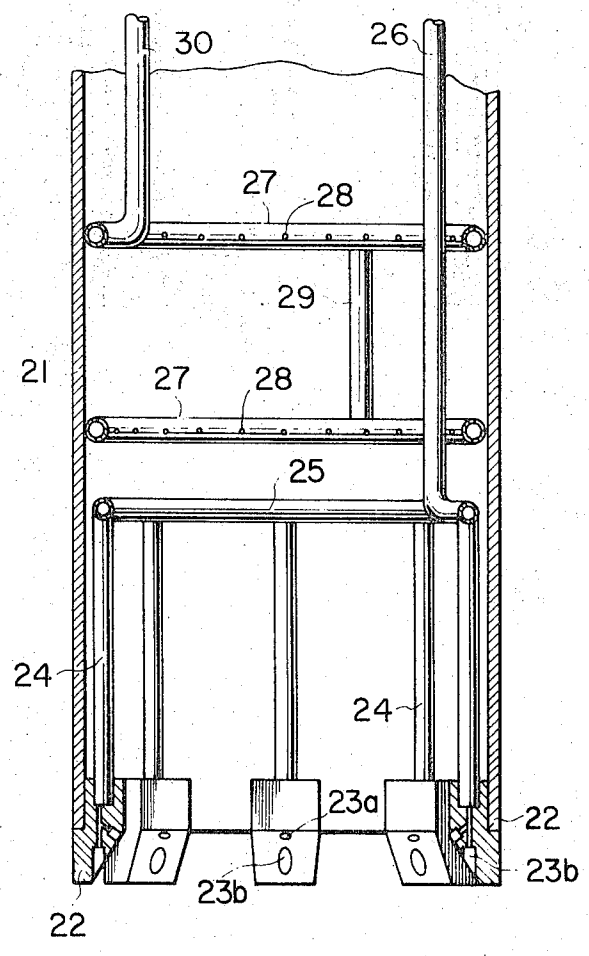
Primary Examiner—Jacob Shapiro

Attorney, Agent, or Firm—Ladas, Parry, Von Gehr, Goldsmith & Deschamps

[57] **ABSTRACT**

A construction pile comprising a hollow cylindrical body. First fluid spray nozzle means including a plurality of radially inwardly and downwardly directed nozzle openings provided at one end of said body, conduit means provided in said body for supplying water under pressure to said first nozzle means, second nozzle means provided in said body and including a plurality of radially inwardly directed nozzle openings, and conduit means provided in said body for supplying pressurized air to said second nozzle means, whereby the pile can be driven into earth by discharging water under pressure through said first nozzle means to form a bore through which the pile can be advanced with a minimum resistance, and simultaneously discharging pressurized air through said second nozzle means to agitate fluid entrapped in said pile so as to prevent the interior of the pile from being clogged by soil.

