Oct. 5, 1971 H. ENGELHARD 3,610,118

VIBRATORY ROAD-ROLLER

Filed April 16, 1969 2 Sheets-Sheet 1

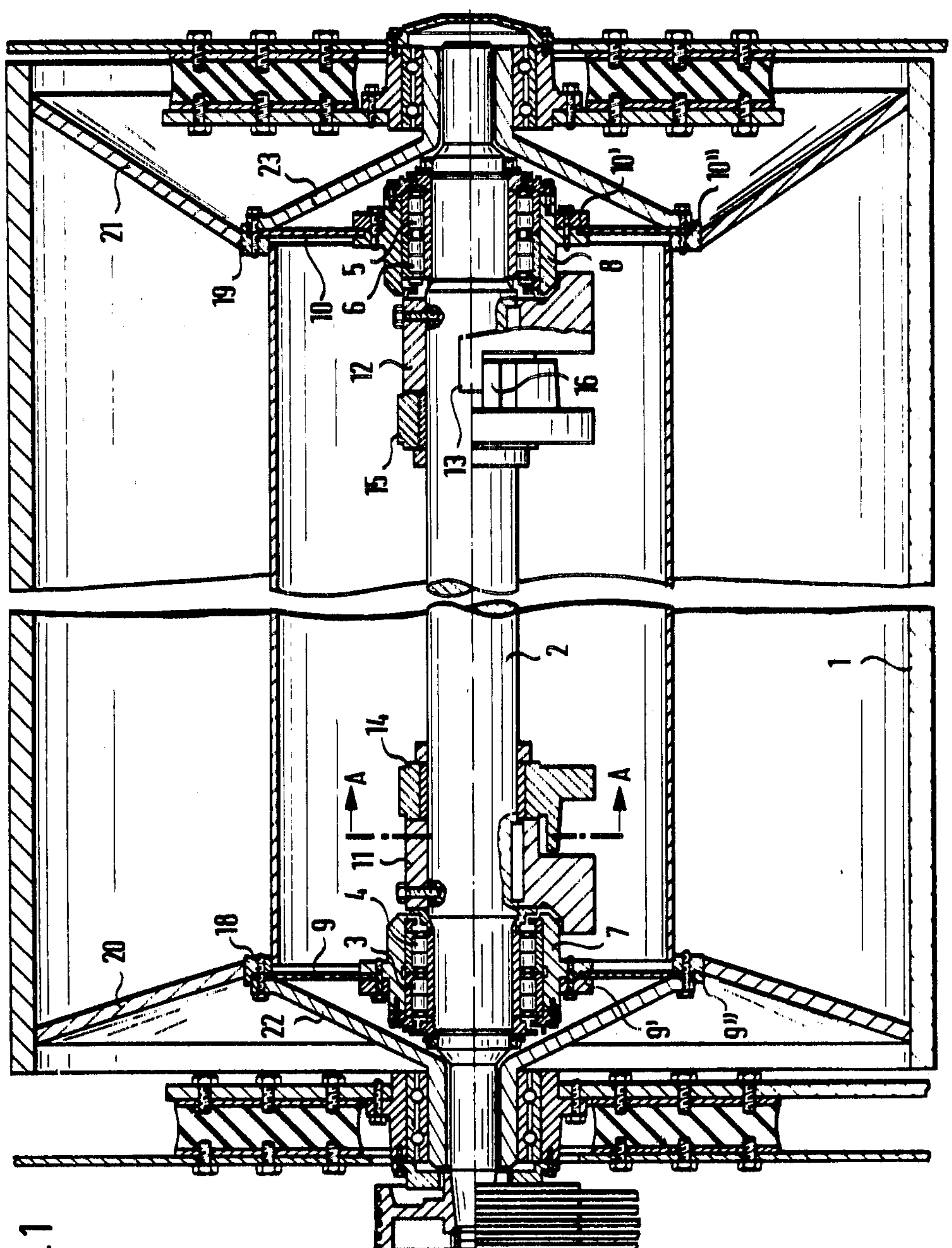


Fig.1

Inventor
Heinz Engelhard
By
Watson, Cole, Grindle & Watson
Attys.

