Feb. 25, 1941. F. G. DOUGLASS 2,232,842

VIBRATORY COMPACTOR

Filed July 22, 1938

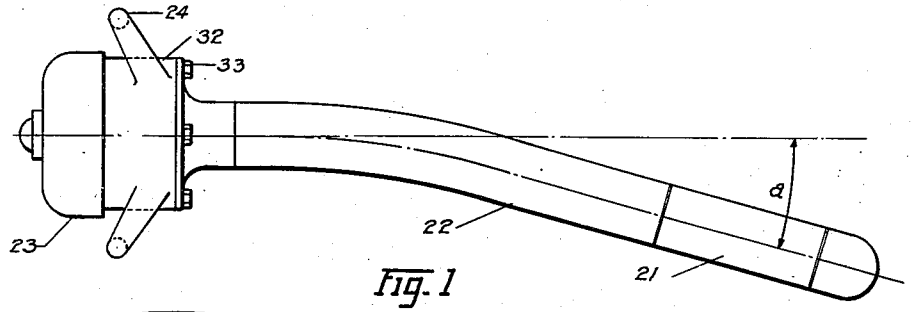


Fig. 1

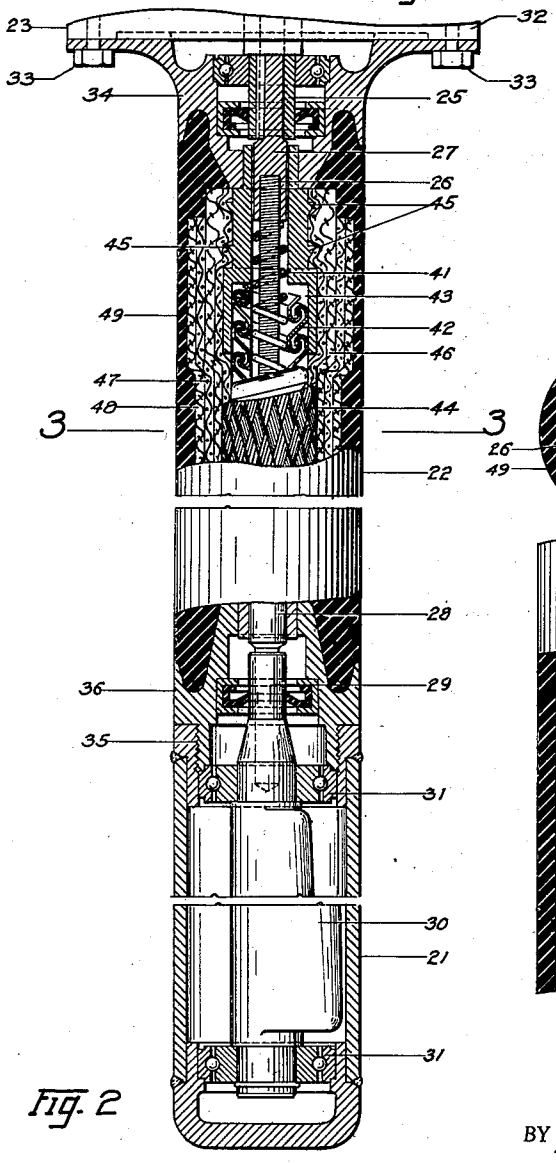


Fig. 2

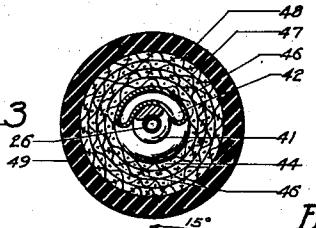


Fig. 3

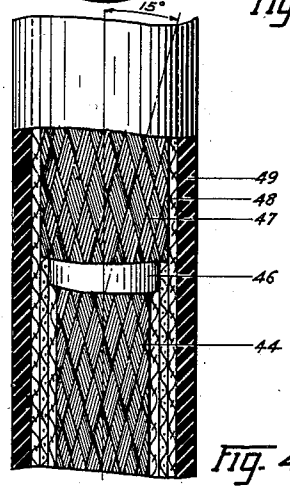


Fig. 4

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VIBRATORY COMPACTORS

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7 Claims. (Cl. 259—1)

This invention relates to vibrators for concrete, and in particular to a vibrator having a flexible, semi-rigid casing suitable for insertion in concrete.

