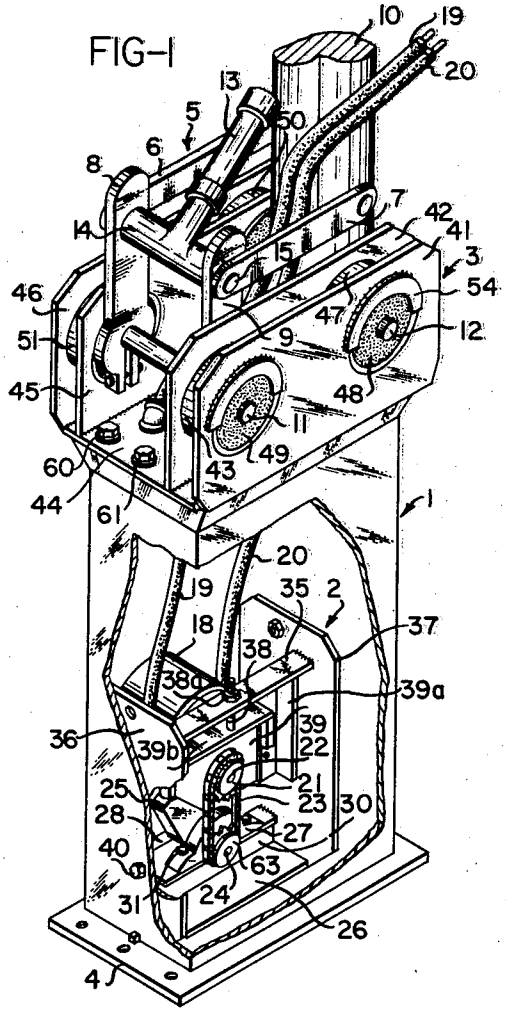
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APPARATUS FOR COMPACTING EARTH AND OTHER MATERIALS

Filed Aug. 23, 1953

FIG-1



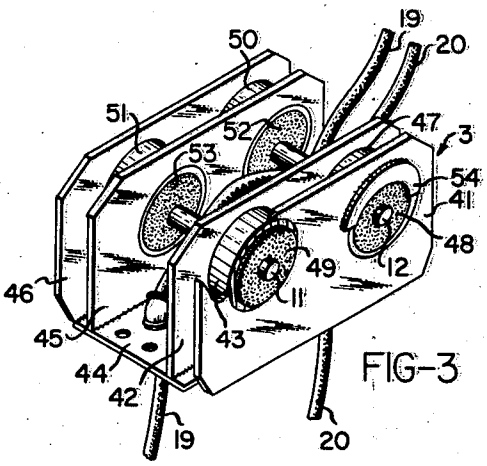
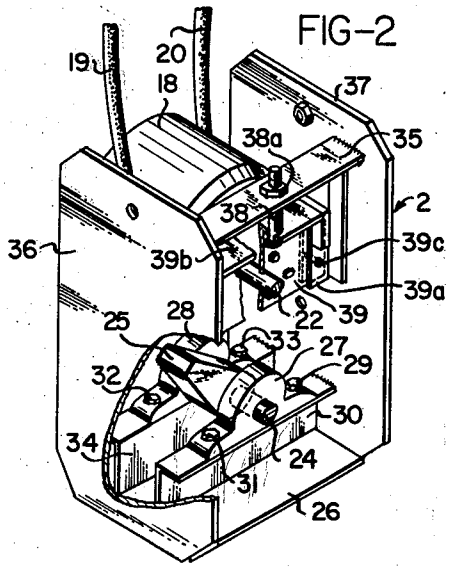


FIG-3

FIG-2



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APPARATUS FOR COMPACTING EARTH AND OTHER MATERIALS

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This invention relates to compacting devices, and more particularly to an hydraulically operated vibratory compactor for use in conjunction with transport means.

