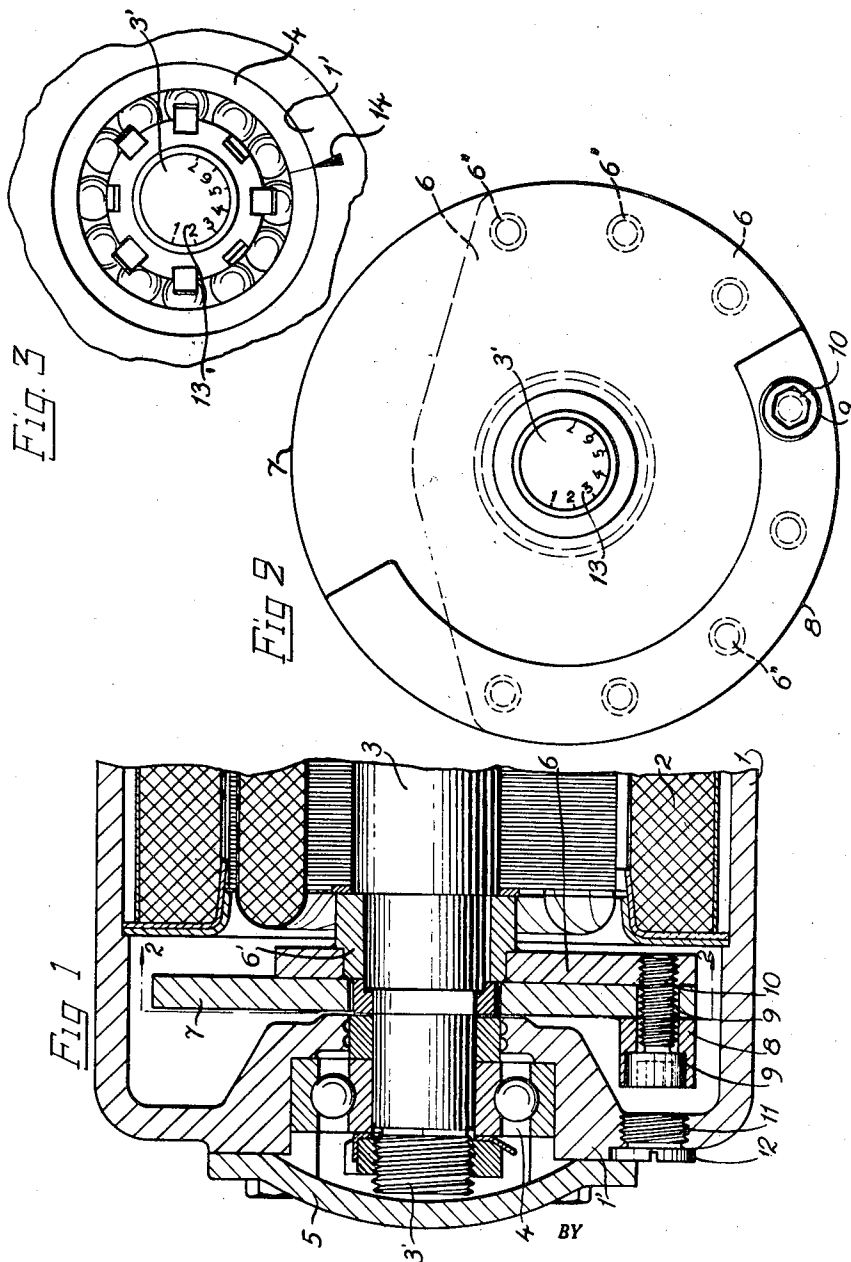


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VARIABLE AMPLITUDE VIBRATOR

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VARIABLE AMPLITUDE VIBRATOR

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This invention relates to vibrators generating free vibrations of an amplitude which is variable within certain limits, and more particularly the invention refers to a vibration of the type having a relatively fixed eccentric mass and a relatively adjustable eccentric mass mounted for cooperation on a common shaft passing through a housing enclosing said two eccentric masses, the said adjustable eccentric mass being rotatable about said shaft and lockable relatively to the fixed eccentric mass, in an arbitrary position.