An object of the invention is to provide a vibrator for concrete in which the insertible portion is semi-rigid. Another object is to provide a semi-rigid conduit for a flexible drive shaft. Still another object is the provision of an insertible vibrator for concrete having a portion of the insertible casing of limited flexibility. Another object is to provide a vibrator tube of sufficient rigidity for insertion in mass concrete by handles attached to the motor.

These and other objects will be apparent from the description and the accompanying drawing in which Fig. 1 shows in elevation one form of my vibrator having a semi-rigid portion in its casing; Fig. 2 shows in section, partly in elevation, a preferred form of my invention; Fig. 3 shows a section taken on the line 3—3 of Fig. 2; Fig. 4 shows in detail the wire lacing used in constructing the semi-rigid portion of my vibrator tube.

In general, my vibrator comprises a tubular casing having a rigid end portion 21 and a semi-rigid portion 22 adjacent a motor 23 having handles 24. The motor shaft 25 is operatively attached to a coiled spring flexible drive shaft 26 by the key coupling fixture 27. At the opposite end of the flexible drive shaft 26 is attached a similar key coupling fixture 28 which engages the end of the rigid eccentric shaft 29 having an eccentric weighted part 30 mounted between bearings 31 held within the rigid casing portion 21. The semi-rigid casing portion 22 is attached at its one end to the motor housing 32 by bolts 33 in the terminal fixture 34, and to the other end to the rigid casing 21 by the threads 35 on the end of the other terminal fixture 36.

The semi-rigid portion 22 of the tubular casing has an inner element consisting of a spirally wound wire 41 which serves as a bearing to enclose the flexible shaft 26. The terminal fixtures 34 and 36 are attached to this wire spiral 41 by insertion and fastening of the wire coils in cylindrical openings in the fixtures. Overlying the spirally wound wire 41 is a flexible, inextensible, non-collapsible tube 42 of spirally wound metallic strip commonly known as flexible steel tubing or interlocking armoured tubing. This armoured tubing 42 is seated in the terminal fixtures within recesses 43 and holds the fixtures at fixed distances apart.

Upon this flexible steel tubing 42 is stretched tubular wire lacing 44 made up of spirally braided wires. In order to permit only a small amount of bending, or flexibility, the lacing is made so that the pitch angle or helical angle of the wire strands is about fifteen degrees. Greater flexibility is attained by increasing the pitch angle. This tubing, when drawn down tightly around the flexible steel tubing, which forms a non-collapsible circumficial base, and when attached in tension between the terminal fixtures 34 and 36, permits flexibility of the whole assembly but resists or eliminates elongation. The wire lacing 44 immediately adjacent the interlocking tubing 42 is held in tension by engagement in its meshes with teeth or projections 45 on the exterior surfaces of the terminal fixtures 34 and 36. Tie wires behind the teeth and around the lacing give stronger attachment.

To hold the tensioned wire lacing in close contact with the flexible steel tubing, and thus prevent buckling and breaking of the individual wires, a fabric strip 46, preferably rubberized or coated with a rubber-like cement, is wound in overlapping spirals on the lacing, and attached to the terminal fixtures by wire ties. To produce greater strength and semi-rigidity, additional alternate layers of wire lacing and spirally wound fabric are superimposed over the others, as shown at 47 and 48.

A final outer layer of rubber 49 is vulcanized under the collars or flanges of the terminal fixtures 34 and 36, and over the surface, to seal the whole semi-rigid casing 22 against moisture.

In the vibration of concrete masses, where the vibrator tool is manually thrust, endwise, into the mass, rigid tubes encasing the eccentric weight and rigidly attached to the motor housing have been used, the handles on the motor serving to guide the tubular portion into the concrete. For this service, the device must, for facility in operation, be light enough in weight to be handled by one man. Since usually large masses of concrete are to be vibrated, a very considerable amount of power is required, and the motor weight may be reduced only by increasing the rotational or vibrational speeds. Operating speeds approaching 10,000 R. P. M. are frequently employed, and at these speeds, vibration of the handles has heretofore seriously affected the length of time that a workman could hold and operate the machine. While flexible shafts with protective casings have been heretofore employed between the motors and the vibrator casing, these have been so flexible that the operator was unable to guide the placement of the vibrator tube, or thrust it into a pile of

concrete, and this type of tool has not been very satisfactory for spreading and compacting masses or piles of concrete, as in mass construction. The use of the semi-rigid tube intermediate the rigid casing enclosing the eccentric weight, or other vibrator mechanism, and the motor, has eliminated the vibration of the handles and the motor, while still providing a tubular portion stiff enough to be manually thrust into a pile of concrete, or accurately guided to positions where compaction was desired. It has also greatly increased the life of the bearings and decreased the trouble due to metal crystallization in the shaft and casing when these are not so flexibly attached to the motor.

