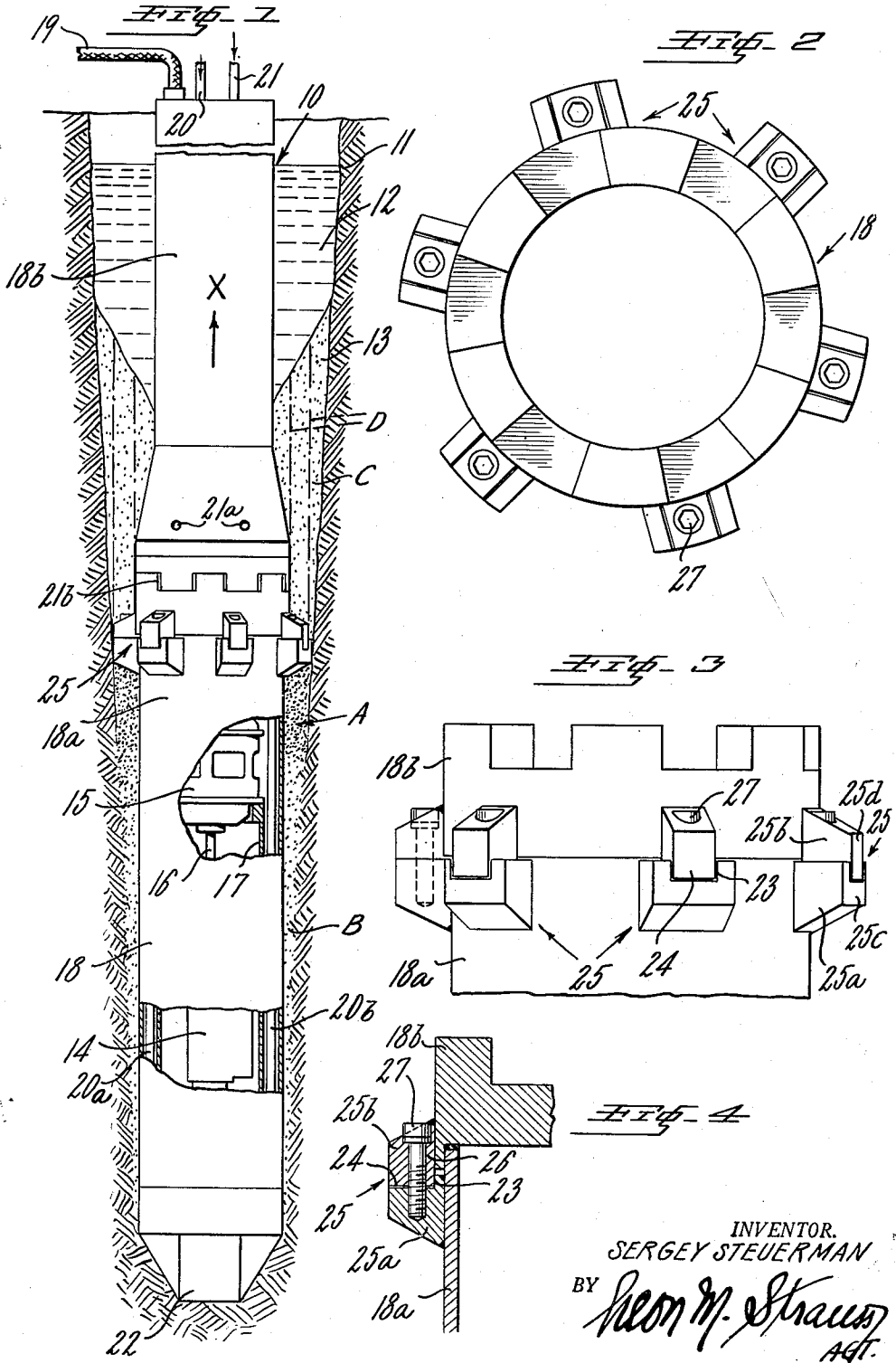


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VIBRATOR DEVICE

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VIBRATOR DEVICE

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The present invention relates to vibrator devices and more particularly to a vibrator device with streamlined body for insertion into loose sandy soil or like mass for compacting the same.

