United States Patent [19]

Matson

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[54] **ROTARY VIBRATOR AND MOUNT THEREFOR**

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[52] **U.S. Cl.** ..... **259/1 R,** 248/25, 248/361 W, 259/DIG. 43

[51] **Int. Cl.** **B06b 1/18,** B28b 1/08

[58] **Field of Search** ..... 259/1 R, DIG. 43, DIG. 44; 164/203, 206, 260, 261; 425/456; 248/15, 20, 25, 361 W, 314, 315, 310; 285/396, 394, 402; 403/351, 352; 64/7

[56] **References Cited**

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954,954	4/1910	Graybill	285/394 X
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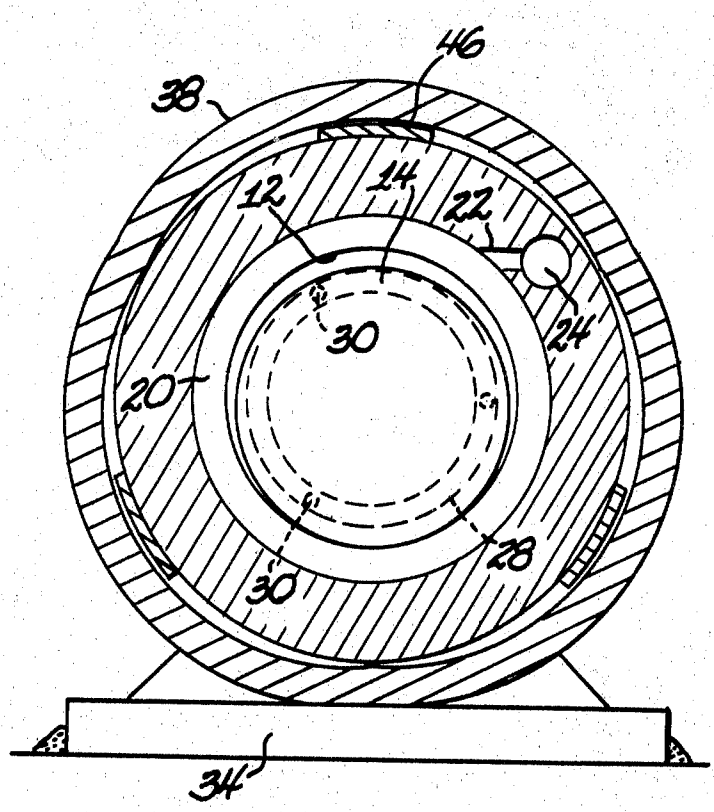
2,875,988	3/1959	Wysong	259/DIG. 43
3,318,163	5/1967	Matson	259/1 R
3,476,415	11/1969	Van Note, Jr. et al.	285/396
3,731,907	5/1973	Lash	259/DIG. 43 X

Primary Examiner—Harvey C. Hornsby
Assistant Examiner—Alan Cantor

[57] **ABSTRACT**

A rotary vibrator interfitted with a mounting structure wherein the vibrator casing and mounting structure have cooperative cam portions adapted to continuously tighten as a result of the migratory rotative movement of the vibrator casing ensuing from the continuing driving force applied to the vibrator rotor, thus providing a simple automatic clamping of the vibrator to the mounting structure.