In vibrators of this type the angular adjustment of the eccentric masses in relation to each other makes it possible to vary the vibration amplitude from a maximum, when both eccentric masses are acting in the same direction relatively to the shaft, to a minimum, when they are acting in opposite directions, and it will be easily understood that the vibration amplitude may thus be varied between zero and a maximum, if the eccentric masses are equivalent, or between a predetermined minimum to a maximum, if the eccentric masses are not equivalent, the minimum amplitude being determined by the difference between the eccentric masses. The adjustment of the relative positions of the eccentric masses may take place in predetermined steps or continuously.

It is obvious that relative adjustment of the eccentric masses in a vibrator of the type defined is rather difficult due to the fact that both eccentric masses are enclosed in the protective housing. In most cases it is necessary to make the adjustment very accurately and this is particularly of great importance in such types of the said vibrators in which two pairs of eccentric masses are located in axially spaced relationship on a common shaft, such as in an ordinary electric rotary vibrator, for example, where one pair of eccentric masses are located at each end of the rotor of the electric motor. An inaccurate adjustment of the eccentric masses in such cases may reduce the efficiency of the vibrations and cause hazardous stresses on the bearings of the vibrator shaft.

It is an object of this invention to provide a vibrator of the kind defined wherein accurate relative adjustment of the eccentric masses may take place without dismantling the vibrator. This and other objects will appear more clearly from the following description of a preferred form of the invention embodied in an electric rotary vibrator illustrated on the accompanying drawing, wherein:

Fig. 1 is an axial section through one end of the electric rotary vibrator, it being supposed that the opposite end of the vibrator is a duplicate of that shown,

Fig. 2 is an end view of the eccentric masses at one end of the motor shaft, and

Fig. 3 is a partial end view of the vibrator, the end cap protecting the shaft end and the bearing being removed.

The vibrator illustrated has an outer casing 1 forming the stator of an electric motor, the rotor 2 of which is carried by a shaft 3 passing through the end walls 1' of the stator casing. The shaft 3 is carried in an external ball bearing 4 fitted in a suitable seat in each end wall 1'. Each end of the shaft 3 projecting through the end wall

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1' of the casing 1 and its bearing 4 is protected by a removable cap 5. Just inside each end wall 1' each end portion of the shaft 3 carries a fixed eccentric mass 6 having a sleeve-shaped hub portion 6' surrounding and keyed to the shaft 3. The eccentric mass 6 actually consists of a circular metal disc which is firmly welded to the hub portion 6' and from which a substantially segment-shaped part has been cut away as shown by dotted lines in Fig. 2. The remaining somewhat semicircular disc member 6 is provided with a series of screw-threaded holes 6'' close to its periphery and all located on the same radial distance relatively to the shaft 3.

The adjustable eccentric mass cooperating with the fixed mass 6 consists of a circular disc 7 mounted outside the fixed mass 6 to be rotatable about the shaft 3 and having the same radius as the disc 6. On the outer side of the circular disc 7 there is mounted an arc-shaped eccentric weight 8 following the periphery of the disc and extending over an angle of about 180°. Through the weight 8 and the disc 7 runs a single hole 9 located on the same radial distance relatively to the shaft 3 as the threaded holes 6'' in the fixed disc 6. Through this hole 9 a locking bolt 10 is threaded into one of the holes 6'' thus interlocking the two discs 6 and 7. The head of the bolt 10 is countersunk in the eccentric weight 8 and is provided with an internal spanner grip of a known type.

