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[54] **OUTER VIBRATOR FOR CONNECTION TO MOLDS, JARRING TABLES, AND THE LIKE**

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[52] **U.S. Cl.** ..... **259/1 R,** 164/261, 259/DIG. 43

[51] **Int. Cl.** **B06b 1/18,** B01f 11/00, B28b 1/08

[58] **Field of Search** ..... 259/1 R, DIG. 15, DIG. 43, 259/DIG. 44; 198/220 A, 220 BB, 220 DD; 164/206, 261; 425/456

[56] **References Cited**

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[57] **ABSTRACT**

An outer vibrator, especially for connection to forms for concrete, jarring tables, or the like, in which an eccentric mass substantially tangentially acted upon by air under pressure rolls on a continuously curved track closed in itself on the inside of the housing means of the vibrator to impart a vibration movement upon the vibrator housing means which latter is by a connecting member connectable to the form for the concrete or the like, the vibrator housing means being so designed that it can be connected end face to end face with other similar housing means coaxially with regard to the axis about which the eccentric mass circulates.

7 Claims, 5 Drawing Figures

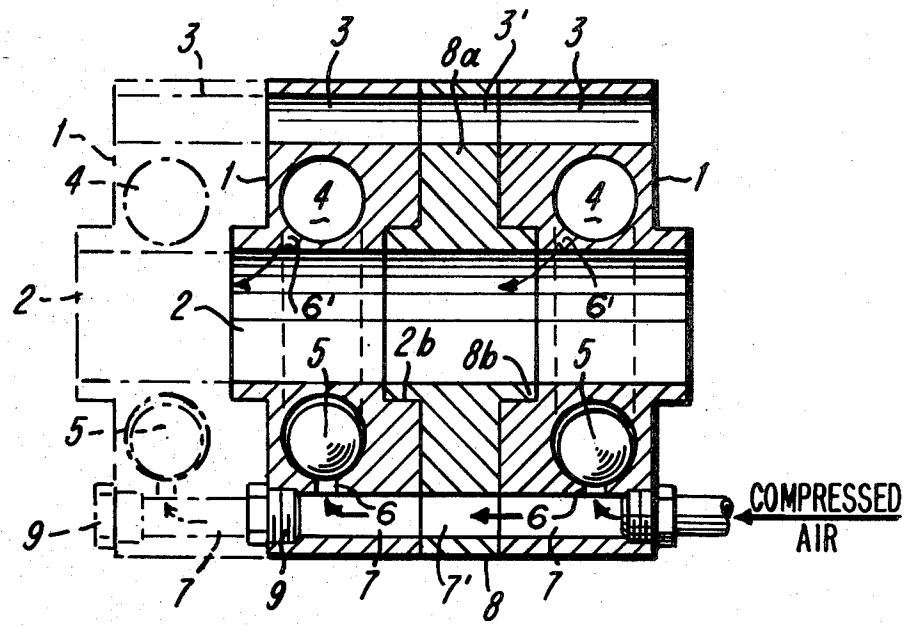


FIG-1

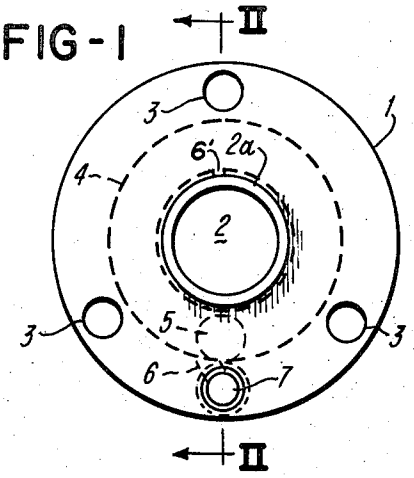


FIG-2

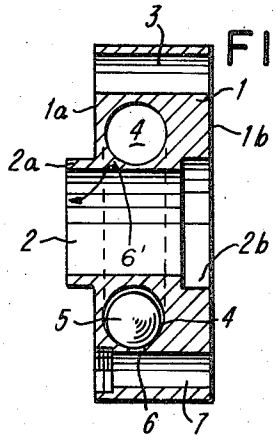


FIG-3

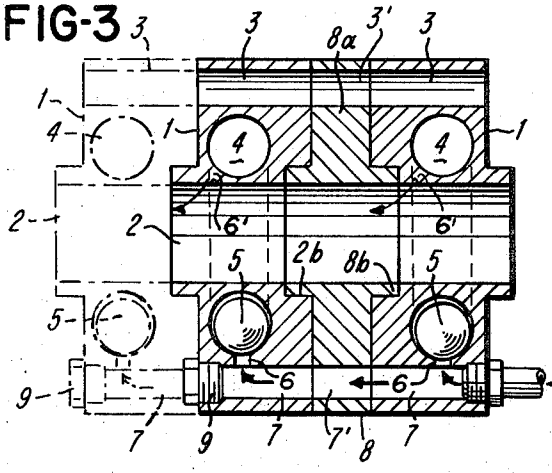


FIG-4

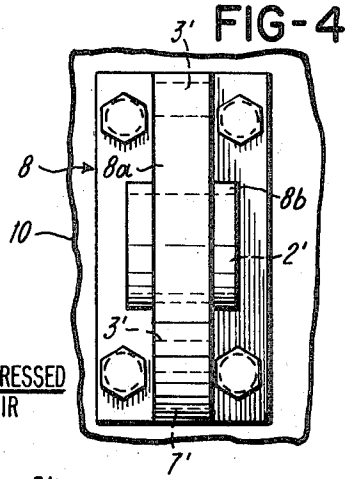
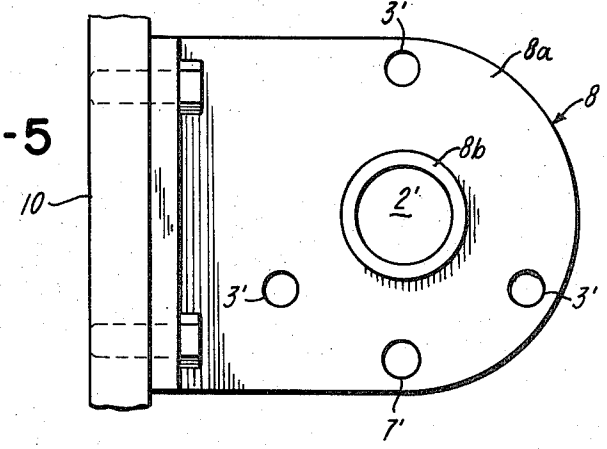


FIG-5



OUTER VIBRATOR FOR CONNECTION TO MOLDS, JARRING TABLES, AND THE LIKE

The present invention relates to an outer vibrator for connection to molds, jarring tables, or the like, according to which an eccentric mass acted upon substantially tangentially by compressed air rolls on a continuously curved path closed in itself which is provided on the inside of the vibrator housing in order to impart upon the latter a vibrating motion which through a connecting device connecting the vibrator housing to the mold or the like is conveyed to the latter.

