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Sironi

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[54] **VARIABLE AMPLITUDE VIBRATOR, FOR EXAMPLE FOR THE MANUFACTURE OF MOULDED CONCRETE PRODUCTS**

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[58] **Field of Search**.....259/1, 72, DIG. 43, DIG. 44

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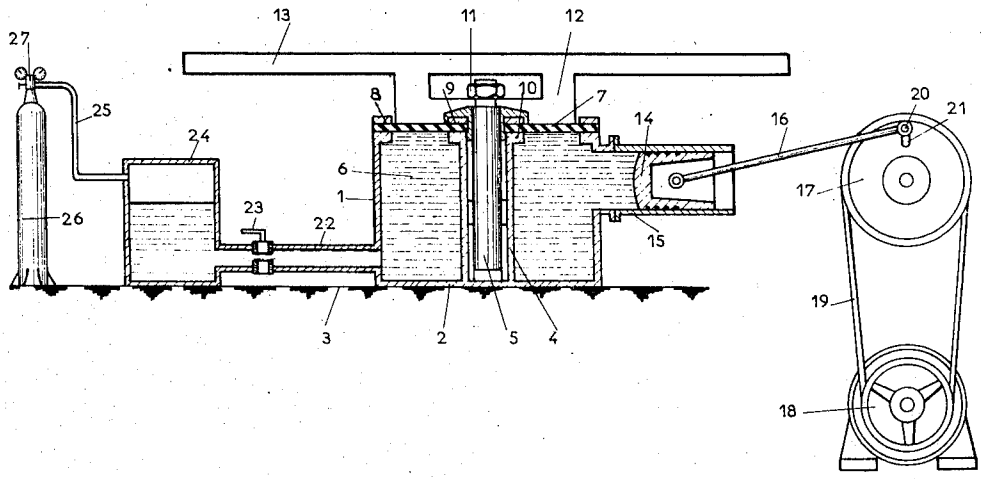
[57] **ABSTRACT**

A vibrator, e.g., for the manufacture of moulded concrete products, comprises a support for a mass to be vibrated, and means for vibrating the support, said means including a chamber adapted to contain a liquid through which in operation vibrations are transmitted to the support, a further chamber adapted to contain liquid under pressure and an adjustable flow restrictor connecting the first-mentioned chamber with the further chamber.

7 Claims, 1 Drawing Figure



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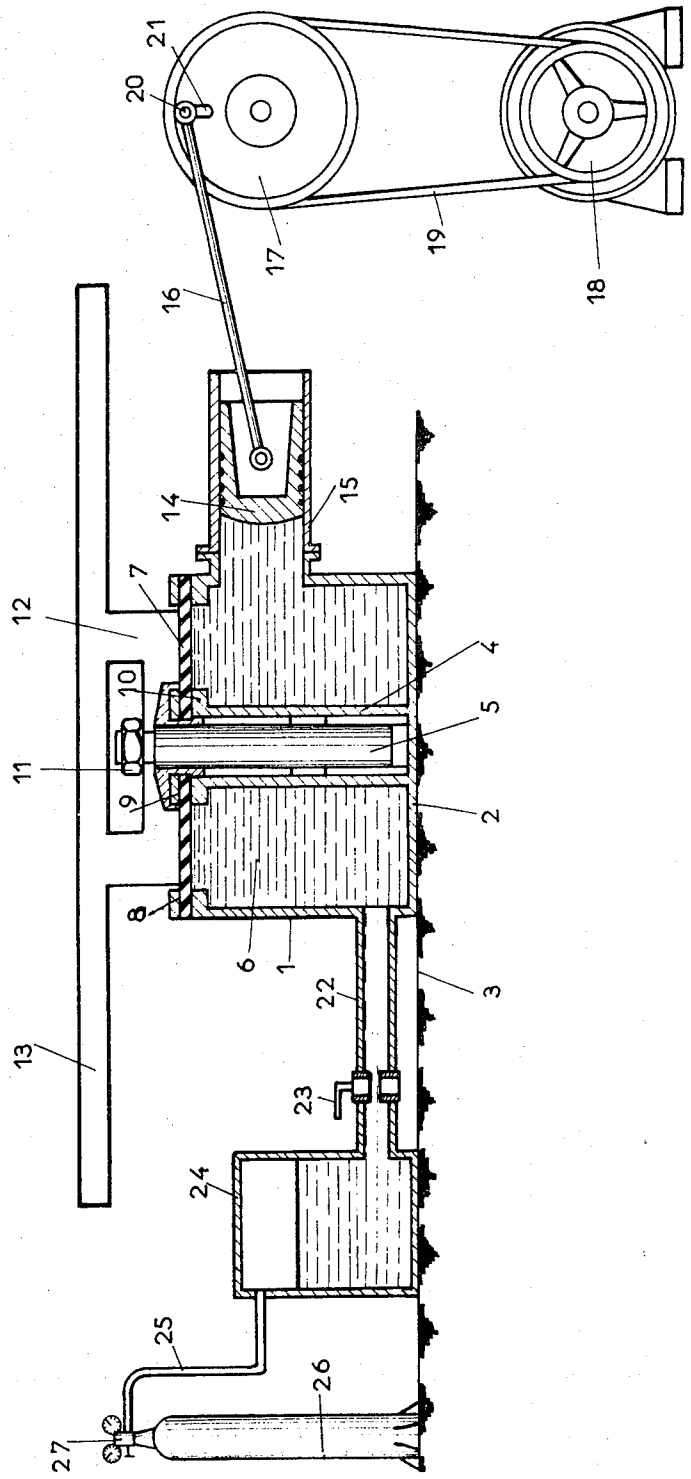