Fig.2

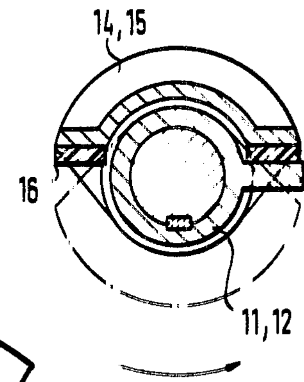


Fig.6

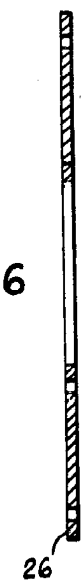


Fig.5

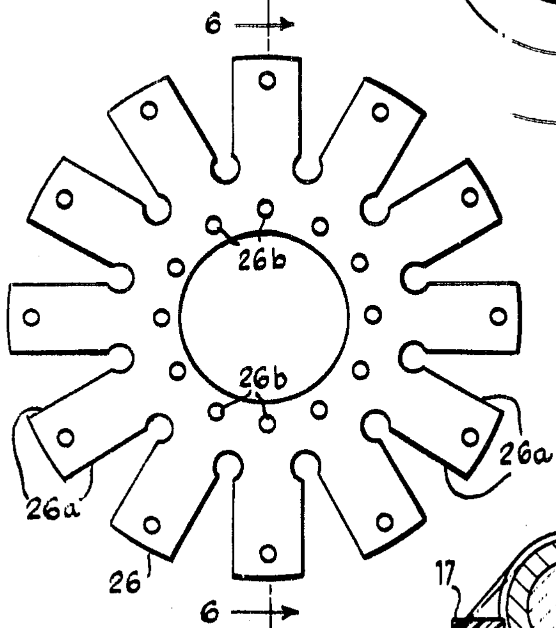


Fig.3

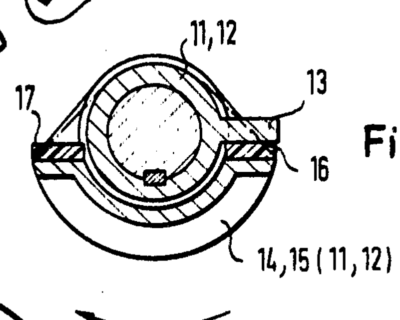


Fig.7

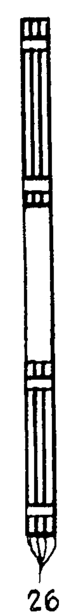
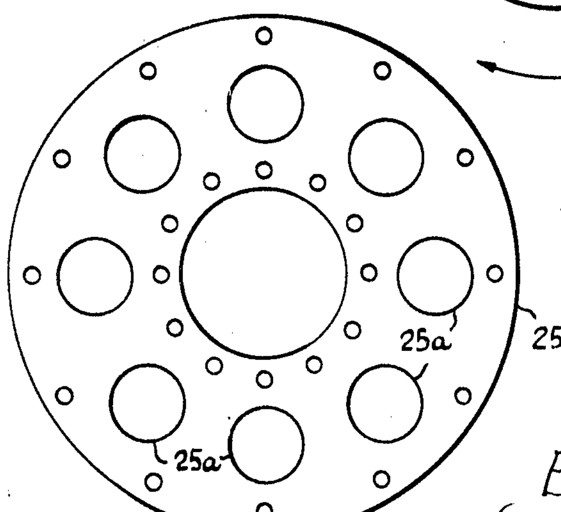


Fig.4



Inventor
Heinz Engelhard
By
Watson, Cole, Grindle & Watson
Attys.

United States Patent Office

3,610,118
Patented Oct. 5, 1971

3,610,118
VIBRATORY ROAD-ROLLER

Heinz Engelhard, Hameln-Auf dem Anger, Germany, assignor to ABG-Werke GmbH, Hameln-Am Damm, Germany

Filed Apr. 16, 1969, Ser. No. 816,512
Claims priority, application Germany, Apr. 19, 1968, P 17 59 301.0
Int. Cl. E01c *19/28*
U.S. Cl. 94—50 R 3 Claims

ABSTRACT OF THE DISCLOSURE

A vibratory road-roller has an improved vibrator shaft mounting along the operation of the machine with high inertia-forces. This is effected by mounting the vibrator shaft bearings in annular plates permitting axial movement of the shaft without radial movement.

The invention relates to a vibratory road-roller capable of producing variable inertia-forces and having an out-of-balance shaft supported at each end in the interior of the roller body.

