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Gebendinger

[11] **3,771,768**

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[54] **ECCENTRIC-MASS VIBRATOR FOR MACHINES ADAPTED TO THE MECHANICAL HARVESTING OF OLIVES AND FRUITS IN GENERAL**

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[52] **U.S. Cl.** ..... **259/1 R,** 56/328 TS, 74/61, 259/DIG. 42, 259/DIG. 43

[51] **Int. Cl.**..... **B06b 1/16,** B06b 1/18, A01g 19/00

[58] **Field of Search**..... 259/DIG. 15, DIG. 42, 259/DIG. 43, 1 R; 56/328 TS; 74/61; 209/367

[56] **References Cited**

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[57] **ABSTRACT**

A vibrating mechanism for fruit-harvesting machines wherein the trunk and branches of a fruit-bearing tree are shaken, in which three eccentric masses are so arranged that they rotate in three different parallel planes, the outer masses being rotated at the same time, and at the same speed and being equal in weight to one another, the intermediate mass being rotated in a direction opposite to that of the other two masses and having a weight which is the sum of the weights of the two outer masses, all three masses having the same eccentricity. By such an arrangement, detrimental alternate twists on the trunk and branches of the tree are effectively prevented.

1 Claim, 2 Drawing Figures

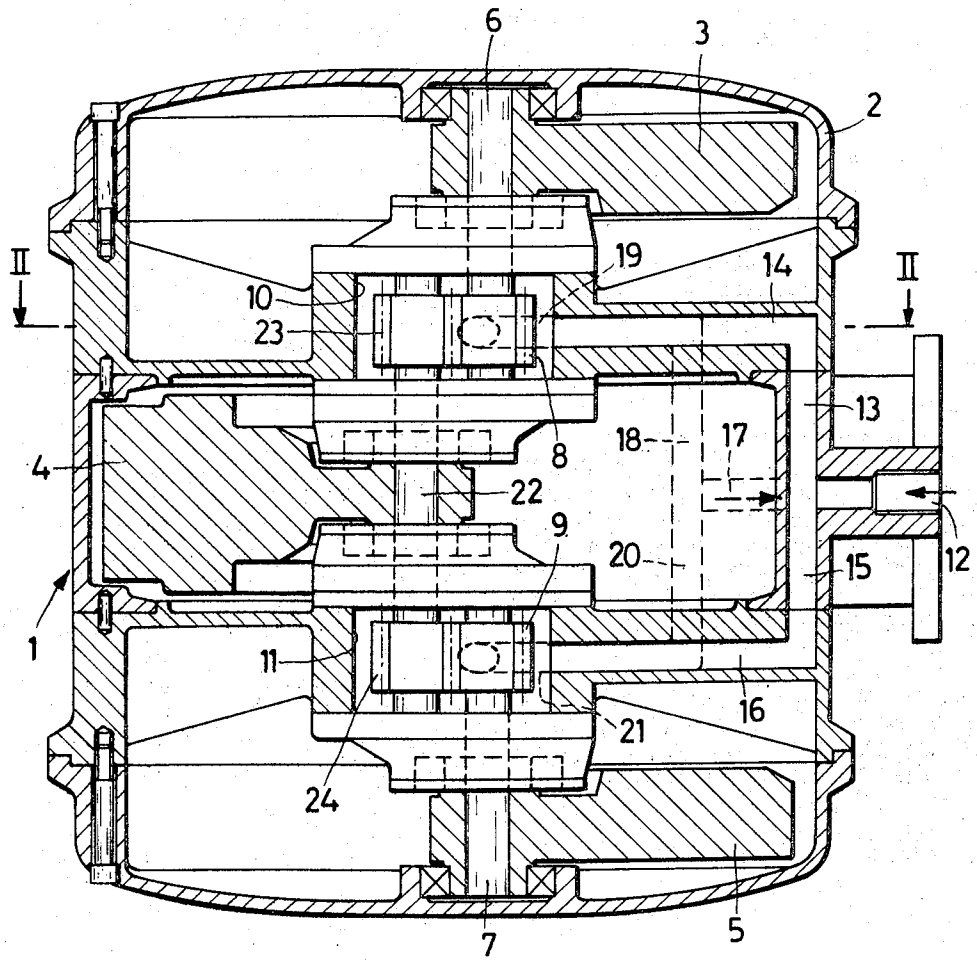


Fig.1

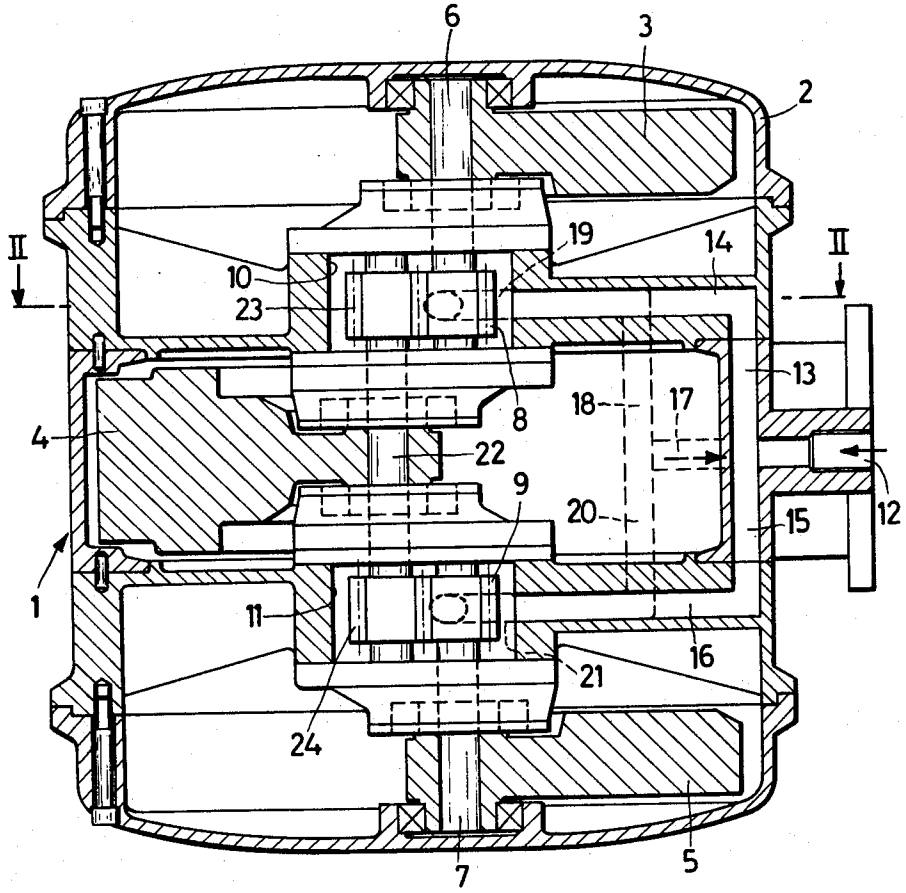
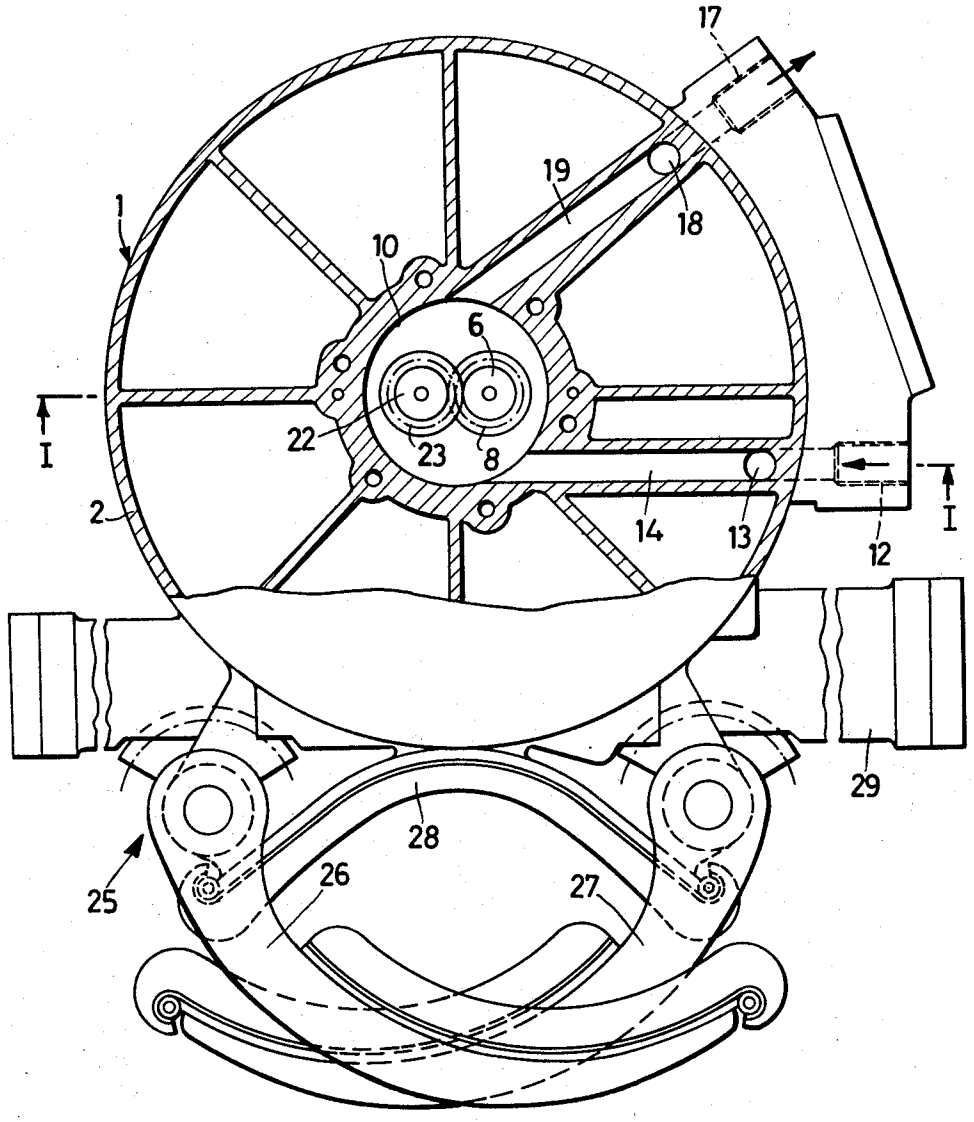


