

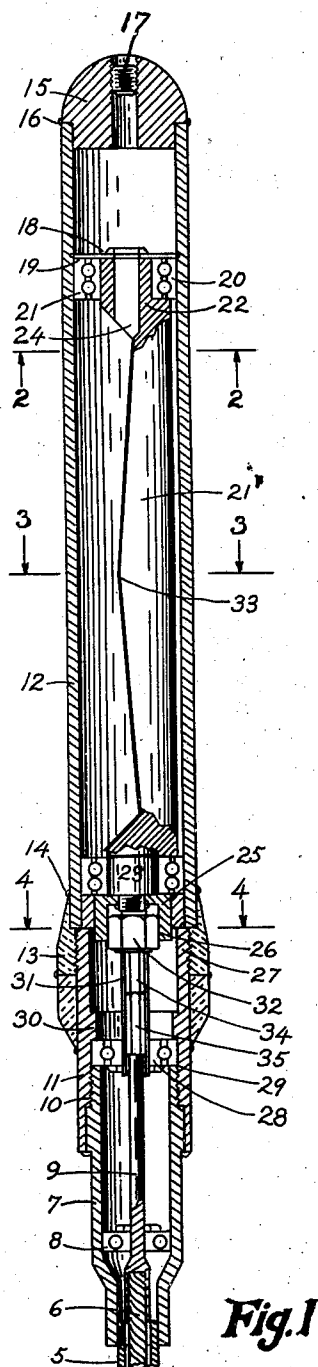
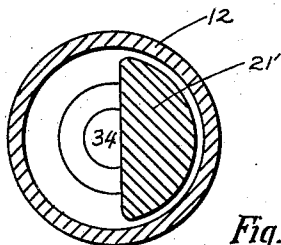
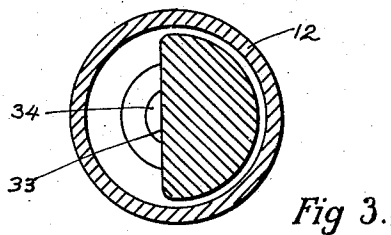
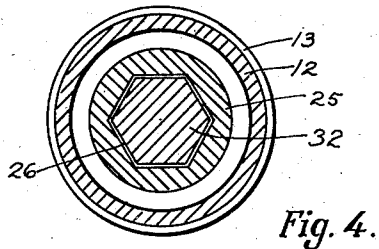
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R. L. WILDE

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VIBRATOR FOR USE IN CONNECTION WITH CONCRETE

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INVENTOR.
ROBERT L. WILDE
BY *Martin E. Anderson*
ATTORNEY.

UNITED STATES PATENT OFFICE

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VIBRATOR FOR USE IN CONNECTION WITH
CONCRETE

Robert L. Wilde, Englewood, Colo.

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2 Claims. (Cl. 259—1)

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This invention relates to improvements in high speed vibrators for vibrating concrete and the like.

Experience has shown that concrete formed from aggregate and Portland cement, for example, in order to have the most desirable properties, for example, the greatest density and imperviousness to moisture, as well as the greatest strength, requires it to be subjected to intense vibrations after it has been put in place in the forms so as to effect a consolidation of the particles and a complete filling of all interstices.

The former practice of making the grout quite wet to make the materials flow together readily and then subject it to tamping and the action of gravity, has been found to be erroneous for various reasons, one of which is that the excess liquid present in such a mixture carries with it a considerable proportion of the cement and therefore leaves the resultant concrete with less than the necessary amount for the best results. There may be, and perhaps are, other reasons why vibration results in a better concrete.

Vibrators, to be effective for the purpose under consideration, must vibrate at a very high speed. It has been found that vibrations obtained by a rotary vibrator turning at a speed of approximately 8500 revolutions per minute accomplishes the desired effect in a highly satisfactory manner. Vibrations in the neighborhood of 8500 R. P. M. appear to set up a sympathetic vibration of the grout so that the vibrator always remains in contact with the surface of the grout. If speeds considerably lower than this are used and also if much higher speeds are used, the rate of vibration seems to be so different that the vibrator soon forms a hole or cavity in which it rests, but in which it is not in contact with the concrete except at portions of its area. It has been found that vibrators that are required to vibrate at such a high speed cannot be successfully lubricated with ordinary grease and that they therefore wear out very quickly.