10 Claims, 5 Drawing Figures



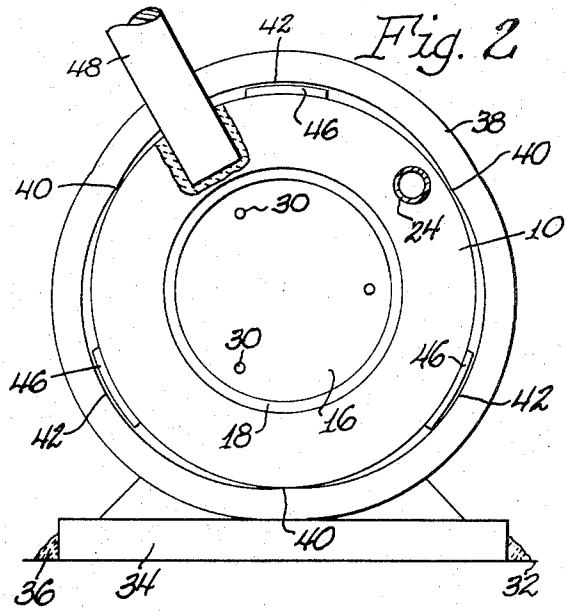


Fig. 2

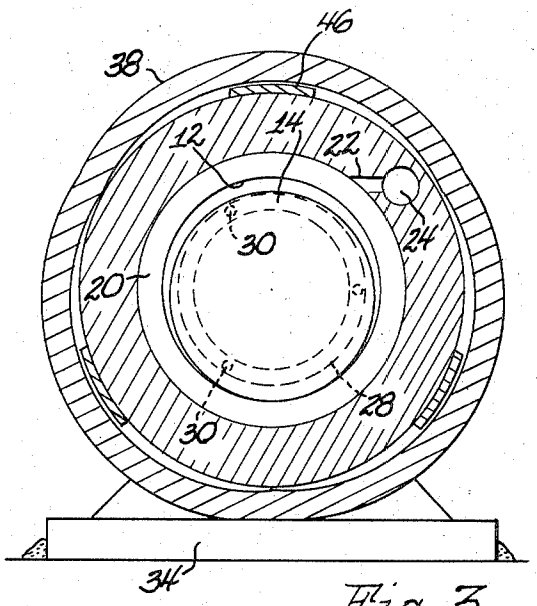


Fig. 3

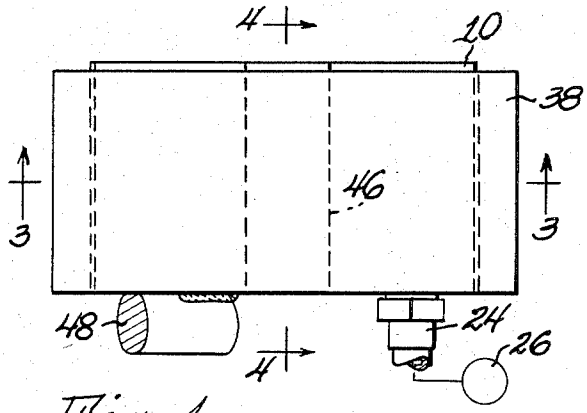


Fig. 1

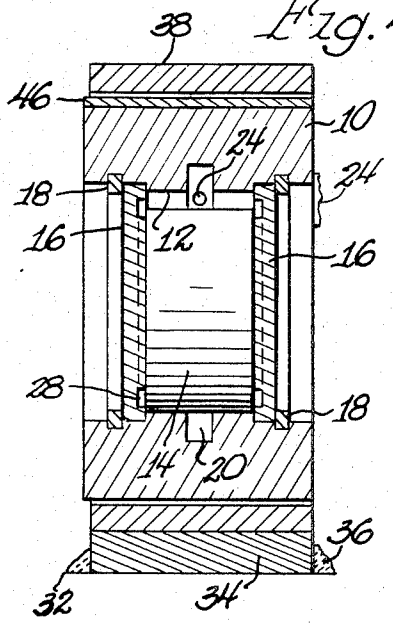


Fig. 4

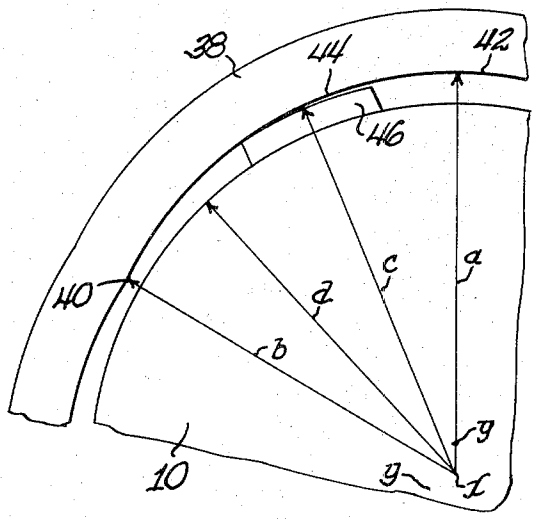


Fig. 5

ROTARY VIBRATOR AND MOUNT THEREFOR

BACKGROUND OF THE INVENTION

Vibrators are commonly used with materials-handling, such as to expedite the flow, settling, etc. of solids, semisolids and the like. One of the best-known examples is the utilization of vibrators in concrete molds. In cases where the mold is of substantial size, it is necessary to use several vibrators or to provide several mounts so that a smaller number of vibrators may be moved from one mount to the other. The latter alternative has several advantages but presents a number of problems, mainly because the vibrator must be integrated with its mount and yet must be easily and quickly removable so as to be used with other mounts.

So far as is presently known, all prior vibrator mounts have relied upon movable parts; e.g., wedges (U.S. Pat. No. 3,003,733); screws (U.S. Pat. No. 3,237,505); "self-tightening" screws (U.S. Pat. No. 3,355,957); hydraulic rams (U.S. Pat. No. 3,185,323). One disadvantage of these prior mounting devices is that they add weight to the vibrators. Another is that screws must be kept tight, are subjected to rust, corrosion, etc. Hydraulic rams are precision devices and are costly and are also subject to rust, corrosion, dust etc. When used with concrete molds, such prior devices provide openings and exposed portions that collect concrete. In general, such prior methods are costly, difficult to operate and inefficient. Furthermore, these devices are not automatically tightened as the vibrator operates but, on the contrary, tend to loosen as the vibrator decelerates, causing objectionable noise and destructive forces within the vibrator and its mount.

SUMMARY OF THE INVENTION