Fig.2



ECCENTRIC-MASS VIBRATOR FOR MACHINES ADAPTED TO THE MECHANICAL HARVESTING OF OLIVES AND FRUITS IN GENERAL

BACKGROUND OF THE INVENTION

The present invention relates to an eccentric-mass vibrator which is particularly adapted for use with apparatus of the kind commonly used for the mechanical harvesting of olives and fruits in general, that is, of the kind comprising a gripping tool for grasping the trunk of a tree, or the branches thereof. The latter are caused to vibrate, along a direction which is substantially perpendicular to their axes, so as to cause the fruits to fall into an underlying canvas having substantially the shape of an umbrella.

PRIOR ART

For vibrating the above mentioned gripping tools, a vibrator is commonly used, which comprises two eccentric masses, which are rotated in two mutually opposite directions, so as to originate a resultant sine-wave force whose line of action is perpendicular to the plane as defined by the two axes of rotation. In order that the transverse size of the vibrator may be contained within such limits as not to hinder or in any way jam its passage between a branch of the tree and another, the two eccentric masses are caused to rotate on axially shifted planes. The result is an alternating torque having an axis parallel to the resultant force aforesaid, and which is detrimental to the branch undergoing shaking.

OBJECTS AND SUMMARY OF THE INVENTION

The object of the present invention is to do away with such an alternating torque without increasing thereby the transverse size of the vibrator.

With the above and other objects in view, the vibrator according to the invention is characterized in that it comprises three eccentric masses which are rotated on respective parallel superposed planes, the two end or outer masses being equal and rotated in the same direction, with the intermediate mass being rotated in a direction which is non-concordant with that of the other two masses and being equal to the sum of the other two masses, all three masses having the same eccentricity.

Thus, between the two outer masses and the intermediate one, two torques are originated, which, being equal and opposite, balance one another. The single force produced by the vibrator and transferred to the gripping tool and the apparatus which supports the same is thus the sine-wave force intended to produce the desired and appropriate shaking of the branch.

In order that the features and advantages of the present invention may be better understood, reference will now be had to the accompanying drawings, wherein :

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a view, taken along the line I—I of FIG. 2, of an exemplary embodiment of the vibrator according to the invention, in actual practice, and

FIG. 2 is a view taken along the line II—II of FIG. 1, of said vibrator, to which the gripping tool is coupled for an apparatus for mechanically harvesting olives and fruits in general.

DETAILED DESCRIPTION OF THE INVENTION

The vibrator shown in the drawings, indicated generally **1**, has an outer casing **2**, in the interior of which are at least three superposed compartments, in which three eccentric masses **3**, **4** and **5** are mounted for rotation in parallel superposed planes. The outer masses **3** and **5** are equal weight and are rotated at the same time, and in the same direction under the drive of respective shafts **6** and **7** which carry toothed gears **8** and **9** respectively housed in chambers **10** and **11** respectively connected in parallel to a fluid inlet **12** by means of respective ducts **13, 14, 15, 16** and similarly connected in parallel to a fluid outlet **17** by means of respective ducts **18, 19,** and **20, 21.** The intermediate mass **4** has, in turn, a weight which is equal to the sum of the weights of the outer masses **3** and **5** and is rotated at the same speed but in a direction opposite thereto under the drive of a shaft **22** carrying at its ends two toothed gears **23** and **24** which are housed in the chambers **10** and **11,** respectively.