In view of the limited space conditions, especially in connection with forms and molds, industry requires that the height of such outer vibrators in the direction perpendicular to the form or mold be kept as low as possible. This requirement, however, is counter to the requirement of as good a degree of efficiency as possible, because a good degree of efficiency requires for a predetermined centrifugal moment as small a ratio as possible of the diameter of the eccentric mass to the diameter of the path of movement, which means that the centrifugal moment should be realized at as large a diameter of the path of movement as possible with a small eccentric mass. If in practice a certain degree of efficiency is to be maintained, an increase in the centrifugal moment will automatically bring about an increase in the height of the outer vibrator. Inversely, if a certain height of the outer vibrator is to be maintained, an increase in the centrifugal moment will be accompanied by a reduction in the degree of efficiency.

It is, therefore, an object of the present invention to provide an outer vibrator of the general character mentioned above, which will make it possible to increase the centrifugal moment at will while maintaining the customary vibration frequency without the necessity of increasing the critical height of the outer vibrator.

This object and other objects and advantages of the invention will appear more clearly from the following specification in connection with the accompanying drawing, in which:

FIG. 1 illustrates an outer vibrator according to the invention as seen from the side in the longitudinal direction of the rotary axis of the eccentric mass.

FIG. 2 is a section taken along the line II — II of FIG. 1.

FIG. 3 represents a simplified sectional view of two outer vibrators built together on the connecting device.

FIG. 4 shows a front view of the connecting device according to the invention.

FIG. 5 illustrates a side view of FIG. 4.