The typical rotary vibrator operates on the principle of orbiting a weight about an axis to create a condition of unbalance which is used to impart vibrations to an object to which the vibrator is affixed. The weight is of course eccentric to the axis of the means that confines the weight to follow an orbit. In some vibrators, the weight may be carried by a shaft, as in U.S. Pat. No. 3,036,658, and in others the weight may be a roller smaller in diameter than and confined by a circular track, as in U.S. Pat. No. 3,318,163. Yet other forms of vibrators are known. In all these is this characteristic: The casing or other means that carries the orbiting weight, rotor, etc. is subjected to migratory or precessive rotative movement in the direction of rotation of the orbiting member, from which it follows that the casing must be securely fastened to the object to be vibrated or it will vibrate itself loose from the object.

As explained above, various types of mounts have been provided heretofore. Obviously, the casing can be welded to the object, but this prevents free and easy removal of the vibrator from one location to the other, and, since removal and relocation are desirable, the mount must be temporary but effective and must not require constant attention, must be relatively simple and inexpensive and must be substantially free from environmental problems; e.g., rust, corrosion, accumulation of the material being handled, etc.

Stated simply, and without any intention to limit the invention, the problem is solved by constructing the mount as a tubular member within which a substantially circular vibrator casing is initially loosely fitted.

The object to be vibrated may be provided with several tubular mounts so that one vibrator may be easily and simply moved from one mount to the other. The interior of the mount has one or more cam surfaces and the exterior of the casing has one or more cooperating cam surfaces. When the casing precesses or migrates as the rotor is orbited by the driving force applied thereto, the cam surfaces, wedges, ramps etc. interengage and continuously tighten so long as the driving force is applied. Fundamentally, the principle of the inclined plane, be it straight, helical etc. is exploited to keep the vibrator tight in its mount so long as it is in operation. When it is desired to move the vibrator to another mount, reverse angular movement quickly and easily frees the vibrator from its mount.