2 Claims, 4 Drawing Figures



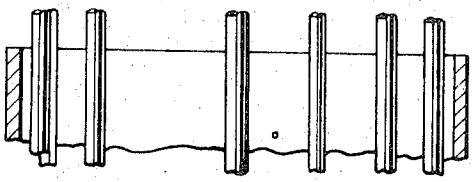


FIG. 1

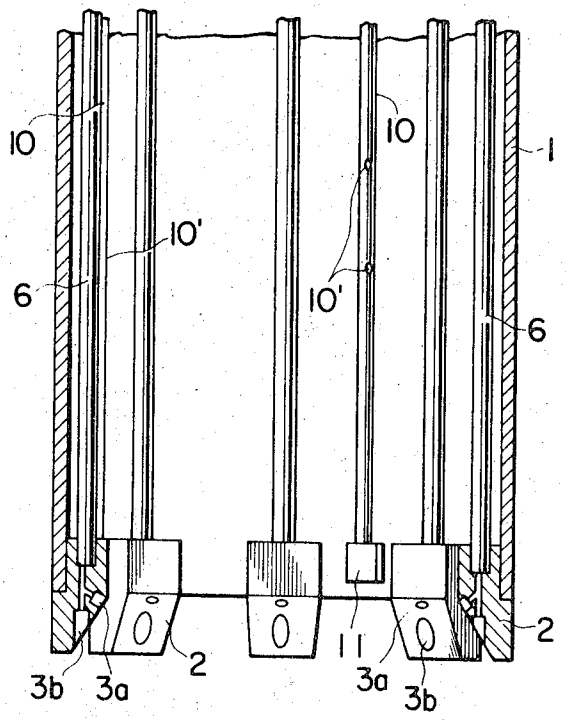


FIG. 2

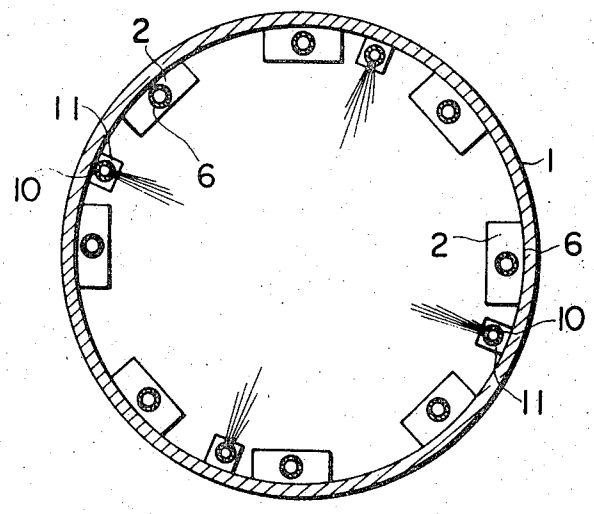
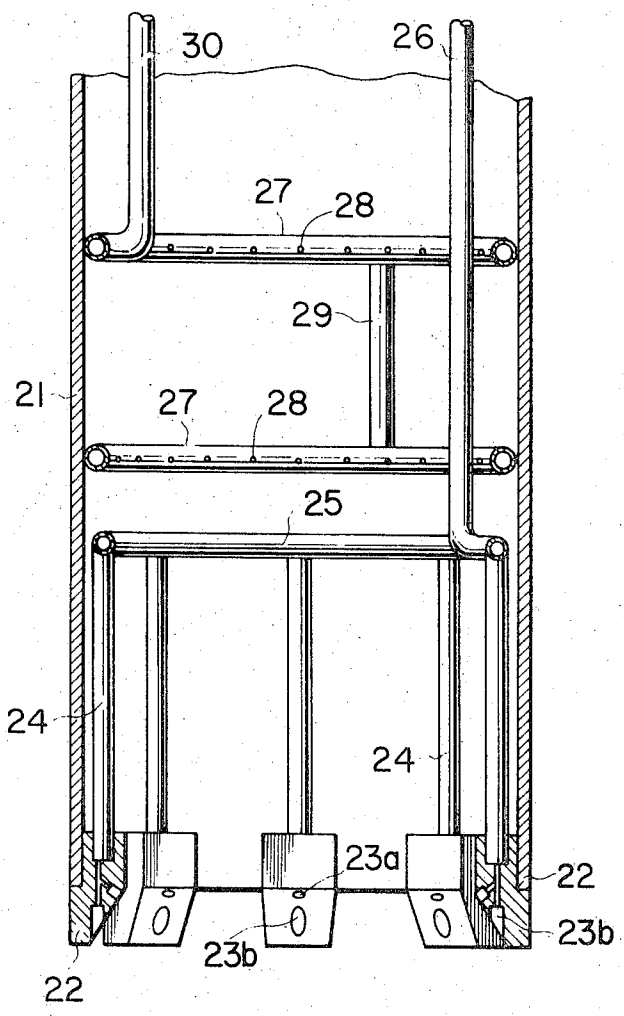