In many areas of construction it often is required to compress or solidify, that is to compact, earth or other substances for various purposes. Such compacting has been accomplished in the prior art by various apparatus operable both manually and with the aid of vehicular transport means.

Where the prior art apparatus used has been manually operated, poor compaction has resulted generally from the limitations of the human being as to the weight he could handle and the vibration he could tolerate for any appreciable time period.

Where the prior art apparatus used has been affixed to some transport means, fairly good compaction has resulted in most applications but a number of inherent disadvantages have occurred. Among these disadvantages is the transmission of vibration and shock from the compacting device to the transport means resulting in shortened life time of both. Furthermore, in many instances, the compacting device was capable of only one speed and was not usable in many soil conditions. If a relatively delicate conduit or other structure were closed by the area to be compacted, damage was often imparted to it.

Accordingly it is an object of the present invention to provide an efficient vibratory compactor capable of applying variable loads and vibration freqeuncies during compaction.

It is another object of the present invention to provide a compacting device which is isolated from its transport means and substantially eliminates transmission of shock and vibration thereto.

It is another object of the present invention to provide a compacting device which is not limited to its own weight to obtain the desired degree of compaction.

The novel features which are believed to be characteristic of the present invention both as to its organization and method of operation together with further objects and advantages thereof will be better understood from a consideration of the following description taken in connection with the accompanying drawing which is presented by way of example only and in which:

FIG. 1 is a perspective view showing the compacting device secured to a typical transport means mounting bracket with a portion of the compactor chassis broken away to better illustrate the hydraulically operated vibrator;

FIG. 2 is a perspective view of the vibrator housing partly broken away to better illustrate the eccentric vibrator mounting. The drive wheels and chain of FIG. 1 have likewise been removed for this purpose; and

FIG. 3 is a perspective view of the compactor mounting head with the typical bracket of FIG. 1 removed and with portions of the mounting head broken away to better illustrate the mounts.

A compacting device in accordance with the present invention includes a vibration generating means housed within a closed chassis having a mounting head at one end thereof. A plurality of resiliently deformable mounting members are retained within the mounting head for use in attaching the device to any suitable transport means.

More specifically, the vibration generating means is an eccentrically mounted hammer driven through a chain and sprocket by a variable speed hydraulic motor. This vibration generating means is contained within a separate pre-packaged insert that is removably attached within the chassis and which rides within an oil bath. The mounting members are constructed of a rubber material and preferably a synthetic rubber such as neoprene having dissimilar hardness to effect an almost complete damping between the compacting device and the transport means.

It should be expressly understood that the compacting device of the present invention may be used with any desired transport means, however, such means having a boom thereon are particularly useful with the compacting device. For purposes of description hereinafter, the transport means will be taken as a back-hoe which is representative of such means.

Referring now to the drawing, and in particular to FIG. 1, the compacting device of the present invention is shown as having a longitudinal chassis 1 to the bottom of which is attached, as by welding or brazing, a base shoe plate 4. Enclosed within chassis 1 is vibrator housing 2 which is removably attached to chassis 1 as by bolt 40 which is representative of other bolts not expressly shown in the drawing. At the end of chassis 1 opposite base shoe plate 4 is mounting head 3 which is removably attached to chassis 1 by means of typical bolts 60 and 61, other mounting bolts not being shown. Secured to mounting head 3, shown separately in FIG. 3, is a typical harness 5 which serves to movably attach back-hoe piston 13 and back-hoe boom 10 to mounting head 3. It should be expressly understood that in the ensuing detailed description the portion of the description pertaining to harness 5 only represents one of many possible devices used for attaching the compactor mounting head to the many makes and models of back-hoe tractors presently available.

