Sept. 6, 1932. R. W. BAILY 1,876,271

VIBRATOR MECHANISM

Filed Jan. 27, 1932

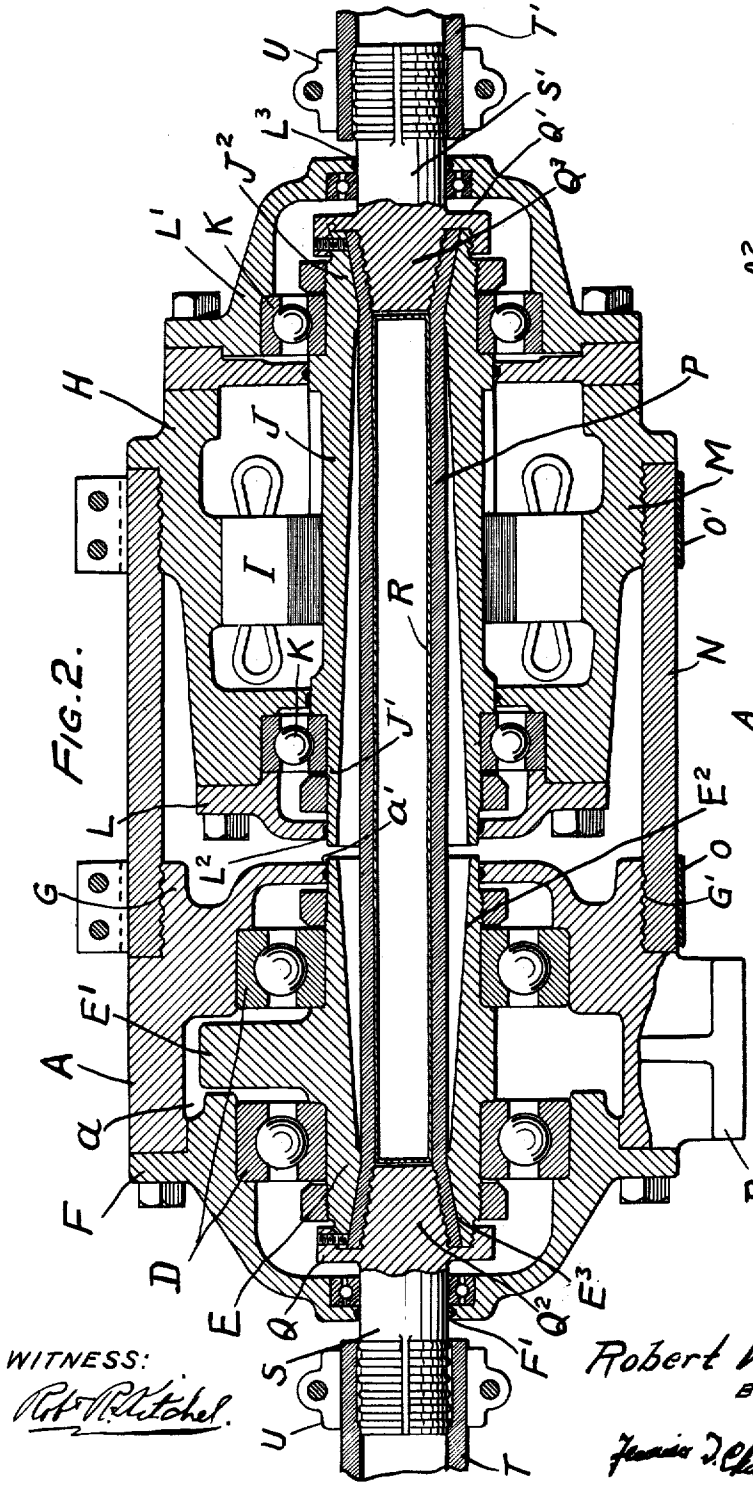


FIG. 2.

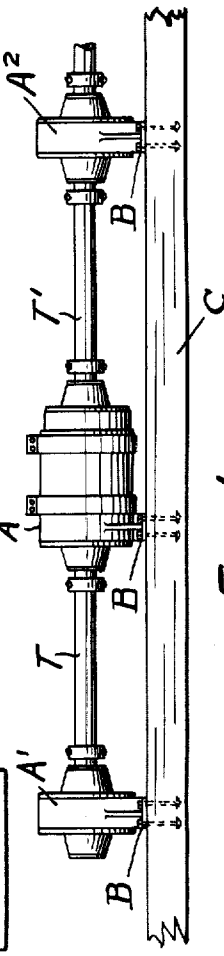


FIG. 1.