In order to render the use of vibration road-rollers, primarily in road-construction, more economical, the out-of-balance masses have been designed to be displaceable in order to enable operations to be carried out with variable inertia-forces. Practice has shown that when compacting cohesive types of earth and broken rock material a very large inertia-force at a low frequency gives the most favorable compacting performance. On the other hand, a low frequency and a high inertia-force in the vibration road-roller leads to undesirable breaking up of the surface of the ground if the number of passes of the road-roller is increased and when non-cohesive types of ground are being compacted. This phenomenon is countered by using a higher frequency and a smaller inertia-force during the last passes of the road-roller or when the ground is of the non-cohesive kind.

Thus, it would be desirable to have a vibratory road-roller which enables operations to be carried out on the one hand with the greatest possible inertia-forces applied at low frequency and, on the other, with lower inertia-forces but applied at high frequencies.

The problem of mounting the out-of-balance shaft has hitherto set limits as regards the very high inertia-forces required, in that with bearing elements of appropriately increased size insoluble lubrication problems have been encountered, particularly as it has been necessary to fulfil the additional requirement that operations had to be carried out substantially without the need for maintenance, although high frequencies were used. Furthermore, with bearing elements of increased size, the slightly oblique positions of the shaft caused by deflections of the vibration shaft during the production of very large inertia-forces, would result in pressure at the edges of the bearings, which pressure could not be countered by the use of appropriate materials.

The object of the invention therefore is firstly to permit the production of low frequency inertia-forces of an order of magnitude greater than those at present obtainable, while taking this problem of mounting the out-of-balance shaft into account, and secondly to provide a construction which can enable operations to be carried out using a small inertia-force at high frequency.

According to the present invention there is provided a vibratory road-roller capable of producing variable inertia-forces, and having an out-of-balance shaft supported at each end in the interior of the roller body in a corresponding support comprising a pair of bearings disposed side by side in a common supporting housing which is suspended in an annular plate secured by its outer edge to the roller body, each of the plates being rigid in the radial direction but permitting slight play in the movement of the supporting housing in the axial direction.

The division of the supports into two bearings disposed side by said enables their individual bearing capacities to be utilized for producing inertia-forces in excess of the present-day standardized order of magnitude, without thereby encountering insoluble lubrication problems.

The inclined positions of the out-of-balance shaft, occuring when large inertia-forces are used, and the associated pressures at the edges of the bearing elements, hitherto of one-piece construction, are taken into account by the suspension of the supporting housings for the double bearings in the annular plates which are rigid in the radial direction but permit slight play in movement in the axial direction. The bearings are thus able automatically to adapt themselves to the unavoidable inclined positions or deflections of the out-of-balance shaft, especially when excessive inertia-forces are present.

Preferably the bearings are roller bearings.

The required properties can be imparted to the annular plates by, for example, providing recesses in them which reduce the rigidity in the axial direction. A further solution consists in forming each annular plate from a number of disc-shaped laminations rather than as a single component. The various laminations can be advantageously combined to form an annular element of fan-shaped cross-section.

The out-of-balance shaft is powered at different frequencies preferably by means of a reversing drive or a reversing gear. The out-of-balance shaft can thus be changed over from anti-clockwise to clockwise movement by means of a simple switching operation. By providing rotatably mounted imbalance masses on the out-of-balance shaft in the vicinity of stops, the vibration roller can be made to operate at high frequency and with reduced inertia-force during anti-clockwise movement and at low frequency and with a very high inertia-force during clockwise movement.

The invention will now be described in greater detail with reference to the accompanying drawings, of which:

FIG. 1 shows a longitudinal section through a vibratory roller having bearing supports and an out-of-balance arrangement in accordance with the invention;

FIG. 2 shows a section on line A—A through the out-of-balance shaft for anti-clockwise movement and high frequency in the out-of-balance shaft;

FIG. 3 shows the same section through the out-of-balance shaft for clockwise movement and low frequency;

FIG. 4 is a plan view of an annular plate according to the invention;

FIG. 5 is a plan view of another annular plate according to the invention;

FIG. 6 is a sectional view taken along the line **6—6** of FIG. 5; and

FIG. 7 is a sectional view similar to FIG. 6 but showing a plurality of plates arranged in the manner of lamellae.