Continuing with FIG. 1, back-hoe boom 10 is attached to mounting head 3 by means of shaft 12 which may be passed through an aperture in boom 10. Similarly, back-hoe piston 13, secured to yoke 14 is movably attached to boom links 6 and 7 and to mounting links 8 and 9 by means of rod 15. Mounting links 8 and 9 are in turn coupled to mounting head 3 by shaft 11. By so attaching mounting head 3 to boom 10 and piston 13, the device of the present invention may be moved or tilted to meet a variety of operating demands as is possible with other methods of attachment currently available.

Once the device of the present invention is maneuvered into position by the operator, the desired vibration to achieve compaction is provided when hydraulic motor 18 is actuated by oil pressure from an external source through lines 19 and 20. When so actuated, drive sprocket 21, mounted on shaft 22 drives wheel 63 mounted on shaft 24 through chain 23. Eccentrically mounted hammer 25 which is permanently affixed to shaft 24 is then caused to rotate about shaft 24 thus imparting vibration components to base plate 26 and through base shoe plate 4 upon which base plate 26 rests.

Referring now more particularly to FIG. 2, it is seen that each end of shaft **24** is received in bearings received within bearing housings **27** and **28**. Bearing housing **27** is firmly secured to L-frame **30** by bolts **29** and **31** while similarly, bolts **32** and **33** hold bearing housing **28** to L-frame **34**. L-frames **30** and **34** as well as motor support member **35** are permanently affixed as by welding to sides **36** and **37**. It should be noted that hammer **25** is selected to substantially fill the space between housings **27** and **28** so as to prevent shaft whip or fracture.

By securing the vibrator components ultimately to sides **36** and **37** of the vibrator housing as opposed to the sides of chassis **1**, the vibrator housing may be removed in its entirety through the top of chassis **1** after first removing mounting head **3** of FIG. 1 and FIG. 3. This feature greatly facilitates access to the vibration components should inspection, adjustments or maintenance become necessary.

The hydraulic motor **18** is mounted upon a plate member **39** in any manner desired such as for example by a plurality of bolts (not shown) in such a manner that shaft **22** extends therethrough. Plate **39** is slidably received within a pair of slots formed by angle irons welded to the sides of the housing **2** as illustrated at **39***a*. Bolt **38** extends through an outwardly extending flange **39***b* forming a part of plate **39** and through an adjustment support bracket **35**.

Such a structure permits adjustment of the tension on the chain **23** to insure a smooth drive for the compacting device. To effect the adjustment nut **38***a* is tightened on bolt **38** causing the motor and attached sprocket **21** to move upwardly as viewed in FIG. 1. When the chain **23** is tightened the desired amount the plate **39** may be more securely fixed by drilling holes through the angle irons **39***a* and plate **39** and inserting a locking pin or bolt **39***c* therethrough.

After such adjustment the housing containing the vibration mechanism is lowered into the chassis **1** and secured in place as above described. It has been found that quieter operation as well as longer life for the compacting device can be obtained by providing an oil bath for the vibrator mechanism. Therefore, the chassis is filled with oil to a depth of about six and one-half inches or until the oil covers the bearings.

In order to minimize the shock and vibration imparted to piston **13** and boom **10** of FIG. 1 and ultimately to the back-hoe and its operator, a special mounting head **3** is provided as shown in FIG. 3. As is illustrated, vertical plates **41** and **42** in parallel relation are secured to base **44** as by welding. In a similar manner, plates **45** and **46** are attached to base **44** through which hydraulic lines **19** and **20** also pass. Attached to the periphery of circular apertures provided in plates **41** and **42** are mounting sleeves **43** and **47**. Isolating means such as rubber shock mounts **49** and **48** are received within sleeves **43** and **47** respectively. Similarly, mounting sleeves **50** and **51** secured between plates **45** and **46** accommodate shock mounts **52** and **53** respectively. Oppositely disposed sleeves **43** and **51** constitute one pair of axially aligned spaced-apart sleeve members and oppositely disposed sleeves **47** and **50**, a second pair, each of which is rigidly affixed to the base **44**. As is clearly illustrated the two pairs of sleeve members are transversely spaced with respect to each other.

