Dec. 15, 1953 W. DEGEN 2,662,750

SHAKING DEVICE FOR LAYER AND LOOSE MATERIALS

Filed July 27, 1951

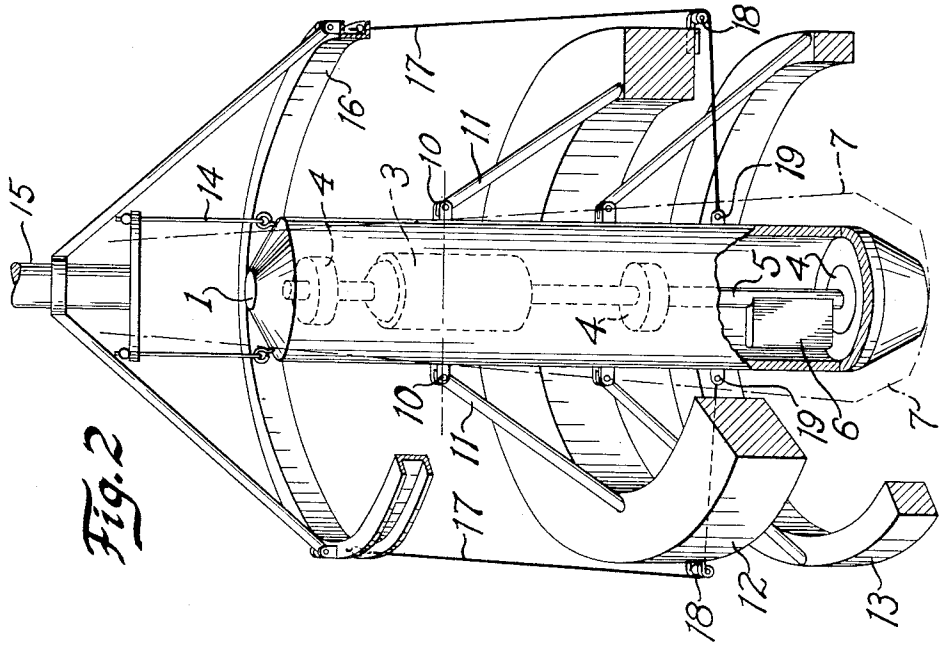


Fig. 2

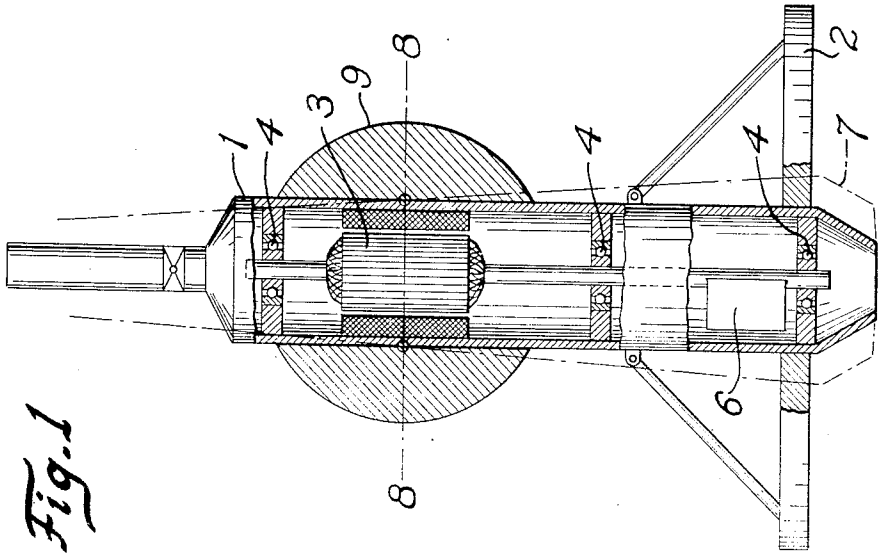


Fig. 1

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Patented Dec. 15, 1953

2,662,750

UNITED STATES PATENT OFFICE

2,662,750

SHAKING DEVICE FOR LAYER AND LOOSE MATERIALS

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Application July 27, 1951, Serial No. 238,902

Claims priority, application Germany July 31, 1950

9 Claims. (Cl. 259—1)

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The invention relates to a shaking device for layer and loose materials, and particularly to upper surface shakers in which it is of special importance that the dead weight be high so that the compressing effect will be correspondingly increased.