It is an object of this invention to produce a vibrator in which the eccentric rotary element is partially immersed in oil of a suitable weight when it is not in use and functions as a distributor and sets up forces that causes the oil to enter the bearing so as to maintain a good lubricating film between the moving surfaces when the vibrator is operated.

It is a further object of this invention to produce a vibrator in which the eccentric, elongated, rotating element is so designed that it will flex

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the least possible in response to the centrifugal forces set up during such rotation.

Another object is to produce a rotary element of such cross section that it will move through the lubricating oil with the least amount of friction and cause the least possible disturbance of the oil.

A still further object is to produce a vibrator of the type having an elongated cylindrical body which contains the rotary element and which is of such construction that it can be hermetically sealed so as to retain the oil in position.

A still further object of the invention is to produce a vibrator that can be readily attached to a flexible shaft and in which the means for effecting such connection is of a construction that permits the parts to readily adjust themselves to variations in length of the shaft due to bending.

Another object is to produce a vibrator having one end provided with a chamber for storing the lubricating oil when the vibrator is in use and from which it will quite readily flow so as to permit it to enter the chamber when the vibrator is inoperative.

The above and other objects that may become apparent as this description proceeds are attained by means of a construction and an arrangement of parts that will now be described in detail and for this purpose reference will be had to the accompanying drawings in which the invention has been illustrated in its preferred embodiment and in which:

Figure 1 is a longitudinal diametrical section;

Figure 2 is a section taken on line 2—2, Figure 1;

Figure 3 is a section taken on line 3—3, Figure 1; and

Figure 4 is a section taken on line 4—4, Figure 1.

In the drawing reference numeral 5 designates the outer tubular portion of a flexible shaft whose power transmitting element has been designated by reference numeral 6. The actual construction of this flexible shaft has not been shown because it forms no part of the invention and such shafts can be purchased on the open market. The flexible shaft terminates in a coupling like that designated by reference numeral 7 which has an anti-friction bearing 8 in which the cylindrical member 9 rotates. Coupling 7 terminates in a cylindrical portion 10, whose outer surface is threaded for connection with the cylindrical connector element 11, which will be hereinafter described in greater detail. The vibrator proper consists of a steel tube or hollow cylinder 12 hav-

ing one end provided with an internally threaded coupling 13, which may be soldered to element 12 along the line indicated by reference numeral 14. The outer end of hollow cylinder 12 is closed by member 15 which is welded or soldered thereto along line 16. The extreme end of member 15 has a threaded opening for the reception of plug 17. The inner surface of cylinder 12 is provided adjacent the closed end with an internal groove 18 for the reception of a split ring that forms shoulder 19 against which the outer race of anti-friction bearing 20 abuts. The eccentric rotor that produces the vibrations, consists of an elongated steel member 21' that terminates in trunnions 22 and 23, the inner bearing races fit over the trunnions as shown in the drawing. Trunnion 23 at the lower end, when viewed as in Figure 1, carries an anti-friction bearing that can slide in cylinder 12. The trunnion near the upper end of the vibrator, when viewed as in Figure 1 is provided with an axial opening that has been designated in the drawing by reference numeral 24. The cup-like nut 25 has its outer end provided with a noncircular and preferably a hexagonal socket 26 and is preferably welded to trunnion 23 so as to prevent accidental rotation thereon.

The short cylindrical connector element 11 is provided at its upper end with a threaded surface 27 by means of which connection may be effected between it and the connector 13. An anti-friction bearing 28 is positioned in connector element 11. Bearing 28 abuts shoulder 29 and is held in position by the inwardly projecting flange 30. A hollow spindle 31 is mounted for rotation in bearing 28 as shown in the drawing. The upper end of this spindle terminates in a hexagonal plug 32 that fits socket 26 with a slight clearness to permit such slight relative movements as are produced when the vibrator is operating.