It is an object of the present invention to provide means facilitating compaction of loose masses of the aforesaid type in a very economical, efficient and quick manner.

It is a further object of the invention to provide means ensuring reduced cost for maintenance, and permitting ready assembly and increased sturdiness of the parts of which the vibrator device consists.

Heretofore, vibrators were constructed with a streamlined shell containing eccentric means for imparting vibrations to the outside of the shell for transfer to the surrounding sandy mass to compact same. A vibrator of this kind is disclosed, for example, in my prior U. S. Patents No. 2,360,803 and No. 2,334,228. Compaction of fine, silty sand by vibrators of the aforesaid type was found to be somewhat slowed down as compared with compaction operations performed with coarser sand or like mass.

When during sand compaction the vibrator is retracted step by step, the sand layer previously permeated with water or like liquid or suspension must undergo a precompaction step whereby excess water or liquid is to be squeezed out and drained off. The escape of such excess liquid however encounters great difficulties, which lead to a considerable loss of time and economy in performing the compaction process, when used for silty sand.

The present invention overcomes these and other disadvantages and provides means facilitating easy removal of excess liquid during compaction of the permeated sandy mass.

The known vibrators generally compact the sand around the entire outside of their shells. To this end, the vibrator to be withdrawn is retracted through compacted sand layers or areas, which show great resistance to any movement of water or like liquid when the treated material is silty sand. According to the invention the vibrator apparatus is so modified and improved that it permits ready movement of such water along the upper shell part of the apparatus.

The inherent vibrations of the vibrator apparatus will cause loosening up of internal structural connections under tension after a certain time of use. This makes it necessary to disassemble the apparatus entirely in order to tighten or repair these connections. The present invention materially improves the assembly of these connections.

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According to the present invention, the vibrator apparatus for compacting a loose mass comprises elongated shell parts, vibrating means mounted in said shell parts for effecting vibrations thereof, a head at the advancing end of said shell and connecting means connecting said shell parts together, said connecting means including a plurality of fins or lugs each having a first portion and a second portion, one of said portions being mounted outside the upper shell part and projecting therefrom, the other of said portions being mounted outside the lower shell part and projecting therefrom, and fastening means for attaching said lug portions together.

According to the present invention, one group of said portions of said lugs includes each a recess or depression and another group of said portions of said lugs is provided with a projection fitting into said lugs depressions, whereby the lugs in assembled condition will be securely registered and interlocked together.

The invention further contemplates the position of a motor within the assembled shell and disposed in proximity of one of the portions of the fins.

Since the fins are on the outside, the connection means which attach the shell parts together are easily accessible and may readily be tightened.

The above and other objects and features will become apparent from the following detailed description, reference being had to the accompanying drawing.

In the drawing:

Fig. 1 shows a side view of a vibrator apparatus inserted into soil, with parts being broken away to show the internal construction;

Fig. 2 is a top plan view of Fig. 3;

Fig. 3 is a fragmentary side view of a portion of the apparatus of Fig. 1 on an enlarged scale;

Fig. 4 is a partial, cross-sectional, elevational view of Fig. 3, illustrating a fin.

Referring now more particularly to the drawing, there is shown a vibrator device 10 which has been lowered into a funnel 11 defined by surrounding earth material and into which funnel fluid 12 and sand material 13 are supplied for being compacted therein.