The outer vibrator according to the present invention is characterized primarily in that the vibrator housing is so designed that it can be connected end face to end face with similar housings in a coaxial manner with regard to the rotary axis of the eccentric mass.

The present invention makes it possible, starting from an optimum with regard to vibrator height and degree of efficiency, to be able to select the centrifugal moment, without a decrease of vibrator height and degree of efficiency, at will within wide limits by building together a plurality of outer vibrators end face to end face which vibrators have been designed according to optimum values, whereby the critical dimensions of the overall arrangement do not change, but only the length measured in the direction of the axis of rotation of the eccentric mass will be increased which, however, is not critical. Aside from this outstanding advantage, the present invention has the further important advantage that for a wide range of centrifugal moments only a small number of basic types of the outer vibrator have to be manufactured and stocked which basic types can then be assembled or united in conformity with the respective desired centrifugal moment.

The invention is based on the finding that with the built together outer vibrators, in spite of the fact that the individual supply of compressed air to the eccentric masses does not bring about an automatic coupling, there is established an automatic synchronism between the eccentric masses because each eccentric mass by itself tries to find the path of least resistance and in this respect there exists a coupling between the eccentric masses via the paths of movement fixedly connected to each other.

Preferably the vibrator housing is at both end faces provided with centering means for the coaxial centering, which centering means are in radial direction positively engaging the adjacent housings. These centering means, according to a further development of the invention, may be so designed that they permit a connection of adjacent vibrator housings to each other on either side. This offers the possibility of realizing directed vibrations because also in such an instance the above mentioned automatic synchronism between eccentric masses rotating in opposite direction with regard to each other will be obtained while the resulting preferred direction of vibration due to the particular conditions on the form or mold is perpendicular to the latter or at least has a pronounced vertical component.

According to a further development of the invention, the connecting device is provided with a support or the like, which is approximately perpendicular to the form or mold, to both sides of which the vibrator housings with their centering means are connectable. This permits an assembly which is symmetrical to the support, either with the same end faces or opposite end faces facing each other, so that a substantially moment-free transfer of the vibrations through the support to the form or mold will be obtained.

According to a still further feature of the invention, it is provided that the supply of compressed air to the eccentric masses of the outer vibrators connected to each other is effected through air passage sections which extend through the outer vibrators and are in alignment with each other and parallel to the axis of rotation of the eccentric mass. From these air passage sections in each outer vibrator a branch passage branches off to the respective eccentric mass. This feature has the advantage that, when connecting the outer vibrators to each other and the support, simultaneously a common air passage is built up into which for the operation of the entire unit compressed air is conveyed from a single connection.

Referring now to the drawings in detail, the outer vibrator according to FIGS. 1 and 2 comprises an approximately circular housing with substantially plane end faces 1*a*, 1*b*. The housing has a circular central opening or bore 2 which at the end face 1*a* is surrounded by an annular flange 2*a* protruding from the end face 1*a*. On the other end face 1*b* the opening 2 is surrounded by an annular groove 2*b* corresponding in dimensions to the dimensions of flange 2*a*. Annular

flange 2*a* and annular groove 2*b* together with the corresponding elements on adjacent outer vibrators form frictionally cooperating centering means in radial direction for a coaxial centering operation. The arrangement furthermore comprises bores 3 which are arranged along a circle and are along this circle evenly spaced from each other. The bores 3 extend through the housing body while connecting screws may be passed through these bores for positioning and interconnecting the respective outer vibrators to be connected to each other. If desired, the outer vibrators may also by these connecting screws be located on and connected to the connecting device by means of which they are connected to the forms or the like. Each vibrator housing is provided with an annular track 4 arranged coaxially with regard to the longitudinal axis of the outer vibrator. The eccentric mass 5 is adapted to roll on the annular track 4 and is acted upon tangentially by air under pressure. The air under pressure is conveyed to the eccentric mass 5 through a branch passage 6 branching off from a main passage 7 which extends through the vibrator housing in a direction parallel to the longitudinal axis of the opening 2. In the specific embodiment shown, the track 4 is formed by a pipe which is closed in itself and which has a cross section slightly larger than the cross section of the ball forming the eccentric mass 5. In this way also the potential energy of the compressed air is utilized for driving the ball.