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VARIABLE AMPLITUDE VIBRATOR, FOR EXAMPLE FOR THE MANUFACTURE OF MOULDED CONCRETE PRODUCTS

This invention relates to a vibrator, for example for use in the manufacture of moulded concrete products.

The invention provides a vibrator comprising a support for a mass to be vibrated, and means for vibrating the support, said means including a chamber adapted to contain a liquid through which in operation vibrations are transmitted to the support, the chamber communicating via an adjustable flow restrictor with a further chamber adapted to contain liquid under pressure.

There may be means for pressurizing the further chamber with a gas.

There may be means for adjustably pressurizing the further chamber.

The first-mentioned chamber may be bounded by a flexible diaphragm which is connected to the support to transmit vibrations thereto from the liquid.

The invention will be described, merely by way of example, with reference to the accompanying drawing.

Referring to the drawing, the vibrator installation illustrated is used for vibrating a mass of concrete (not shown). It comprises a cylindrical vessel **1** having a vertical axis, the bottom **2** of which rests on a base **3** and also serves as bottom for a coaxial internal cylinder **4**, in which a guide piston **5** is adapted to move. An annular chamber **6** is thus provided between the cylinder **4** and the inside walls of the vessel **1**. This chamber, which in operation is entirely filled with oil, is provided at its top with a movable closure wall constituted in this embodiment by a flexible annular diaphragm **7**. At its periphery this diaphragm is gripped sealingly in a groove **8** in the top edge of the vessel **1**, and in its central portion it is gripped, likewise sealingly, in a groove **9** formed in a thickened portion **10** of the top of the cylinder **4**.

On the top of the piston **5** there is fastened by means of a clamp nut **11** an annular part **12** resting on the diaphragm **7** and solid with a movable support **13** on which the material to be vibrated is placed.

It will thus be understood that if the volume of oil contained in the chamber **6** is varied cyclically, cyclical vibrations of the diaphragm are produced, which by means of the part **12** are communicated to the support **13** and thus to the material. In the example illustrated the means for cyclically introducing oil into the chamber is constituted in known manner by a piston **14** adapted to move in the cylinder **15** in communication with the chamber **6**. This piston is driven in a reciprocating movement by a connecting rod **16** connected to a rotating driving pulley **17** driven rotationally by a motor **18** and a belt **19**. The big end **20** of the connecting rod can be fixed to the pulley **17** at various points spaced radially apart on the latter, with the aid of a radial slot **21** provided in the pulley.

As so far described, the vibrator is capable of operating at frequencies below the audible range. Also, since the liquid in the chamber **6** is incompressible, the vibrations produced have a constant amplitude which is independent of the load placed on the support **13**; this amplitude in fact depends only on the volume of liquid pushed by the piston **14** into the chamber in each cycle.

It is also useful to adjust the amplitude of vibration according to the composition of the material to be vibrated or to other treatment conditions.

Therefore, the chamber **6** is in addition in communication through a pipe **22**, provided with an adjustable loss of head device or flow restrictor **23**, with an oil container **24** constituting a further chamber. The top portion of said container is in communication through a pipe **25** with a compressed air cylinder **26** provided with a pressure reduction valve **27**.