The vibrator device 10 contains an eccentric weight 14 and a drive motor 15 therefor, the eccentric weight 14 being connected to motor 15 through a shaft 16. The motor as well as the eccentric weight are suitably supported on a frame 17 within the shell 18 of the vibrator 10. The vibrator device principally consists of two shell parts 18a, 18b which parts are connected to each other by a plurality of suitable flange or lug

connections 25. The electric current to the motor is supplied through a cable 19, whereas liquid or fluid is supplied through the vibrator device from conduit means 20 to a manifold connected to pipes 20a, 20b for discharge of liquid at the forward or advancing end 22 of the vibrator device 10. Further liquid is supplied through conduit means 21 to the upper vibrator part 18b for discharge at nozzles 21a and slots 21b.

As can be more clearly seen in Fig. 4, each flange or lug connection 25 consists of a lug part 25a fixed exteriorly of and to the lower shell part 18a whereas an upper lug part 25b is fixed or otherwise connected to the upper shell part 18b. Each lug part 25a has a recess or depression 23 into which fits the projecting lug extension 24 of the upper lug part 25b. Suitable watertight gaskets may be arranged to attain improved connections.

The flange or lug parts 25a and 25b are provided with bores or passageways 26 which are in registry with each other to thereby facilitate insertion of screw bolts 27 for tightly connecting shell part 18a to shell part 18b. It is preferred to have the outwardly projecting flange connections 25 equally distributed over the circular shaped outer surface of the shell 18, as more clearly seen in Fig. 2.

It will be further noted that the lug connections 25 are tapered to facilitate cutting of channels in the sand layers. To this end the lower lug part 25a extends obliquely in upward direction toward the outer end 25c of the lug part 25a and similarly, the lug part 25b tapers downwardly toward the lug end 25d as clearly apparent from Fig. 1.

The function of the vibrator device is known per se and the operation thereof has been more clearly explained in the aforesaid prior U. S. Patents Nos. 2,360,803 and 2,334,228.

When the vibrator 10 is being retracted from within the funnel 11, the compaction of the sand material 13 takes place at various degrees. First, a precompaction is achieved in zone A while the final compaction takes place approximately at the forward end of the vibrator and in zone B. Above the lug connections 25 which form fins, there is a zone of sand C, which has been fed or supplied from the open upper end of the funnel. Above and in this zone of relatively loose sand C is disposed fluid 12, such as water, which is also supplied in a regulatable amount through hose connection 21, to nozzles 21a and openings or slots 21b so that it seeps through the loose sand zone C, and is then subsequently brought in contact with the precompacted sand zone A through channels D cut into the sand zones by means of the cutting fin-forming flange or lug connections 25, as clearly indicated in Fig. 1.

Thus, a direct connection between the fluid 12 and the mass to be compacted in zones A and B is achieved through the fin-shaped flange or lug connections cutting into the sand zone C the aforesaid channels D. Consequently, a connection between the fluid 12 and the lower sand zones A and B is achieved whereby water or similar fluid communicates through said cut channels with the loose sand.

While the vibrator is withdrawn from the funnel in the direction of arrow X step by step and while the compaction of loose sand in the zones A and B is performed, it will be realized that the fin-forming lug connections bring about a quantitative supply of fluid or water to the zones to be compacted which contributes to a speedy and

highly economical compaction operation. It is further to be noted that the lug connections 25 contribute to an increased precompaction in the zone A since the vibrations from the eccentric weight 14 are also communicated through the shell 18 to the lug connections 25. These lug connections further increase the strength of the vibrator device and facilitate repairs in and disassembly of the interior of the vibrator when needed.

In comparison with heretofore known, streamlined vibrators, the compaction process in accordance with the construction of the vibrator of the present invention is intensified and becomes more economical.

During the compaction of the successive sand layers which are permeated with a fluid or water, excess water may be squeezed out from the respective sand layers in accordance with the present invention and will thus be drained off. This excess or surplus water had generally no opportunity of escaping from silty sand which made the compaction process or operation considerably slow when used in silty sand. The channels D now temporarily cut into the sand layer above the actual precompaction and compaction zones A and B not only facilitate greatly the removal of excess or surplus fluid or water but also contribute to a certain grouping of the sand particles prior to the precompaction step during which the cut channels subsequently disappear when the lower part 18a of the vibrator 10 comes into action and completes the compaction.