For the purpose of increasing the weight, the entire device has been suitably constructed up to now in order to attain the desired shaker weights. But the increase of the entire weight of the shaker obtained in this manner resulted in a decrease in the amplitude of the shaker oscillations proportionally with the weight, and thus the shaking effect also decreased correspondingly. But on the other hand, if a reduction of the oscillation range of the shaker is to be avoided, a shaker stronger in all parts has to be constructed.

It is an object of the present invention to avoid the foregoing disadvantages while providing a shaking or vibrating device in which an increase of the entire weight is attained so that, as in the case of the hitherto existing devices, by means of increasing the top load an improvement of the compressing effect is attained, but, on the other hand, the entire load of the shaker need not be oscillated. Very heavy shakers can be constructed in accordance with the invention without requiring any substantial increase in the operating power.

The shaking apparatus, in accordance with the invention in question, is substantially characterized by the fact that a supplementary load weight is mounted in indirect or direct connection with the shaker in such a manner that no, or hardly mentionable oscillations can be transferred to this load weight. The present invention is preferably made use of by employing shakers with lateral deflection, in the case of which the oscillation range decreases toward the top in order to thereby economize on motor output, impact power and stress on bearings, in that the comparatively heavy motor is arranged at a location of relatively small oscillating amplitudes. Shakers are utilized in which the oscillation generator, for example, an eccentric weight, is provided near the attacking working parts, as, for instance, the pressure plate of the shaker. The fitting of the supplementary load weight of the shaking device within the range of the least deflection or oscillation can, for instance, practically be attained by such means that the load weight is attached in a compact form, for example, in the form of a sphere or a spherical shaped body in the upper part of the shaker or within the range

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of the least oscillation by means of a clamp, or an elastic connection. The load weight can also be elastically hung in one of the bearings provided for at this point, that is, by means of ropes, chains or, if occasion arises, by the utilization of elastic, energy consuming means, such as rubber-metal bodies. In order to position the center of gravity of the entire shaking device at a low location as security against tilting, the supplementary weight shall be arranged as low as possible. The load weight has a special favourable form if it is constructed in such a manner that it rotates around the device in the form of a ring.

The drawing illustrates two examples of shaking devices constructed according to the invention, and wherein:

Fig. 1 schematically shows, in a longitudinal section, a shaking device in the form of an upper surface shaker with lateral deflection produced by means of an oscillating body driven by a motor arranged within the range of the least lateral deflections, with the motor leads and the like being omitted for the sake of clarity; and

Figure 2 is a perspective view of another shaking device, one-half in longitudinal section, with the load weight being suspended from the area or range of smallest lateral deflection.

Referring specifically to Fig. 1 of the drawing, reference numeral 1 thereon identifies a casing of the shaker with the pressure plate 2 of the shaker arranged at the lower end thereof. The shaking device is equipped with a motor 3, bearings 4 which support a shaft 5 driven by the motor, and a pressure changer 6 in the form of an eccentric weight mounted on the shaft 5 so that the pressure plate 2 essentially executes horizontal oscillation movements. These oscillation movements are, as the broken lines 7 indicate, greatest within the compass of the pressure plate 2 and decrease toward the top until about the height of the line 8—8. The motor 3 is preferably mounted at the level of the line 8—8 and is thereby practically kept free from disadvantageous oscillation stress. A load body 9, having an almost spherical form, is mounted on the casing 1 at the level indicated by the line 8—8 so that the particles of material of this body will effect a low deflection. By the arrangement of the load weight the oscillations, as may be seen by the drawing, are not transferred to this at all or in a hardly mentionable manner; nevertheless the supplementary load weight will produce a high top load to increase the compressive forces on the material undergoing the shaking action.