To achieve damping of shock and vibration components, the shock mounts **49** and **53** each define an aperture which receives one end of mounting shaft **11**. Similarly, the outer ends of shaft **12** are received by apertures formed in shock mounts **48** and **52**. As clearly illustrated in the drawings, the distance between the aperture edge and mount edge is substantially greater than the aperture diameter to provide sufficient rubber volume to isolate the compactor from the back hoe. A semi-circular shock mount retainer **54** attached as by welding to the outer surface of plate **41** near the periphery of mounting sleeve **47** serves to contain shock mount **48** during operation of the present invention. Similar shock mount retainers are positioned about the other three shock mounts in a like place and manner. Accordingly, when vibration and shock components are received by plates **41**, **42**, **45** and **46** generated within vibrator housing **2** of FIG. 1, the shock mounts being made of rubber substantially isolate shafts **11** and **12** from such vibration.

In actual operation it has been found that neoprene synthetic rubber provides satisfactory damping properties particularly when used in pairs having different resiliencies as for example shock mounts **52** and **54** being less resilient than shock mounts **49** and **53**. Although the shock mountings of the present invention are shown as positioned in the mounting head, it is obvious that other spatial mounting possibilities are contemplated as for example affixing the shock mountings to the side of chassis **1**.

In accordance with the foregoing it is seen that there has been disclosed a highly versatile device for compacting soil or other compactable media in that it may be positioned, when used in conjunction with a back-hoe or similar device in areas inaccessible to bulkier or less maneuverable devices. By raising the back-hoe boom the apparent weight of the present invention can be made as little as desired which will permit compaction to be carried out in the immediate vicinity of relatively fragile conduit such as tile or asbestos or other structure. Conversely by exerting a downward thrust to the back-hoe tractor boom, high loading in addition to the vibration components generated by the vibrator permits compaction of a variety of media of differing coarseness or moisture.

The shock mounts as described not only serve to isolate the back-hoe and its operator from undesirable shock and vibration due to the isolation of the mounting head shafts from the body of the mounting head itself, but the head itself is of such a configuration as to accommodate a wide range of attaching brackets or devices currently to be found on various back-hoe tractor designs.

Further, by providing the motor and vibrator as a separate unit contained in a removable housing the individual components are readily accessible should inspection or adjustment be required. An additional feature is found in the fact that the shoe base plate will accommodate any desired size of shoe.

Although the present invention has been described and illustrated with the specific embodiment shown in the drawing, it is to be expressly understood that such was by way of example only and that the only limitations to the present invention are those found in the appended claims.

What is claimed is:

1. A device for compacting earth materials which is adapted for connection to a maneuverable boom, said device comprising: a hollow housing having an open upper end; vibrating means positioned within and rigidly affixed to said housing; a motor positioned completely within and surrounded by said housing and supported thereby; means intercoupling said motor and said vibrating means; a mounting head rigidly affixed to and closing said housing to seal said housing and prevent the entry of foreign matter, said mounting head including a base member, conduit means passing through said base member and connected to said motor for conducting energizing power thereto, first and second pairs of axially spaced-apart and axially aligned sleeve members rigidly affixed to said base, said second pair of said sleeve members being spaced transversely from said first pair of said sleeve members, a rubberlike shock absorbing mount defining a centrally disposed aperture therein removably received within each of said sleeve members, first and second rigid mounting rods each having its outer ends received within said aperture of said mounts received within said first and second pair of said sleeve members respectively thereby leaving the inter-mediate portion of each of said rods free for connection to said boom, and keeper means in contact with each of said mounts and cooperating with said sleeve

members to retain said mounts in operative position during operating of said compacting device.

2. A compacting device as defined in claim 1 which further includes a frame member, said vibrating means and said motor being affixed to and supported by said frame member, said frame member being received within and surrounded by said hollow housing and rigidly secured thereto.

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