April 3, 1956 W. DEGEN 2,740,336

APPARATUS FOR CONSOLIDATING BACKFILL, PILES OF COARSE AGGREGATE AND THE LIKE

Filed Aug. 21, 1951

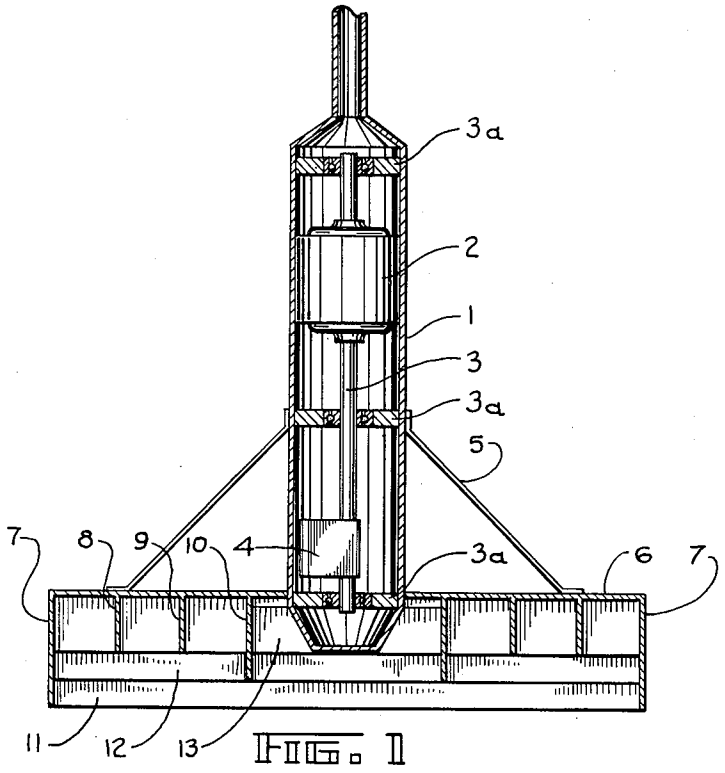


FIG. 1

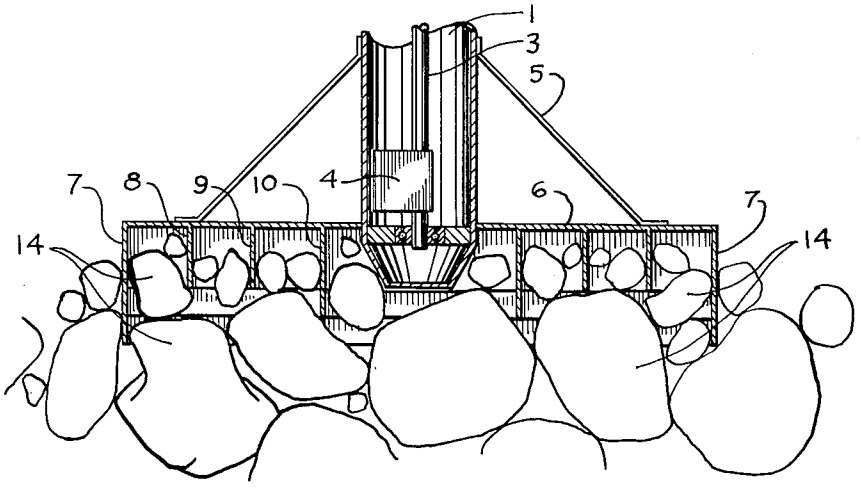


FIG. 2

INVENTOR.

Wilhelm Degen

BY Arnold Fleischer

ATTORNEY

United States Patent Office 2,740,336 Patented Apr. 3, 1956

2,740,336

APPARATUS FOR CONSOLIDATING BACKFILL, PILES OF COARSE AGGREGATE AND THE LIKE

Wilhelm Degen, Frankfurt am Main, Germany

Application August 21, 1951, Serial No. 242,964

Claims priority, application Germany August 26, 1950

2 Claims. (Cl. 94—48)

The present invention relates to apparatus for obtaining efficient compression or consolidation of non-plastic masses, such as piles of earth, and, in particular, piles of coarse stone.