As well known and self-understood in the state of the art, there is provided an exhaust port or passage 6' in track 4 as shown in FIGS. 1, 2 and 3 to permit escape of air supplied through passage 6 extending from passage 7.

FIG. 3 shows a cross section through the connecting device by means of which the outer vibrators 1 are arranged on the form or the like. FIG. 3 also shows two outer vibrators 1 connected to each other to form a unit. The outer vibrators connected to each other by screws (not illustrated) which pass through the bores 3 fully engage the support 8*a* of the connecting device 8 which support is perpendicular to the form 10 or the like. The outer vibrators are centered with regard to the support 8*a* by means of annular flanges 8*b* which engage the grooves 2*b* and correspond to the flanges 2*a*.

FIGS. 4 and 5 show the support 8*a* for bores 3', 7' and 2' which respectively correspond to the bores 3, 7 and the central opening or bore 2 of the vibrator housing 1. In assembled condition, the bores 3', 7' and 2' are in axial alignment with the bores 3, 7 and 2 respectively.

FIG. 3 indicates in dash lines that in the same manner in which the outer vibrators 1 are connected to the support 8*a* of the connecting device 8, further vibrators 1 may be directly connected to the other vibrators which are connected to the support 8*a*. In each instance the main air passages 7, 7' will be in alignment with each other so that, for instance, when closing one end of the thus obtained total passage by means of a closure member 9, the supply of compressed air to the eccentric masses can be effected from the other open end of this main passage through the branch passages 6. It is a matter of course that to this end at the mouth of the passage between the individual elements there are provided sealing means (not shown in the drawing) which seal the joints.

The connection of the individual outer vibrators 1 to each other or to the support 8*a* may be effected either from the proper side or the reverse side while in the last mentioned instance a directed oscillation is obtained when the eccentric masses in their tendency to follow the path of the least resistance roll in an automatic synchronous movement on the annular paths 4 which in FIG. 3 have been omitted for the sake of simplicity.

It is, of course, to be understood that the present invention is, by no means, limited to the particular showing in the drawing but also comprises any modifications within the scope of the appended claims.

What we claim is:

1. An external vibrator unit, especially for use in connection with forms for concrete and with jarring tables, which comprises: housing means having inside track means closed in themselves and conduit means communicating with said track means and connectable to a source of compressed air, and an eccentric mass body movable along said track means for imparting a vibration upon said housing means, said housing means having two oppositely located parallel end faces respectively provided with a protrusion and a recess in axial alignment with said protrusion for selective engagement with a correspondingly designed vibrator unit in stacked relationship therewith and aligning the same.

2. An outer pneumatic vibrator, especially for use in connection with forms for concrete and with jarring tables, which includes at least one vibrator unit comprising a housing body with inside track means and with conduit means communicating with said track means and connectable to a source of compressed air, an eccentric mass member arranged inside said housing body and movable along said track means for imparting a vibration upon said housing body, and a connecting member for connection to the respective device with which the vibrator is to be used, said housing body and said connecting member having oppositely located end faces provided with interengaging aligning means, and means for detachably interconnecting said members, said vibrator unit having that end face thereof which faces away from said connecting member provided with additional aligning means for selective aligning engagement with another corresponding vibrator unit in stacked relationship therewith.

3. An outer pneumatic vibrator according to claim 2, which includes a plurality of vibrator units in disc-like arrangement, and in which the housing body of each vibrator unit has its oppositely located end faces provided with centering means frictionally and radially engaging the respective adjacent housing body for coaxially centering the same.

4. An outer pneumatic vibrator according to claim 3, in which said centering means are so designed as to permit either end face of each housing body to be engaged and centered by either end face of the respective adjacent one of said housing bodies.

5. An outer pneumatic vibrator according to claim 3, in which the conduit means of each vibrator unit are stacked in axial alignment with each other.

6. An outer pneumatic vibrator according to claim 2, in which said connecting member includes connecting plate means for connecting the vibrator to the device in connection with which it is to be used, and also includes supporting plate means connected to said connecting plate means while protruding from said connecting plate means in the manner of a cantilever, said

supporting plate means having opposite sides thereof provided with some of said aligning and engaging means.

7. An outer pneumatic vibrator according to claim 2, in which each vibrator unit and said connecting member are provided with aligned bores for receiving connecting bolts for connecting said stacked units to said connecting member.

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