WITNESS:

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UNITED STATES PATENT OFFICE

ROBERT W. BAILY, OF PHILADELPHIA, PENNSYLVANIA

VIBRATOR MECHANISM

Application filed January 27, 1932. Serial No. 589,239.

My invention relates to vibrator mechanism and has particular, though not exclusive, reference to vibrator mechanism as used in connection with the compacting of unset concrete, the vibrators being attached to the forms into which the concrete is poured or, in the case of concrete roads, to platforms resting on the top of the poured concrete. For such and other uses of vibrating mechanism it is desirable that the motor actuating the vibrator should be supported on the vibrator housing or parts immediately connected therewith but as heretofore constructed, mechanism of this kind has involved the energetic vibration of the motor housing and motor parts, which for obvious reasons is undesirable and frequently results in such injury to the motor mechanism as to put it out of operation.

Again, it is frequently desirable that the object to be vibrated should have attached to it a plurality of vibrators acting on the same form, wall or platform but where a plurality of vibrators has been so used it has been found that at times the vibrations imparted to the wall or platform will be at times deadened, this being, as I have found, due to the fact that the vibrations of the vibrators are out of time, that is, do not occur at the same time in the same direction and under such conditions the vibrations imparted by one vibrator are to a certain extent nullified by the vibrations imparted by another vibrator.

Having particularly the above stated facts in view, the objects of my invention are, in the first place, to provide means for supporting a motor on the housing of a vibrator which, while providing for the proper support and positioning of the motor and its parts with respect to the vibrator, will at the same time prevent or greatly reduce the tendency of the supporting vibrator housing to impart its vibratory movements to the motor which it supports. A second primary object which I have in view is to provide means for synchronizing the vibratory movements of a plurality of vibrators attached to the same object so that their vibratory movements will be imparted to the object at all times in the same direction, thus avoiding the liability of the one vibrator to nullify or impair the vibrations imparted by another vibrator. Other objects which I have in view are to provide appropriate and serviceable details of construction in apparatus designed to embody the primary feature of my invention.

Vibrators of the typical kind to which my invention relates generally consists of a vibrator housing adapted to be secured to the wall or platform to be vibrated and supporting a driven shaft to which is attached an eccentric weight, which when the shaft is rapidly rotated, imparts an energetic vibration to the housing and the object connected thereto. The motor which actuates the vibrator may be of any convenient kind, involving and actuating a driving shaft, the motor and shaft being supported in a suitable housing, which in turn must be so supported as to support the driving shaft in approximate alignment with the driven shaft of the vibrator and my invention, broadly speaking, consists in providing as a support for the motor housing a laterally resilient supporting device secured to the vibrator housing at one end and to the motor housing at its other end, the supporting devices being of such rigidity as will normally support the motor in correct alignment with the vibrator, while at the same time it has such lateral resilience as will enable it to yield to the vibratory movements of the vibrator housing without imparting these vibratory movements to the supported motor housing or at least to effect a very material reduction to the vibratory influence which would be imparted to the motor housing if it were rigidly connected to the vibrator housing. Any supporting device having sufficient lateral resilience to permit the vibrator housing to which it is attached to vibrate without communicating its vibrations to the motor housing which it supports or to communicate these vibrations with greatly reduced amplitude may be used but preferably I employ as a motor support a heavy hose-like structure of fabric and rubber, secured at its ends to the housings of the vibrator and motor and by preference so located as to encase and form a shield for the ends

of the motor shaft and the shaft of the vibrator and for the flexible connection or coupling by which the motor shaft is connected to the vibrator shaft.

By preference I make the motor and vibrator shafts hollow and with an internal taper expanding toward the opposed ends of the shafts and I couple the shafts together by a flexible shaft extending through the hollow shafts and secured to them at their outer ends and by preference also I provide means for stiffening the intermediate part of the flexible shaft so as to obviate the tendency of such a shaft to whip.

Where a plurality of vibrators are attached to the object to be vibrated, my invention consists in so locating the eccentric weights secured to the shafts of the vibrators that they will extend from the shafts in the same angular direction and then connecting the shafts of the motor and vibrators in tandem in such manner that they will rotate in synchronism with each other so that the impulses imparted to the housings and through them to the object to be vibrated will always be in the same direction instead of in opposite directions. For the better understanding of my improvements reference should be had to the drawing which illustrates vibrator mechanism embodying my improvements and in which

Figure 1 is an elevation showing a motor and three vibrators connected in tandem, the motor being shown as supported by the housing of one of the vibrators through a laterally resilient support, and

Figure 2 is a sectional elevation through the motor housing and through the housing of the vibrator which supports the motor, the elevation being on a vertical plane passing through the centers of the driving and driven shafts.