It is well known that in the case of compression by shaking down of piles of coarse aggregate and the like —whose behavior differs basically from freshly-poured concrete and similar plastic masses—a shaking down of the upper surfaces is, when compared to internal shaking down, ineffective; and, that even a considerable increase in the power applied to the shaking process only results in a limited increase in its effect. However, in very many cases, such an internal shaking down requires the insertion or bedding-in of the equipment used in shaking down. This means that it is impossible to use this method for the consolidation of piles of coarse stone, where the bedding-down of the equipment is very difficult or even impossible, or where the withdrawal of the shaking equipment would create severe disadvantages.

The present invention relates to a surface shaker, but of special construction so that it causes vibration in a horizontal plane, and also so that, during the process of shaking down, the formation of a horizontal plane of slipping between the platform of the shaker and the upper layers of the coarse aggregate or the like, is prevented.

The fact that surface shaking down was, up to the present, limited in its effect is due to the impossibility of obtaining coincidence in the frequency of the shaking and the inherent frequency of the pile of coarse aggregate. Attempts were therefore always made to adapt the frequency of the shaker to that of the piled up coarse aggregate. However, this inherent frequency varies with the nature and properties of the aggregate which constantly vary with the degree of compression obtained. A constant coincidence by regulation of the shaker frequency to the constantly changing frequency of the piled up coarse aggregate has, up to the time of writing, not been practicable. The present invention rests on the theory that if the movement of the shaker is not limited to the horizontal surface on which the shaker plate oscillates, but forces a considerable portion of the surface of the tippings to oscillate with it, then that portion of the tippings must take up the frequency of the shaker.

This constant oscillation of the aggregate can only be obtained if the formation of a horizontal plane of slipping is prevented by the introduction of a limiting area or fence which forces the aggregate to assume the frequency of the shaker. Furthermore, the friction engendered by the oscillating movement of the material also increases the mass-effect of the shaker considerably. By these means and as the result of the coincidence of the frequencies of the shaker and the aggregate, a deep and far reaching compression is obtained.

In accordance with the present invention, the horizontally vibrated plate or platform is constructed to firmly grip the stones at the surface of the aggregate to be compacted.

The parts utilised for this purpose, enable the effect

of the shaker to be distributed through the firmly gripped stones to the rest of the material surrounding them. The effect will be far greater than would be the case if only a horizontal plate with sliding contact were used. In addition, the firmly gripped stones form a solid oscillating unit, quite different from an inserted shaker. Finally, the stones will, according to the degree of the changes in the layers, release themselves and sink into the mass of the tippings, forming a firm, compressed mass, quite different from what would be the case if a shaker had to be inserted and then withdrawn again. The horizontal vibrations of the shaker enable the pressure on the plate to be kept constant. It may even, with advantage, be supplemented. The frictional contact is thus constantly maintained, whereas in the case of a vertical shaker, the pressure is only applied at the instant a blow is given.

The shaker plate or platform may, for the above purposes, be fitted with an exterior frame having deep walls, and, by means of interior parallel or concentric partitions, individual cells of varying heights may be formed. These interior partitions grip the material and prevent all horizontal movement of the material relative to the plate or platform until the compression process is finished.

The attached drawing shows an upper surface shaker which has been specially designed for shaking down coarse stone.

Fig. 1 shows a vertical cross-action of the shaker and attached plate.

Fig. 2 shows the lower portion of the same appliance in the working position, together with coarse stone that has been shaken down by it.

Referring to the drawing in detail, and initially to Fig. 1 thereof, an apparatus embodying the present invention for compacting backfill made up, for the most part, of coarse stone aggregates is there illustrated and seen to include a casing **1** of generally elongated, cylindrical configuration having a motor **2**, for example, an electric motor, mounted therein for effecting rotation of a longitudinally extending shaft **3** which is rotatably mounted in suitable bearings **3***a* within the casing **1**. An eccentric weight **4** is fixed on the shaft **3** so that, as the latter is rotated, the weight or mass **4** will cause vibration of the casing **1** in a substantially horizontal plane.