The structure described provides a semi-rigid tubular vibrator which when supported in a horizontal position from the motor or handles, will bend not more than about 10 to 20 degrees, as indicated diagrammatically on Fig. 1 as angle *a*.

While I have described a preferred embodiment of my invention, I do not wish to be limited to this particular form, but restrict my invention only in so far as is necessitated by the prior art and by the spirit of the appended claims.

I claim:

1. A unitary vibratory compacting device comprising, in combination, a motor in a motor housing provided with handles for manipulating the device; a vibrator casing of limited flexibility connected to said motor housing and having a rigid end casing portion containing rotary vibratory mechanism, and a semi-rigid casing portion intermediate said motor housing and said rigid end casing portion containing a flexible drive shaft connecting said motor and said vibratory mechanism, said semi-rigid casing portion having sufficient rigidity to permit accurate guiding or manipulation of the vibrator casing by means of said handles while having sufficient flexibility to permit bending or displacement of said casing relative to said motor housing through a substantial arc.

2. A unitary vibratory compacting device comprising, in combination, a motor in a motor housing provided with handles for manipulating the device; a vibrator casing of limited flexibility connected to said motor housing and having a rigid end casing portion containing rotary vibratory mechanism, and a semi-rigid casing portion intermediate said motor housing and said rigid end casing portion containing a flexible drive shaft connecting said motor and said vibratory mechanism, said semi-rigid casing portion being constructed of material resistant to the transmission of vibrations and of a limited rigidity designed to permit a bending or displacement of said vibrator casing relative to said motor housing, of the order of and not substantially exceeding approximately twenty degrees from normal position.

3. A unitary vibratory compacting device comprising, in combination, a motor in a motor housing provided with handles for manipulating the device; a vibrator casing of limited flexibility connected to said motor housing and having a rigid end casing portion containing rotary vibratory mechanism, and a semi-rigid casing portion intermediate said motor housing and said rigid end casing portion containing a flexible drive shaft connecting said motor and said vibratory mechanism, said semi-rigid casing portion being constructed of tubular wire lacing held in tension lengthwise of said casing portion and having a limited rigidity designed to permit a bending or displacement of said vibrator casing relative to said motor housing, of the order of and not substantially exceeding approximately twenty degrees from normal position.

4. A unitary vibratory compacting device comprising, in combination, a motor in a motor housing provided with handles for manipulating the device; a vibrator casing of limited flexibility connected to said motor housing and having a rigid end casing portion containing rotary vibratory mechanism, and a semi-rigid casing portion intermediate said motor housing and said rigid end casing portion containing a flexible drive shaft connecting said motor and said vibratory mechanism, said semi-rigid casing portion being constructed of a hollow flexible non-collapsible core member providing a passage for the flexible drive shaft, tubular wire lacing overlying said core member and held in tension longitudinally of said casing portion and binding means adapted to hold said lacing tightly against said core member, said construction having a limited rigidity permitting a bending or displacement of said vibrator casing relative to said motor housing, of the order of and not substantially exceeding approximately twenty degrees from normal position.

5. A unitary vibratory compacting device according to claim 3, wherein the wire of the tubular lacing is coiled around said core at a helical angle of approximately fifteen degrees, for the purpose indicated.

6. A unitary vibratory compacting device according to claim 4, wherein the wire of the tubular lacing is coiled around said core at a helical angle of approximately fifteen degrees, for the purpose indicated.

7. A unitary vibratory compacting device comprising, in combination, a motor in a motor housing provided with handles for manipulating the device; a vibrator casing of limited flexibility connected to said motor housing and having a rigid end casing portion containing rotary vibratory mechanism, and a casing portion intermediate said motor housing and said rigid end casing portion containing a flexible drive shaft connecting said motor and said vibratory mechanism, said intermediate casing portion having a sheathing of individually flexible elements held in tension between said motor housing and said rigid casing portion to render said sheathing and said casing portion sufficiently semi-rigid to permit accurate guiding or manipulation of the vibrator casing by means of said handles while having sufficient flexibility to permit bending or displacement of said casing relative to said motor housing through a substantial arc.

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