FIG. 3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23a
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23b
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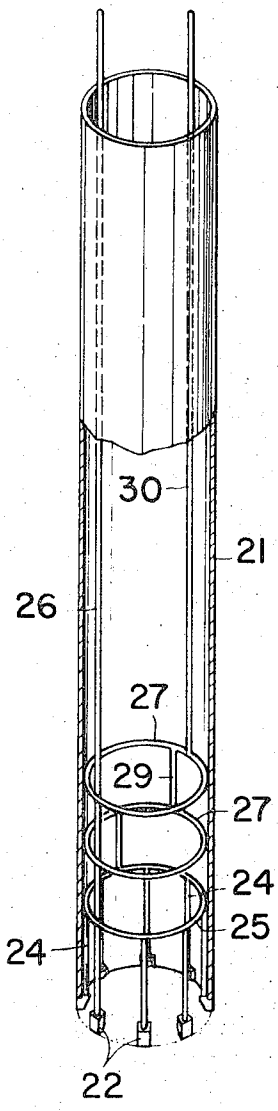
FIG. 4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CONSTRUCTION PILE HAVING FLUID INJECTION MEANS

The present invention relates to a construction pile and more particularly to a construction pile which can be driven into earth with minimum noise and vibration.

In the field of construction, there has been an increased demand for development of a noise and vibration free pile driving technique in order to eliminate any adverse effect produced by the construction work. A noise and vibration free pile driving is distinguishable from a conventional method, in that a pile is not mechanically driven as by hammer means but it is driven into the earth by its own weight or by using additional weight means or hydraulic press means. In order to have the pile advanced into the earth, the soil beneath the lower end of the pile is continuously removed by spraying water or air under pressure. The pile is usually of a hollow cylindrical configuration and the supply of pressurized water or air is made through the hollow interior of the pile. However, according to the known method of this type, the water or air spray cannot provide a satisfactory effect and the lower end or the interior of the hollow pile has often been clogged by loosened soil with the result that a smooth advancing movement of the pile is undesirably prevented.

Therefore, it is an object of the present invention to provide a construction pile which can be driven into earth with minimum noise and vibration.

A further object of the present invention is to eliminate the aforementioned problems of prior art by providing a construction pile having means for preventing the hollow interior of the pile from being clogged by loosened soil.

Still further object of the present invention is to provide a construction pile having fluid discharge nozzle means provided therein for discharging fluid under pressure in said pile to agitate the soil therein and thus prevent the soil from blocking the interior of the pile.

According to the present invention, there is provided a construction pile comprising a hollow cylindrical body, first fluid spray nozzle means provided at one end of said body, conduit means provided in said body for supplying fluid under pressure to said first nozzle means, second nozzle means provided in said body, and second conduit means provided in said body for supplying fluid under pressure to said second nozzle means. According to a preferred mode of the present invention, said first nozzle means includes a plurality of nozzle openings disposed along the whole periphery of said one end of the body and the openings are directed radially inwardly and preferably slightly downwardly. Preferably, water is discharged under pressure through said first nozzle means so as to form a bore in the earth below said one end of the pile body so that it can be driven into the earth with minimum resistance. The second nozzle means may also include a plurality of nozzle openings which are radially inwardly directed. Pressurized air may be discharged through said second nozzle means to form a turbulence flow in said pile by agitating the soil therein. Thus, it is possible to prevent the loosened soil cloggqng the interior of the pile.

These and other objects and features of the present invention will become apparent from the following descriptions of preferred embodiments taking reference to the accompanying drawings.

FIG. 1 is a fragmentary vertical sectional view of a construction pile according to one embodiment of the present invention;

FIG. 2 is a cross-sectional view of the pile shown in FIG. 1;

FIG. 3 is a fragmentary vertical sectional view of a construction pile according to a second embodiment of the present invention; and,

FIG. 4 is a perspective view of the pile shown in FIG. 3, a part of the pile body being broken away to show the interior thereof.

Referring to the drawings, particularly to FIGS. 1 and 2 which show the first embodiment of the present invention, there is shown a construction pile having a hollow cylindrical body 1 made of a suitable material such as steel. At the lower end of the body 1 there are disposed a plurality of nozzle fittings 2, each having nozzle openings 3*a* and 3*b* . The nozzle opening 3*a* is directed radially inwardly of the pile body 1 and the nozzle opening 3*b* is directed downwardly. It is preferred that the nozzle fittings 2 are disposed at equi-distant positions along the periphery of the lower end of the body 1 and secured thereto by suitable means such as welding. Each of the nozzle fittings 2 is connected with a water conduit 6 which is disposed along the inner wall surface of the pile body 1. Although not shown in the drawings, each conduit 6 is connected with a source of pressurized water so that water can be discharged under pressure through the nozzle openings 3*a* and 3*b* in the nozzle fittings 2. A suitable number of air conduits 10 are also disposed along the inner wall surface of the pile body 1. Each of the air supply conduits 10 has a lower end closed by a plug 11 and has a suitable number of nozzle openings 10′ which are directed radially inwardly of the pile body 1. Each of the conduit 10 is also connected with a suitable source of pressurized air.