DESCRIPTION OF THE DRAWINGS

FIG. **1** is a plan view of an exemplary vibrator in its initial position as related to its mount.

FIG. **2** is an elevation of the same.

FIG. **3** is a section on the line **3—3** of FIG. **1.**

FIG. **4** is a section on the line **4—4** of FIG. **1.**

FIG. **5** is an enlarged fragmentary view showing the action of the cam, ramp, inclined plane, etc. during operation of the vibrator.

DESCRIPTION OF A PREFERRED EMBODIMENT

As said above, a typical rotary vibrator forms the subject matter of U.S. Pat. No. 3,318,163, and such a vibrator has been chosen here for purposes of illustration, it being understood that the vibrator structure by itself constitutes no limitation on the invention. To that end, the selected vibrator includes a casing or carrier structure **10** having an interior circular track **12** within which a rotor **14** is confined by the track and by a pair of side plates **16** retained by snap rings **18.** The track has an annular groove **20** to which fluid under pressure—e.g., compressed air—is supplied by a tangential port **22** formed in such a way as to be connected to a pressurized inlet **24** which in turn is supplied by a fluid pressure source shown schematically at **26** (FIG. 1). It is only in the area of the external disposition of the inlet **24** that the vibrator shown herein differs from that in U.S. Pat. No. 3,318,163. Further, whether the vibrator is driven by compressed air or otherwise is of little moment.

The side plates each have annular grooves **28** provided respectively with exhaust outlets **30.** When the interior of the casing is pressurized by means of the pressure source **26,** line **24** and port **22,** the rotor or weight **14** is caused to orbit about the axis as established by the axis of the annular track **12,** all as explained in the above U.S. Pat. No. 3,318,163.

An object to be vibrated—e.g., a concrete mold or the like—is designated at **32,** and to this is affixed one or more mounts typified by a mount or mounting structure **34.** As is customary, the mount **34** is rigidly affixed to the object **32,** as by welding at **36.** The mount, by way of example, includes a member **38** of tubular form or configuration, so shaped and dimensioned that the vibrator casing **10** fits intitially relatively loosely therein; i.e., sufficiently so that the casing may be easily inserted in and withdrawn from the mount when the vibrator is idle and yet not so loosely as to permit the accumulation of environmental material or not so tightly

as to require excessive and expensive machining of cooperative parts.

Looking now specifically at the tubular part or member **38**, it is seen that its basic construction—and not by way of limitation—takes the form of a three-lobed cam or "cloverleaf", particularly in the area of its interior. Assuming further that the casing **10** fits within the tube **38**—although the parts could obviously be reversed—, there are thus three "high" spots or areas **40** and likewise three "low" spots or areas **42**. This results because the tube is non-circular. Considering further that, for purposes of clarity only, the structure is described in terms applicable to circles, the high and low areas are achieved because of the difference in cross-wise or radial dimensions. For example, the basic center of the tube occurs at *x* (FIG. **5**), but the three parts of the tube are formed about three axes *y*, so that, as measured from the center or axis *x*, the radius or dimension *a* is greater than the dimension *b*, and areas in which the arcs merge provide the cam or ramp areas or surfaces **40**.

In essence, the tube **38** is "ovalized", and it is clear that fewer or more than three cams, ramps etc. could be provided, and, likewise the surfaces need not be arcuate. The present description is based on a simple construction.

The exterior of the casing **10** is complementarily formed; i.e., it has three cooperating cam or ramp surfaces **44**, but here again, as said above, the number of cams is representative only. For the sake of simplicity, the outer surface of the casing **10**—as where it is a casting or forging—may be essentially circular, and the cams or ramps **44** are the result of lugs or strips **46** welded or otherwise rigidly affixed to the casing. Whether the lugs as described are used or whether the casing is a "deformed" tube is immaterial. The point is that the casing has two basic cross-wise or radial dimensions *c* and *d* wherein *d* is less than *c*, is less than *a* but is greater than *b*.