A indicates a housing of the vibrator which supports the motor. A^1 and A^2, Fig. 1, indicate the housings of additional vibrators connected in tandem with a motor driving shaft and the shaft of the vibrator A. As shown, these vibrators are provided with extensions B by which they can be conveniently secured to the object or objects to be vibrated. C indicates a platform to which the vibrators are secured through their extensions B.

The vibrator housing A has secured within it bearings (ball bearings, as shown) indicated at D. These bearings support a shaft E, having extending from one side of it an eccentric weight, indicated at E^1. The shaft E is preferably made hollow with a tapering bore, indicated at E^2, the bore extending in the direction of the attached motor and at its opposite end the bore is enlarged, as indicated at E^3, this enlarged portion of the bore being externally threaded. The shaft and bearings are inserted in the housing through an open end *a*, which is closed by a head or cover, indicated at F and, as shown, is formed with a central opening indicated at F^1 to give passage to a stub shaft, to be described. At the opposite end of the housing an opening a^1 is provided to give passage to the end of the shaft E. G is an annular rim extending from the end of the housing A and formed concentric with the shaft opening *a*. This rim is preferably formed with annular grooves G^1 on its outer surface.

H is a motor housing. This house encloses a motor, conveniently an electric motor, diagrammatically indicated at I, a shaft J actuated by the motor and constituting the driving shaft of the apparatus, the said shaft being supported in bearings, indicated at K, K. This shaft, like the shaft of the vibrator, is made with a tapering bore, indicated at J^1 and at its outer end the bore is enlarged to form a seat J^2, this enlargement being externally threaded. The motor housing, as shown, is open at both ends, the openings being covered by caps or cover plates, indicated at L, L^1. The cover L is formed with an opening L^2 through which the end of the shaft J extends and the cover L^1 is also formed with an opening, indicated at L^3, for the passage of a stub shaft. An annular rim M extends from the housing of the motor, so located as to surround and, as shown, be concentric with the end of the motor shaft J, the outer surface of this rim being provided with annular grooves, as indicated. In the construction illustrated the laterally resilient motor support consists of a hose-like section N, conveniently made up of rubber and fabric, as is an ordinary hose and secured to the annular rims G and M by passing over these rims and being clamped down upon them by clamping rings, indicated at O and O^1. This hose or other equivalent supporting structure must be sufficiently stiff to support the motor in proper alignment with the vibrator shaft, while at the same time it is sufficiently laterally resilient to permit the vibrator housing to vibrate without communicating its vibratory motion to the supported motor housing or at least without effecting a corresponding vibration to the motor housing.

While any convenient flexible coupling may be used to connect the driving shaft of the motor with the driven shaft of the vibrator, I prefer the construction indicated in Fig. 2, in which the two shafts are coupled by a hollow flexible shaft preferably made up of fabric and rubber and indicated at P. This hollow shaft extends through the tapered bores of the driving and driven shafts and is secured in the seats E^3 and J^3 by plugs Q, Q^1, which screw onto the threaded ends of the shafts E and J and are formed with conical plugs Q^2, Q^3, which are thrust into the ends of the hollow flexible shaft so as to expand these ends and force them against the seats E^3 and J^3.

It is desirable that the intermediate portion of the flexible shaft P should be stiffened and for this purpose, while any stiffening means may be employed, I have indicated the location in the hollow flexible shaft of a stiffening metal cylinder, indicated at R, this stiffening cylinder, as shown, being located in the portion of the flexible shaft which lies between the ends of the driving and driven shafts.

While any convenient means may be used for coupling additional vibrators in tandem with the vibrator A, I have, in the construction illustrated, provided stub shafts S and S^1 extending from the backs of the plugs Q and Q^1 through the openings indicated at F^1 and L^2. To these stub shafts additional vibrator shafts can be connected by any flexible couplings, as indicated by flexible shafts indicated at T and T^1. As shown, the flexible shafts are clamped on to the ends of the stub shafts by bands U.