A horizontal plate or platform **6** is secured to the lower end of the casing **1** and braced with respect to the latter by suitable links or struts **5**. The platform **6** is adapted to rest upon the surface or upper layer of the coarse stone aggregate that is to be compacted by the horizontal vibrations and, in accordance with the present invention, the platform **6** has an arrangement thereon for securely gripping the stone at the surface of the backfill to be compacted so that the horizontal vibration of the casing **1** and platform **6** is positively communicated to the coarse stone aggregate.

In the illustrated embodiment of the invention, the arrangement on the platform **6** for securely gripping the stone in the upper layer of the backfill to be compacted includes relatively deep members **7** and **11** depending from the platform **6** along the opposite edges of the latter and forming a peripheral fence. Within the downwardly opening compartment defined by the fence made up of the depending members **7** and **11**, there are provided partition members **10** and **12** having a depth less than that of the members **7** and **11** and intersecting in order to define downwardly opening compartments having depths and areas less than that of the compartment defined by the fence members **7** and **11**. Finally, within the downwardly opening compartments defined by the partition members **10** and **12**, there are further provided intersecting depending partition members **8**, **9** and **13** having depths less than that of the partition members **10**

and 12 in order to define smaller downwardly opening compartments of reduced depth.

As seen in Fig. 2, the above described compartment defining structure ensures that large and small stones of the aggregate 14 will be positively gripped by the members depending from the platform 6 so that, when the platform is horizontally vibrated, the vibrations of the platform are positively transmitted to the stones of the coarse aggregate and any horizontal slipping between the platform 6 and the upper layers of the aggregate is prevented. Thus, the relatively large stones at the surface of the aggregate to be compacted will fit into the relatively large and deep downwardly opening compartments at the bottom of the platform 6, while the relatively small stones, which would be capable of movement within such large compartments, are positively gripped within the correspondingly small compartments at the bottom of the platform.

Although a particular embodiment of the present invention has been described in detail herein and illustrated in the accompanying drawing, it is to be understood that the invention is not limited to that particular embodiment, and that various changes and modifications may be effected therein without departing from the scope or spirit of the invention, except as defined in the appended claims.

I claim:

1. In apparatus for compacting backfill made up, for the most part, of relatively uncompacted formations of non-plastic geological components and particularly coarse stone aggregate; the combination of a platform for positioning on the upper layer of the backfill, means for vibrating said platform in a substantially horizontal plane, and partition members depending from said platform and having different depths, said partition members being arranged so that the partition members of relatively large depth define downwardly opening compartments of relatively large depth and area, while the partition members of relatively small depth are arranged within said compartments of large depth and area and define downwardly opening compartments of relatively small depth and area within the latter, whereby large stones at the surface of the backfill are gripped in said large compartments and smaller stones are gripped in said small compartments to prevent horizontal slipping movement between said platform and the upper layers of the backfill.

2. In apparatus for compacting backfill made up, for the most part, of coarse stone aggregate and having a platform for positioning on the upper surface of the backfill, and means for vibrating the platform in a substantially horizontal plane; partition members depending from the platform and having different depths, the relatively deep partition members being spaced apart by relatively large distances to define downwardly opening compartments of relatively large area and depth therebetween, and the partition members of relatively small depth being arranged between said deep partition members to define downwardly opening compartments of relatively small area and depth within said compartments of large area and depth, so that large and small stones at the surface of the backfill can fit into the large and small compartments, respectively, to prevent horizontal slipping movement between the vibrated platform and the upper layers of the backfill.

References Cited in the file of this patent

UNITED STATES PATENTS

2,061,943	Jorgensen	Nov. 24, 1936
2,077,356	Day	Apr. 13, 1937
2,180,198	Day	Nov. 14, 1939
2,259,110	Jackson	Oct. 14, 1941
2,643,595	Jackson	June 30, 1953

FOREIGN PATENTS

77,550	Austria	Aug. 11, 1919
41,949	France	Jan. 31, 1933
441,228	Great Britain	Jan. 15, 1936

OTHER REFERENCES

"Engineering News Record," Sept. 16, 1948, pages 88, 89, 90.