According to the present invention a screw threaded hole 11 is formed in the end wall 1' of the casing 1 and is normally kept closed by means of a screw plug 12, which in its screwed in position is retained by the marginal portion of the removable cap 5. The hole 11 is arranged on the same radial distance relatively to the shaft 3 as the bolt 10 interlocking the discs 6 and 7 so that the bolt 10 may be reached by a spanner and unscrewed when it is directly in front of the hole 11, from which the plug has, of course, been previously removed. The discs 6 and 7 are arranged so close to the end wall 1' of the casing 1 that, when the bolt 10 is screwed out of the threaded hole 6'' in the disc 6 but still guided by the disc 7, the head of the bolt 10 will be received in the hole 11 of the end wall, thus preventing relative rotation between the outer, adjustable disc 7 and the casing 1 but leaving the inner disc 6 secured to the shaft 3 free to rotate together with said shaft. Adjustment is then easily made by turning the shaft 3 a desired angle, this being accomplished by gripping the end of the shaft projecting through the bearing 4 by a suitable tool. The cap 5 has, of course, been removed to release the screwplug 12 so that the end of the shaft 3 is easily accessible.

To facilitate proper adjustment of the eccentric discs 6 and 7 by the measures just described, the end 3' of the shaft 3 has been provided with markings 13 indicating the positions of the respective holes 6'' of the disc 6, one of said holes having no marking because it is provided for balancing purposes only. The markings 13 cooperate with an indicator marking 14 on the end wall 1' of the casing 1, this latter marking indicating the position of the hole 11 relatively to the shaft 3. As shown, the markings 13 on the shaft end 3' are numbered from one to seven to tell the degree of unbalance obtained in each position, number one representing the lowest obtainable unbalance and hence vibration amplitude and number 7 representing the highest obtainable unbalance and vibration amplitude. When the shaft 3 has been properly set relatively to the casing 1 the bolt 10 is screwed into the corresponding new hole 6'' of the disc 6, thus again interlocking the two discs 6 and 7 and releasing the disc 7 from the casing 1. The screw plug 12 is inserted to close the hole 11 and the bearing cap 5 is again secured to the casing to protect the shaft end 3'.

Even when the discs 6 and 7 are completely invisible

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throughout the whole adjustment, full control of their mutual positions may be had by means of the markings as soon as the bolt 10 is screwed out to lock the disc 7 relatively to the casing 1, and by similar arrangements in both ends of the vibrator both parts of discs may be simultaneously adjusted by one and the same turning of the shaft 3 when the two adjustable discs 7 have been fixed relatively to the casing in the manner described. In such a case one set of markings 13 at one end of the shaft 3 is obviously sufficient to allow proper adjustment of both the composite unbalances.

The invention is not limited to the particular form of the respective details illustrated in the drawing, since it is to be understood that their shape, size and relative arrangement may be varied within the scope of the appended claims.

What we claim is:

1. In a variable amplitude rotary vibrator the combination of a shaft, a relatively fixed eccentric mass rigidly secured to said shaft, a relatively adjustable eccentric mass rotatably mounted on said shaft for cooperation with said fixed eccentric mass, axially movable means for interlocking said eccentric masses in the forward operative position, a casing housing said eccentric masses and being passed through by said shaft, an opening in said casing aligned with the axially movable interlocking means and making said interlocking means accessible from the outside of said casing, said opening forming a socket adapted to receive a part of said interlocking means when the latter is retracted to inoperative position to release said adjustable eccentric mass from said fixed eccentric mass, said interlocking means, when partly received in said socket, preventing relative rotation between said adjustable eccentric mass and said casing, and means

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on said shaft and said casing for indicating the relative angular position of said fixed eccentric mass on said shaft.

2. In a variable amplitude vibrator the combination as claimed in claim 1, wherein said means for interlocking said eccentric masses comprises a bolt passing freely through a hole in said adjustable eccentric mass and normally screwed into one of a series of threaded holes in said fixed eccentric mass.

3. In a variable amplitude rotary vibrator the combination of a shaft, an eccentric mass secured to said shaft, a relatively adjustable eccentric mass rotatably mounted on said shaft for cooperation with said fixed eccentric mass, means axially movable to operative position for interlocking said eccentric masses, a casing housing said eccentric masses and accommodating said shaft, and an opening in said casing aligned with the axially movable interlocking means making said interlocking means accessible from the outside of the casing, said opening forming a socket adapted to receive a part of said interlocking means when the latter is axially moved to inoperative position to release said adjustable eccentric mass from said fixed eccentric mass, said interlocking means, when partly received in said socket, preventing relative rotation between said adjustable eccentric mass and said casing.

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