It will be understood that when the vibrator housing A and the motor housing H are coupled by the laterally resilient motor support N, the motor is supported with its driving shaft in approximate alignment with the shaft of the vibrator and that the driving and driven shafts are connected by a flexible coupling, preferably as shown, by the flexible shaft P. When the motor is set in operation this flexible shaft communicates the motion of the driving shaft of the motor to the driven shaft of the vibrator, which is set in rapid rotation, so that its eccentrically located weight E^1 imparts to the vibrator housing a rapid vibratory motion, which is communicated to the connected object to be vibrated, as shown, the platform C. It will also be obvious that by supporting the motor from the vibrator housing on a laterally resilient support, as shown, the hose coupling N, the rapid vibrations of the motor housing may and to a large extent will be taken up in the laterally resilient support and thereby be prevented from imparting to the motor the vibrations of the vibrator housing or at least with the effect of so deadening these vibrations as not to have a destructive effect upon the motor. The flexible coupling uniting the shafts of the motor and vibrator enables the motor to drive the vibrator shaft notwithstanding the vibratory motion of this shaft, while the stiffening of the flexible shaft, preferably used as a coupling for the shafts, obviates such tendency as may exist to impart a whipping action to this shaft.

Where it is desired, as indicated in Fig. 1, to use a plurality of vibrators, it is, as I have stated, important that these vibrators should vibrate in unison so as to impart their vibratory action to the object to which they are attached in properly timed relation and this is readily effected by coupling the motor and vibrators, as indicated in Fig. 1, seeing to it that the eccentric weights attached to the vibrator shafts extend from the shafts in the same direction.

Having now described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. Vibrator mechanism comprising in combination a vibrator housing adapted to be secured to the object to be vibrated supporting a driven shaft and an eccentric weight rotating with said shaft, a laterally resilient motor support secured to the vibrator housing and supporting a motor housing, a motor housing supported on said laterally resilient support and supporting a motor and a driving shaft in such manner that the driving shaft will be in approximate alignment with the driven shaft of the vibrator and a flexible coupling between the driving and driven shafts.

2. Vibrator mechanism as called for in claim 1, in which the motor support consists of a hose-like structure secured at its ends to the vibrator and motor housing and surrounding the opposed ends of the driving and driven shafts and the flexible coupling uniting them.

3. Vibrator mechanism as called for in claim 1, in which the driving and driven shafts are made hollow, the hollow portions of the opposed ends of the shafts being tapered and the flexible connection consists of a flexible shaft extending through and between the tapered portions of the driving and driven shafts, said flexible shaft being secured at the outer ends of said shafts.

4. Vibrator mechanism as called for in claim 1, in which the driving and driven shafts are made hollow, the hollow portions of the opposed ends of the shafts being tapered and the flexible connection consists of a flexible shaft extending through and between the tapered portions of the driving and driven shafts, said flexible shaft being secured at the outer ends of said shafts and being provided with means for stiffening an intermediate portion of its length.

5. Vibrator mechanism comprising a unitary member to be vibrated a plurality of vibrator housings secured to such unitary member and each supporting a shaft with an eccentric weight secured thereto, said weights extending from their respective shafts in the same angular direction and said shafts being set in approximately tandem alignment with each other, flexible couplings connecting the shafts of the vibrators so that they will rotate in synchronism with each other and means for imparting rotative motion to said coupled shafts.

6. Vibrator mechanism comprising a unitary member to be vibrated a plurality of vibrator housings secured to such unitary member and each supporting a shaft with an eccentric weight secured thereto, said

weights extending from their respective shafts in the same angular direction, in combination with a motor actuated driving shaft and flexible couplings connecting the shafts of the motor and vibrators in tandem so that all so connected shafts will rotate in angular unison.

ROBERT W. BAILY.

DISCLAIMER

1,876,271.—*Robert W. Baily*, Philadelphia, Pa. VIBRATOR MECHANISM. Patent dated September 6, 1932. Disclaimer filed January 8, 1936, by the patentee.

Hereby directs this disclaimer to that part of the claims in said patent which are in the following words, to wit:

"5. Vibrator mechanism comprising a unitary member to be vibrated, a plurality of vibrator housings secured to such unitary member and each supporting a shaft with an eccentric weight secured thereto, said weights extending from their respective shafts in the same angular direction and said shafts being set in approximately tandem alignment with each other, flexible couplings connecting the shafts of the vibrators so that they will rotate in synchronism with each other and means for imparting rotative motion to said coupled shafts.

"6. Vibrator mechanism comprising a unitary member to be vibrated, a plurality of vibrator housings secured to such unitary member and each supporting a shaft with an eccentric weight secured thereto, said weights extending from their respective shafts in the same angular direction, in combination with a motor actuated driving shaft and flexible couplings connecting the shafts of the motor and vibrators in tandem so that all so connected shafts will rotate in angular unison."

[*Official Gazette February 4, 1936.*]

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