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2,800,309

IMMERSION VIBRATOR

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Fig. 1.

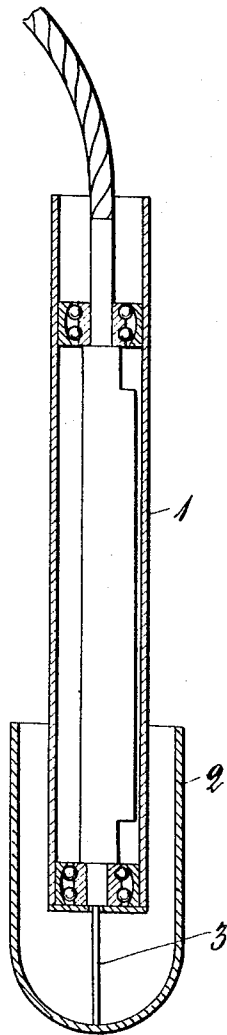
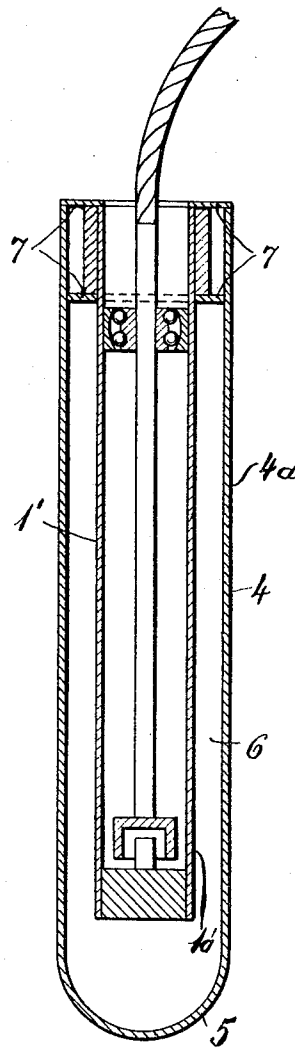


Fig. 2.



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IMMERSION VIBRATOR

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2 Claims. (Cl. 259—1)

This invention relates to an immersion vibrator, that is to say, a vibrator of the type intended for immersion at least partially in a semi-fluid or viscous material to be vibrated, such as concrete.

It is already known to employ so-called rod vibrators for this purpose, and numerous types of such rod vibrators are available all consisting of a longitudinal tubular casing having a rotary vibrating member in the form of an eccentric or the like located therein. In order to produce the greatest possible vibratory effect in the concrete it is necessary for the rod vibrator to carry out extensive movements, that is to say, it should have a great vibratory amplitude, but as the stresses thus set up are very considerable it is difficult to obtain this amplitude on account of the limited strength of the constructional material.

The present invention has for its object the construction of an immersion vibrator, the active part of which is capable of working with large amplitudes without subjecting the vibrating element to heavy stresses. According to the invention this is achieved by resiliently connecting a rod vibrator of a suitable type with an auxiliary structure or casing, the natural frequency of which is substantially the same as the operating frequency of the rod vibrator. The connection between the auxiliary structure and the rod vibrator should preferably be symmetrical and resilient and preferably the auxiliary structure or casing is symmetrically mounted relatively to the rod vibrator proper.

The immersion vibrator according to the invention is hereafter more particularly described with reference to the accompanying drawing from which further characteristic features of the invention will be seen.

In the drawing,

Fig. 1 is an axial section through an immersion vibrator according to the invention, which is primarily intended to illustrate the inventive principle, and

Fig. 2 shows an axial section through another form of construction which is found preferable in practice.

In Fig. 1, 1 is a rod vibrator of a customary type at the outer end of which a bowl- or sleeve-shaped auxiliary structure 2 is attached, freely surrounding the lower portion of the rod vibrator and connected to the latter by means of a resilient rod 3 arranged coaxially with the rod vibrator. The auxiliary structure 2, which is so dimensioned relatively to the rod vibrator that its natural frequency approximately corresponds to the operating frequency of the rod vibrator, is arranged symmetrically in relation to the rod vibrator 1. When the rod vibrator 1 is started, it is found that the auxiliary structure will vibrate with an appreciably greater amplitude than the rod vibrator. In the ideal case the rod vibrator 1 remains practically stationary or in rest, while the auxiliary structure performs a very extensive and powerful movement. If the immersion vibrator 1 shown in Fig. 1 is provided with a flexible packing between the upper edge of the auxiliary structure and the casing of the rod vibrator proper 1 so that concrete cannot penetrate into the sleeve

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2, said vibrator may be employed for vibrating concrete and will then have a very much greater effect than the rod vibrator 1 by itself.