Referring now again to the elongated rotating element 21', it will be observed that practically all of this is positioned to one side of the axis of rotation as shown, for example, in Figure 2. For the purpose of strengthening this element so as to limit the outward bending, in response to centrifugal force, to as small an amount as practicable, the central portion has been formed with an inwardly bowed part like that designated by reference numeral 33, the section at the maximum thickness being like that shown in Figure 3. Spindle 22 has an axial opening 24 which interconnects the rotor chamber with the oil reservoir for a purpose that will presently appear. Hollow spindle 31 has a hexagonal opening 34 for the reception of the correspondingly shaped plug 35 at the end of member 9. It will be observed that plug 35 has considerable longitudinal movement relative to the spindle and therefore no appreciable strains can be set up due to bending of the flexible shaft or due to any slight elongation or contraction of the same or any of the other parts in response to temperature differences.

In the operation of this vibrator, the reservoir at the upper end, when viewed as in Figure 1, is supplied with a quantity of oil sufficient to fill it and this will flow through opening 24 and between the anti-friction elements of the bearing and into the rotor chamber, when the vibrator is lying on a flat surface. When the vibrator is positioned with closed end 15 at the bottom, practically all of the oil will drain back into the reservoir leaving only the oil that adheres to the

rotor and other surfaces. When the vibrator is in operation, the high speed at which the rotor turns distributes the adherent oil to all of the bearings and this keeps the parts properly lubricated during each period of operation, when the vibrator is laid down on the ground or other supporting surface, between operations, the oil in the reservoir is again distributed over the parts thus renewing the lubrication to all the bearings.

Attention is again directed to the construction by means of which the rotatable parts are all thoroughly lubricated at the beginning of each period of use. Vibrators of this kind are nearly always operated with the end which is shown at the top in Figure 1 lower than the end to which the flexible shaft is connected. By the expedient above described of providing the closed end with a reservoir into which the oil can retreat at the beginning of each period of operation and from which it can flow when the vibrator is laid down flat, the oil is kept out of the way of the rotor during the time that it is operating and is not worn out needlessly. Since the rotor is positioned almost wholly on one side of a diametrical plane, it will naturally assume a position below the horizontal diametrical plane when at rest and therefore a comparatively small quantity of oil is sufficient to fill the space between the rotor and the housing.

It is essential that the vibrator be perfectly sealed at all joints and these are therefore sweated with a silver solder which makes a hermetic seal. If the parts are to be separated at any future time, this can be effected by heating them until the solder melts. The welded joint 16 may be soldered instead of welded and is the only one that is completed after the parts are in place. The distance between bearing 20, 21' and joint 16 is so great that the heat will not injure the bearing. It is, however, possible to immerse the vibrator in water up to bearing 20, 21' while welding at 16.

Having described the invention, what is claimed as new is:

1. A mechanical vibrator comprising, an elongated housing having one end closed, an elongated eccentric vibrator positioned in the housing, each end of the vibrator having an anti-friction bearing supported by the inner surface of the housing, one of said bearings being spaced from the closed end forming an oil reservoir, said last mentioned bearing having an opening communicating the reservoir with the space between the bearings, whereby oil from the reservoir will flow into the space between the bearings when the vibrator is positioned in a horizontal plane, and return to the reservoir when the vibrator is in a vertical position with the reservoir at the bottom.

2. In a mechanical vibrator having an elongated tubular housing, two anti-friction bearings positioned therein, in longitudinally spaced relation, one adjacent each end, an elongated unbalanced rotor having trunnions at its ends mounted for rotation in the bearings, and means at one end for turning the rotor, means for automatically applying a lubricant to the bearings when the device is in horizontal position, comprising an extension of the housing beyond the bearing at the end of the housing opposite from the rotating means, forming a lubricant reservoir, the trunnion at the lubricant reservoir end having an axial opening communicating the interior of the reservoir with the rotor chamber, whereby any oil in the rotor chamber when

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the device is in horizontal position will drain back into the reservoir when the device is in an upwardly ranging position with the reservoir at the lower end.

ROBERT L. WILDE. 5

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