Thus, as the casing **10** is initially inserted into the mount or tube **38** (FIG. **2**, for example), there is ample clearance, because *c* is less than *a* and *d* is less than *b*. This makes it easy for the user to install and remove the idle vibrator. But, when the vibrator is started—and after the user gives the casing a slight turn (here counterclockwise) by means of handle **48**—, the precessive or migratory movement of the casing causes the cams **44** to continuously tighten on or in the mount cams **40**, thus resulting in an automatic and constant wedging or tightening action so long as driving force is applied to the vibrator.

It should be observed that the "angle of approach" of the cam **44** to the cam **40** should be selected on the basis of a gradual rather than an abrupt basis so that the necessary interlocking action is achieved. The "angle" shown in the drawings—albeit exaggerated—is preferred, the word "angle" being used because of the fact that straight lines rather than curves could be exploited. Likewise, other than strictly circumferential directions—e.g., helical—are within the scope of the invention. Other variations will occur to those skilled in the art after having the benefit of the present disclosure.

I claim:

1. A rotary vibrator and mounting structure therefor wherein the vibrator has a casing, a rotor in said casing and means subjecting the rotor to a continuing driving force causing the rotor to orbit about an axis and resulting in a unidirectional migratory rotative movement of the casing about the orbit axis and the mounting structure and casing are interfitted with each other so that the structure carries the vibrator, characterized in that the casing and structure respectively have initially loosely interfitting portions, said rotor and casing being provided with cooperative cam surfaces arranged to engage and to continuously tighten as a result of the aforesaid migratory rotative movement of the casing so long as the driving force to the rotor is continued.

2. The invention defined in claim **1**, further characterized in that the mounting structure is of tubular configuration embracing the casing and the cam surfaces are provided respectively on the interior of the structure and the exterior of the casing.

3. The invention defined in claim **2**, further characterized in that the mounting structure has a plurality of cam surfaces and the casing has a like plurality of cooperating cam surfaces.

4. The invention defined in claim **2**, further characterized in that the tubular configuration of the mounting structure is non-circular so as to provide the interior with cross-wise dimensions of greater and lesser lengths and the exterior of the casing is also non-circular and has cross-wise dimensions of greater and lesser lengths, the greater dimension on the casing being less than that in the structure but greater than the lesser dimension in the structure.

5. The invention defined in claim **1**, further characterized in that the mounting structure is of tubular form having an interior surface including at least two circumferentially merging surface portions of different radial lengths whereby the area of the merger of the portion of greater length with that of the lesser length provides an interior cam, and the exterior of the casing is configured to initially fit loosely into the structure and has an exterior cam engaging and tightening with the interior cam upon the aforesaid migratory rotative movement of the casing.

6. The invention defined in claim **5**, further characterized in that the interior of the structure has a plurality of interior cams as aforesaid and the exterior of the casing has a like plurality of cooperating exterior cams.

7. The invention defined in claim **6**, in which the exterior of the casing is circular and of such diameter as to fit intitially within the casing and the exterior cams are raised portions on the casing engageable respectively with the interior cams.

8. In combination, a rotary vibrator having a casing, a rotor in said casing, means for continuously driving said rotor about an axis, mounting structure for the casing and including a cam portion, a cam portion on the casing engageable with the structure cam portion and adapted to continuously tighten as a result of unidirectional migratory rotative movement of the casing ensuing from continuous driving of the rotor.

9. The invention defined in claim **8**, in which the structure is tubular and embraces the casing and the cam portions are provided respectively on the interior of the structure and the exterior of the casing.

10. The invention defined in claim **8**, in which the structure is tubular and a portion thereof is of generally oval configuration and the casing initially loosely fits within the structure and has its exterior cam portion engageable with the cam provided by the decreasing radial dimension of the oval portion of the structure as the casing partakes of the aforesaid migratory rotative movement.

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