In the form of construction shown in Fig. 2 the rod vibrator proper 1' is of a somewhat different form to that in Fig. 1 but works in substantially the same manner. In Fig. 2 the auxiliary structure 2 is given the form of a symmetrical tubular casing 4 with a rounded bottom 5 which surrounds the rod vibrator 1' along its whole length. The casing 4, which may be of steel, for example, is concentric with the rod vibrator 1' and is separated from the latter by an annular space 6. A lower end 1a' of the rod vibrator 1' is spaced from the casing 4 and may be termed the free end of the rod vibrator. At the upper end of the rod vibrator the casing is rigidly connected to the former by means of flanges 7 on the rod vibrator or the casing. If desired, a symmetrical resilient connection, such as a rubber ring connection, can also be arranged between the rod vibrator and the casing. However, it is to be understood that the lower portion of the casing due to the resiliency of the casing itself will be free to oscillate relative the rod vibrator proper also without such resilient connection. In other words, an upper portion 4a of the casing 4 may comprise the resilient connection between the rod vibrator 1' and the lower portion of the casing 4.

As an example of the effect obtainable according to the invention it may be mentioned that in a practical experiment with a rod vibrator of the type shown in Fig. 2 but without the auxiliary structure according to the invention, at a frequency of about 7000 R. P. M. an amplitude of the rod vibrator's outer surface of 0.7 mm. was obtained. When this rod vibrator was subsequently fitted with a resilient auxiliary structure according to Fig. 2 consisting of a steel pipe having a wall thickness of some millimeters and an external diameter corresponding to approximately twice the diameter of the rod vibrator proper and so chosen that the natural frequency thereof substantially corresponded to the operating frequency of the rod vibrator, the double amplitude was measured at the auxiliary structure, whilst at the same time the amplitude of the rod vibrator was reduced below the value of 0.7 mm., mentioned above.

The vibrating element in the immersion vibrator according to the invention may, as already mentioned, be constructed in accordance with previously known principles, for example the pendulum principle according to the U. S. Patent No. 2,194,410 of March 19, 1940, or in the form of other vibrating rods with eccentric shafts and bearings without affecting the method of operation of the outer tube. As the rod vibrator no longer comes into direct contact with the medium vibrated owing to its surrounding auxiliary structure, it is not necessary to construct the vibration generator proper as a complete rod vibrator, but a vibrating element similar in principle may be employed.

In addition to the increased amplitude obtained by adopting the inventive principle as described above, it is possible to produce relatively light immersion vibrators with a large effective surface, that is to say, a large diameter in practice, without the introduction of heavy masses, and in this way a considerable increase in the vibratory effect is obtained without loading the immersion vibrator and vibratory element unnecessarily.

It is obvious that the forms of construction shown do not limit the possibilities for applying the inventive principle. Thus, the auxiliary structure may also consist of a purely axial extension of the rod vibrator, and the resilient connection between the rod vibrator and the auxiliary structure may be obtained by different auxiliary means within the scope of the invention. As an example of the latter, reference may be made to the fact that the

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casing 4 in Fig. 2 can be constructed with a progressively increasing thickness of material at its upper part nearest to the fixing point, whereby the oscillating movements will exert lower stresses on the casing.

What I claim is:

1. An immersion vibrator comprising, in combination, a vibration generator including a rod rotatably mounted in an elongated casing, an auxiliary structure adjacent to the generator, said auxiliary structure including a casing at least partially surrounding the vibration generator, the internal surface of said casing being radially spaced from said vibration generator, and means for resiliently connecting the generator to the auxiliary structure to permit the auxiliary structure to oscillate independently of the generator, the natural frequency of said auxiliary structure being substantially the same as the operating frequency of the vibrator.

2. An immersion vibrator comprising, in combination, a slender vibration generator having a free end, an auxiliary casing surrounding said free end of said generator

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and being spaced therefrom to freely oscillate in relation thereto, a resilient connection between said generator and said casing capable of transferring free oscillations therebetween to energize said casing when said generator is operated, and means preventing the entry of liquid into said space between said generator and said casing when the vibrator is immersed in a fluid medium.

References Cited in the file of this patent

UNITED STATES PATENTS

2,018,789	Jorgensen	Oct. 29, 1935
2,148,722	Baily	Feb. 28, 1939
2,194,410	Svenson	Mar. 19, 1940
2,360,803	Steurman	Oct. 17, 1944
2,437,983	Wenander	Mar. 16, 1948
2,500,293	O'Connor	Mar. 14, 1950
2,649,286	Karlstrom	Aug. 18, 1953

FOREIGN PATENTS

145,826	Sweden	Apr. 1, 1954
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