It is well understood that the arrangement and the dimensions of the lug or flange connections must be carefully selected and it has been found that approximately six flange connections or lugs equally distributed over the circumference of the vibrator and protruding therefrom to an extent of approximately one fourth of the radius of the vibrator shell, will be suitable for average practical requirements.

The lug connections and the bolts employed therefor are adapted to transfer the vertical forces from the vibrator through the upper part 18b to the supporting derrick or crane (not shown) and are susceptible to withstand continuous vibrations.

The screw bolts are easily accessible and permit easy checking and tightening, if necessary. It will be observed that the parts of the lug connections interengage with each other at the recesses 23 and thus prevent any horizontal rotation of the upper shell part 18b with respect to the lower shell part 18a. Such structure further contributes to a rigid vibrator construction. Residual torque forces transferred through the aforesaid bolts produce in the same smaller shear forces when they are located outside the shell 18 on a suitably large diameter whereby the lugs transfer the torque forces from the shell to the head of the vibrator.

If such lugs were made long as compared with the space between two adjacent lugs, sand would wedge in and would stick to the vibrator. In such case, these lugs would produce an increase of the total diameter and weight of the vibrator device but no vertical channels could be attained in the precompacted sand layers. For the purpose of producing vertical channels the lengths of the lugs must be made shorter than the transverse distance between two adjacent fins or lugs and the lugs should have wedge-shaped configuration to avoid deposit of sand thereon.

Although several specific embodiments of the

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invention have been described and shown in the drawing, it should be noted that the invention may be realized in modified form and adaptations of the arrangements herein disclosed may be made as may readily occur to persons skilled in the art without constituting a departure from the spirit and scope of the invention as defined in the objects and in the appended claims.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent, is:

1. A vibrator device for treating earth and like material; comprising an upper shell part, a lower shell part, said shell parts when in assembled condition being adapted to house vibrating means, a plurality of lug means arranged in spaced apart relation to each other, each lug means comprising a portion exteriorly fixed to said upper shell part and a further portion exteriorly fixed to said lower shell part, the respective lug portions being in registry with each other in assembled condition of said shell parts, and connecting means extending into said lug means, respectively, to hold the respective portions together, the length of said lug means in assembled condition of said shell parts and the distance between said lug means being sufficient to substantially obviate, between said spaced apart lug means, accumulation of material under treatment, said lug means being shaped to cut channels of appreciable dimensions into said material when moving said lug means relative to the latter.

2. A vibrator device according to claim 1, wherein said lug means are disposed substantially along the same level and adjacent the line of juncture of said upper shell part and said

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lower shell part, the height of each lug means being smaller than the distance between two adjacent lug means to thereby impede wedging of said material therebetween.

3. A vibrator device according to claim 1, including a motor housed in said lower shell part and forming a part of said vibrating means, said motor being arranged in proximity of said lug means.

4. A vibrator device according to claim 1, wherein the respective portions of each lug means are provided with interengageable formations to thereby take up torsional forces when acting between said upper and said lower shell parts.

5. A vibrator device according to claim 1, wherein said further portions of said lug means are upwardly tapered and larger in width than the portions of said lug means which are downwardly tapered and fixed to said upper shell part.

6. A vibrator device according to claim 1, wherein the lug portions of said lower shell are larger in width than the lug portions of said upper shell part, said lug portions of said lower shell part being provided with recesses in which said lug portions of said upper shell part are engaged in said assembled condition of said shell parts.

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References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
2,229,912	Baily	Jan. 28, 1941
2,233,833	Jackson	Mar. 4, 1941
2,334,228	Steuerman	Nov. 16, 1943
2,360,803	Steuerman	Oct. 17, 1944