During each vibration cycle a part of the liquid pushed into the chamber **6** by the piston **14** will serve to effect the displacement of the diaphragm **7** and another part of this liquid will flow into the container **24** through the pipe **22** which contains the flow restrictor **23**. If by adjusting the restrictor **23**, the loss of head in the pipe **22** connecting the container **24** to the chamber **6** is increased, the volume of the liquid displaced from the container to the chamber, or in the opposite direction is reduced. Since the volume of liquid displaced by the piston **14** remains constant, the amplitude of the vibrations of the diaphragm **7** is increased.

Conversely, if the restrictor **23** is adjusted to reduce the loss of head in the pipe, a larger proportion of the liquid displaced by the piston **14** flows into the container **24** and the amplitude of the vibrations imparted to the movable diaphragm **7** and consequently to the support **13** is reduced.

Thus, it is possible to adjust the amplitude of vibration of the support **13** without having to stop the vibrator.

The position of rest of the movable wall **7** bounding the chamber also is adjustable. By 'position of rest' we mean the position which it occupies when the piston is stopped at mid-stroke. This is particularly advantageous when as in this case the movable wall **7** is constituted by a flexible diaphragm. In order that the vibrations are regular and have a suitably shaped waveform, it is desirable that the diaphragm **7** should not be deformed when in its rest position.

The rest position of the diaphragm is adjusted by adjusting the pressure of the gas in the container **24** by means of the valve **27**, according to the load on the support **13**.

Adjusting the pressure causes liquid to pass between the chamber **6** and the container **24** or vice versa. Adjusting the quantity of fluid in the chamber **6** raises or lowers the diaphragm **7** thus permitting it to be brought into an undeformed shape when it is in its rest position.

The vibrator is operated as follows. The motor **18** being at rest, a mass of concrete to be vibrated is placed on the movable support **13**. The pressure reduction valve **27** of the cylinder is then adjusted so that when the piston **14** is at mid-stroke the diaphragm **7** will be perfectly horizontal and undeformed. When the motor **18** is started the amplitude of vibration of the support **13** is adjusted by adjusting the flow restrictor **23**. If the amplitude of the vibrations is too low, it is necessary to increase the loss of head in the restrictor **23**.

Conversely, if the amplitude of the vibrations is too great, it is necessary to reduce the loss of head in the vibrator **23**.

Adjustment of the restrictor **23** provides accurate control of the vibrator amplitude. Choice of different ranges of amplitude is effected by preadjustment of the radius of rotation of the connecting rod big end **20** by fixing the big end at a predetermined point in the aperture **21**, thereby adjusting the stroke of the piston **14**.

I claim:

1. In a vibrator having support means for a mass which is to be vibrated and vibrating means interconnected to said support means for vibrating same, said vibrating means comprising:

first wall means defining a primary chamber adapted to contain a substantially incompressible fluid therein;

said first wall means including a movable wall portion defining a part of said primary chamber and adapted for engagement with the fluid in said primary chamber, said movable wall portion being engaged with said support means;

input means for imposing a vibration on the fluid within said primary chamber, whereby the vibrations are transmitted through the fluid to the movable wall portion and the support means;

second wall means defining a secondary chamber adapted to contain said substantially incompressible fluid therein;

means defining flow passageway providing communication between said primary and secondary chambers, whereby at least a part of the vibrations imposed on the fluid in the primary chamber are transmitted to the fluid in the secondary chamber; and

adjustable flow restricting means associated with said passageway for controlling the flow therethrough, whereby the vibrations transmitted through the fluid to the support means can be selectively varied relative to the vibrations imposed on the fluid by the input means.

2. A vibrator according to claim 1, wherein said substantially incompressible fluid occupies only a portion of said secondary chamber, and means associated with said secondary chamber for supplying a pressurized compressible gas thereto whereby said pressurized compressible gas occupies the remainder of said secondary chamber.

3. A vibrator according to claim 2, further including adjustment means for permitting the pressure of the compressible gas as contained in said secondary chamber to be selectively varied.

4. A vibrator according to claim 1, wherein said movable wall portion comprises a flexible diaphragm.

5. A vibrator according to claim 1, wherein said input means includes a reciprocal piston member, said piston member comprising a part of the external periphery of said primary chamber, and said input means including drive means connected to said piston means for reciprocating same for causing cyclic displacement of the fluid within said primary chamber.

6. A vibrator according to claim 1, wherein said input means includes adjustment means associated therewith for permitting the reciprocating stroke of said piston member to be selectively varied.

7. A vibrator according to claim 1, wherein said flow restricting means comprises an adjustable device associated with said flow passageway for permitting the flow area to be selectively varied.

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