In the arrangement according to Fig. 2 two bearings, for example, so-called wing bearings 10, are provided on the casing at approximately the height of the lowest oscillating range, and carrying, similar to hangers for clock pendulums, suspension links 11 bearing the load weight 12 provided in the form of a ring shaped body, which is disposed close to the attacking working parts, namely the pressure plate 13. The shaker hangs on the hanger pipe 15 by means of the wire cables 14. A circular iron rim 16, surrounding the shaker at a certain distance and bearing the four cables 17, is rigidly connected with the hanger pipe. These four cables 17 are loosely conducted over rolls or pulleys 18 attached to the load weight, and are fastened to the oscillating shaker at the points 19.

The arrangement illustrated in Fig. 2 operates as follows:

If the shaker tends to assume a slanting position in consequence of the severe unevenness of the loose material, the load weight inclines relative to the shaker casing and swings toward the side in the direction of the slant of the shaker. In this case one of the four cables 17 will be tightened toward the side of inclination. Thus, the inclination of the load weight relative to the shaker will not only be hindered by the tightened cable, but it will act upon the latter to exert a righting force on the shaker.

I claim:

1. In a vibrating apparatus for compacting loose material; a supporting structure an elongated casing suspended from said structure with its longitudinal axis in an upstanding condition, a rotatable shaft in said casing, means for rotating said shaft, an eccentric member on said shaft adjacent the lower end of said casing to produce horizontal vibration at said lower end of the casing, the amplitude of horizontal vibration of said casing decreasing from said lower end upwardly to a predetermined level at which said vibration is of a minimum amplitude, and supplementary loading means connected to said casing at substantially said predetermined level so that said loading means is substantially free of horizontal vibration.

2. In a vibrating apparatus; the combination according to claim 1, wherein said supplementary loading means includes a member of spherical form disposed with its center substantially at said predetermined level.

3. In a vibrating apparatus; the combination according to claim 1, wherein said supplementary loading means includes a weighted member, and flexible means for mounting said weighted member on said casing and connected to the latter at said predetermined level.

4. In a vibrating apparatus; the combination according to claim 3, wherein said weighted member is in the form of a ring loosely extending around said casing.

5. In a vibrating apparatus; the combination according to claim 4, wherein said flexible means are dimensioned so that said weighted member is disposed substantially below said predetermined level of the casing.

6. In a vibrating apparatus; the combination according to claim 5, including stabilizing means interposed between said weighted member and said casing and operative to maintain uniform spacing therebetween when said casing assumes a slanted position.

7. In a vibrating apparatus; the combination according to claim 6, including a hanger member independent of said casing and disposed above the latter; said stabilizing means including flexible cables attached at their opposite ends to said hanger member and to said lower end of the casing, and rollers on said weighted member having said cables trained therearound so that inclination of said weighted member relative to said casing acts through said cables upon the casing to bring the latter back to a centered position within said weighted member.

8. In a vibrating apparatus for compacting loose material, a supporting structure, an elongated casing freely suspended from said structure, a pressure plate rigidly secured to the lower end portion of said casing, means within said casing for imparting horizontal vibrations to said lower end portion of said casing and to said pressure plate, and means for increasing the dead weight of said pressure plate without increasing the power required to vibrate it, comprising supplementary loading means freely supported from said casing in the region of the nodal point of said vibrations.

9. Means for increasing the dead weight of a vibrating tool without substantially adding to the power requirements for inducing vibrations in said tool, comprising supplementary loading means freely suspended from said tool in the region of a nodal point of said vibrations.

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