The numeral **1** indicates the roller body and **2** the out-of-balance shaft. The out-of-balance shaft **2** is mounted at both ends in bearing supports which each comprise two cylindrical roller bearings, **3**, **4** and **5**, **6** respectively, disposed side by side. Associated with the pairs of bearings are supporting housings **7**, **8** which are suspended in annular plates **9**, **10**; the supporting housings **7**, **8** are secured to the inner edges **9′**, **10′** of these plates and the outer edges **9″**, **10″** of the plates are secured, by means of ring inserts **18**, **19** to the end-walls **20**, **21** of the roller body **1**. The ring inserts **18**, **19** also serve to secure the journal-covers **22**, **23** of the roller body **1**.

Firmly keyed on to the out-of-balance shaft **2** are two imbalance masses **11, 12,** which are provided with a dog **13.** Associated with each of the fixed imbalance masses **11** and **12** is a rotatably mounted imbalance element **14, 15** each of which is provided with two resilient stops **16, 17.**

When the vibratory roller is driven at high frequency and moves in the anti-clockwise direction as shown in FIG. 2, the dogs **13** of the fixed imbalance masses **11, 12** carry the rotatably mounted imbalance elements **14, 15** beyond the resilient stops **17,** so that the rotatably mounted imbalance elements **14, 15** have the effect of reducing the total inertia-force.

When the vibratory roller is driven at low frequency and moves in a clockwise direction, as shown in FIG. 3, the dogs **13** on the fixed imbalance masses **11, 12** move the rotatably mounted imbalance elements **14** and **15** beyond the resilient stops **16,** so that the rotatably mounted imbalance elements **14, 15** have the effect of raising the total inertia-force.

By dimensioning and/or shaping the annular plates **9, 10** in such a way that they can be regarded as practically rigid in the radial direction and permit play in the movement of the supporting housings **7, 8,** suspended therefrom, in the axial direction, the effect is achieved of enabling the pairs of roller bearings **3, 4** and **5, 6** to adapt themselves to the inclined positions of the out-of-balance shaft, so that no excessive pressures can occur at the edges of the bearings, and the full bearing capacity of the roller bearings can thus be utilized. The consequence of this is that such bearing supports can withstand inertia-forces well above the present norm, and there is thus provided the possibility of vibratory rollers operating at low and high rotational speeds using inertia-forces hitherto regarded as being unattainable.

Also, FIGS. 4 and 5, respectively, show annular plates **25** and **26** each having respective cutout portions **25*a*** and **26*a*** for reducing the rigidity of each plate in its axial direction. FIG. 7 is a sectional view similar to FIG. 6 except that a plurality of plates **26** are shown which may be secured together through apertures **26*b*** for producing a flexible lamellae of annular plates.

I claim:

1. A vibration roller capable of producing variable inertia forces, comprising a roller body, an axial out-of-balance shaft mounted at opposite ends within said roller body, eccentric mass elements secured to said shaft within said body, bearing means for mounting each said opposite end, each said bearing means comprising a double bearing unit, each having a pair of bearings therein, each of said unit pairs being adjacent one another and each pair being provided in a common supporting housing, a thin annular plate member surrounding each said housing and being disposed substantially midway between the opposite ends of said housing perpendicularly to said axial shaft, each said plate member being mounted at its inner annular edge to each said housing and at its outer annular edge to the inside of said roller body, each said plate being rigid in a radial direction and flexible in its axial direction, thereby permitting a wobblng movement of said shaft opposite ends in relation to the bending of said shaft during its rotation with said eccentric mass elements thereon, whereby each said pair of roller bearings are capable of adapting themselves to the inclined positions of said bending shaft at said opposite ends.

2. Vibration roller according to claim **1,** in which the annular plate consists of a multiplicity of annular plates arranged in the manner of lamellae.

3. Vibration roller acording to claim **2,** in which the lamellae of the annular plates have a fan-shaped cross section.

References Cited

UNITED STATES PATENTS

2,671,386	3/1954	Kerridge	94—50
3,052,166	9/1962	Thrun	94—48
3,145,631	8/1964	Green	94—50
3,267,825	8/1966	Owen	94—50
3,303,762	2/1967	Jennings	94—50
3,427,940	2/1969	MacDonald	94—50
3,437,019	4/1969	Peterson	94—50

FOREIGN PATENTS

947,616	8/1956	Germany	94—50

NILE C. BYERS, Jr., Primary Examiner

U.S. Cl. X.R.

94—50 RV