When the pile is driven into earth, water is discharged under pressure through the conduits 6 and the nozzle openings 3*a* and 3*b* in the nozzle fittings. Simultaneously, pressurized air is discharged through the nozzle openings 10′ in the air conduits 10. The sprayed water serves to remove soil below the lower end of the pile and form a bore in the earth, through which the pile can be advanced with minimum resistance. The sprayed air serves to agitate the mixture of soil and water in the pile body 1 to form a turbulence flow therein. Thus, the removed soil is prevented from accummulating on the inner wall surface of the pile body 1 and clogging the interior of the body. According to this embodiment, water may be discharged only through selected one or ones of the nozzle fittings 2 in accordance with the soil condition.

Referring now to the second embodiment shown in FIGS. 3 and 4, the construction pile includes a hollow cylindrical body 21. A suitable number of nozzle fittings 22 are disposed at the lower end of the pile body 21 as in the first embodiment. Each of the nozzle fittings 22 has a radially inwardly directed nozzle opening 23*a* and a downwardly directed nozzle opening 23*b*. The nozzle fittings 22 are connected through corresponding number of water pipes 24 to a common manifold ring 25 which is in turn connected through a water conduit 26 to a suitable source of pressurized water (not shown). In the pile body 21, there are also dis-

posed a pair of nozzle rings **27** each having a plurality of radially inwardly directed nozzle openings **28.** As shown in the drawings, the nozzle rings **27** are connected by a vertical air pipe **29** and the upper nozzle ring is connected through an air supply conduit **30** to a suitable source of pressurized compressed air. The operation of the embodiment is substantially similar to that of the previous embodiment so that it will not be necessary to repeat again. The second embodiment is advantageous over the previous embodiment in that separate water conduits **24** can be of smaller lengths and that only two long conduits are required in the arrangement.

Although the invention has thus been shown and described with reference to preferred embodiments, it should be noted that the invention is in no way limited to the details of the illustrated structures but various changes and modifications may be made without departing from the scope of the appended claims.

I claim:

1. A construction pile comprising a hollow cylindrical body; first water spray nozzle means provided at the bottom end of said body and including a plurality of nozzle fittings disposed along the whole periphery of said bottom end, each of said nozzle fittings having a radially inwardly directed nozzle opening and an axially downwardly directed nozzle opening; a water supply means for supplying pressurized water to said first nozzle means including a common manifold ring disposed within said body at the upper side of said nozzle fittings, a plurality of water pipes for connecting said manifold ring with said nozzle fittings respectively, and a water conduit for connecting said manifold ring with a suitable source of pressurized water on the ground; an air nozzle means provided within said body and including at least one tubular ring disposed adjacent the cylindrical inner surface thereof and connected together with the adjacent one by a conduit, each of said rings having a plurality of radially inwardly directed nozzle openings disposed along the whole range of said ring and at angularly spaced relationships; and an air supply conduit passing through said body and connecting the uppermost positioned tubular ring to a source of pressurized air for introducing said pressurized air to said nozzle openings of said upper and lower tubular rings.

2. A construction pile comprising a hollow cylindrical body; first water spray nozzle means provided at the bottom end of said body and including a plurality of nozzle fittings disposed along the whole periphery of said bottom end, each of said nozzle fittings having a radially inwardly directed nozzle opening and an axially downwardly directed nozzle opening; a water supply conduit means connected to each of said nozzle fittings for supplying pressurized water thereto and disposed adjacent the inner surface of said body extending axially therethrough; an air nozzle means provided within said body and including a plurality of conduit pipes axially extending adjacent the inner surface of said body therethrough, each of said conduit pipes being provided with at least one nozzle opening directed radially inwardly and being closed at its bottom end and connected at its upper end to a source of pressurized air on the ground.

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