To the vibrator **1** a tong or gripping tool **25** (FIG. **2**) is coupled, which is composed by one or more pairs of cooperating jaws **26** and **27,** a saddle-piece **28** and an actuating mechanism enclosed in a protection casing **29** integral with the outer casing **2** of the vibrator. This actuating mechanism is neither shown herein nor described in detail, inasmuch as it can be of any kind as known to those skilled in the art and, the selection of a kind of mechanism or another has no bearing on the structure or the operability of the vibrator. The plane of rotation of the center of gravity of the mass **4** must be equidistant from the planes of rotation of the centers of gravity of the masses **3** and **5.**

All three centers of gravity must have the same eccentricity.

The centers of gravity of the masses **3** and **5** and the axes of the shafts **6** and **7** must all be coplanar. Also, the axes of the shafts **6, 7,** and **22** must all be parallel to and equidistant from the plane which bisects the saddle **28** and the trunk or branch longitudinally, and lie in a plane normal to the bisecting plane.

The operation of the vibrator shown in the drawings is clearly apparent from the structure described. The flow of the fluid from the inlet **12** to the outlet **17** through the two chambers **10** and **11** in parallel causes the motion of the gear couples **8, 23** and **9,24** via the fluid in the chambers and between the teeth of the gears and thus of the shafts **6** and **7** in one direction and the shaft **22,** in the opposite direction, so as to originate a sine-wave resultant force whose line of action is perpendicular to the plane of FIG. **1.** In addition, the fact that the three masses are in different planes originates two unbalancing torques, which, however, being equal and of opposite sign, balance one another and do not produce any detrimental effects on the branch grasped by the gripping tool **25,** or the remaining portion of the machine, either. The gear couples **8, 23,** and **9, 24** angularly relate the masses **3, 4, 5** such that at one point of their rotation, their centers of gravity and the axes of the shafts **6, 7** and **22** are all coplanar, as represented in FIG. **1.**

It should also be noticed that what has been shown in the drawings, is but a practical exemplary embodiment of the vibrator according to the invention and a number of modifications can be introduced therein,

within the spirit and scope of the invention which are limited only in and by the appended claim.

What is claimed is :

1. A vibrator for use in machines for harvesting fruits and more particularly olives, of the type in which gripping means grasp the trunk or the branches of a tree, comprising a casing, means attaching the gripping means to the casing, said casing being provided with at least three superposed compartments, a first shaft mounted for rotation in one of the outer compartments, a second shaft mounted for rotation in the other of the outer compartments and being in axial alignment with the first shaft, a mass supported by each of said first and second shafts, with its center of gravity eccentric with respect to the axis of its shaft, the masses supported by said first and second shafts being equal, a third shaft arranged in parallelism to and spaced from the first and second shafts mounted for rotation in the innermost compartment, a mass supported by said third shaft and having its center of gravity eccentric with respect to the axis of the third shaft, the plane of rotation of the center of gravity of the mass supported by said third shaft being equidistant from the planes of rotation of the centers of gravity of the masses supported by the first and second shafts, the axes of the first, second, and third shafts being parallel to and equidistant from the plane bisecting the gripping means and the trunk or branch longitudinally and lying in a plane normal to said bisecting plane, the mass supported by said third shaft being equal to the sum of the masses supported by the first and second shafts, the eccentricities of the centers of gravity of all three masses being equal, complemental toothed gear means on said first and third shafts and said second and third shafts operative to rotate said first and second shafts in one direction at the same time, at the same speed and said third shaft in the opposite direction at the same speed, and angularly relating the centers of gravity of the masses such that the centers of gravity of the masses supported by said first and second shafts and the axes of said first and second shafts are always coplanar, and such that at one point in the rotation of said three masses, the centers of gravity of said three masses and the axes of said three shafts are all coplanar, said masses rotating in three different planes originating two unbalancing torques, which being equal and of opposite sign, balance one another and do not produce any detrimental effects on the branch grasped by the gripping means.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,771,768 Dated November 15, 1973

Inventor(s) Giovanni Mario Gebendinger

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Italian Priority 25742 A/70 filed June 9, 1970.

Signed and sealed this 9th day of July 1974.

(SEAL)
Attest:

McCOY M. GIBSON, JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents

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