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OSCILLATING CENTRIFUGE

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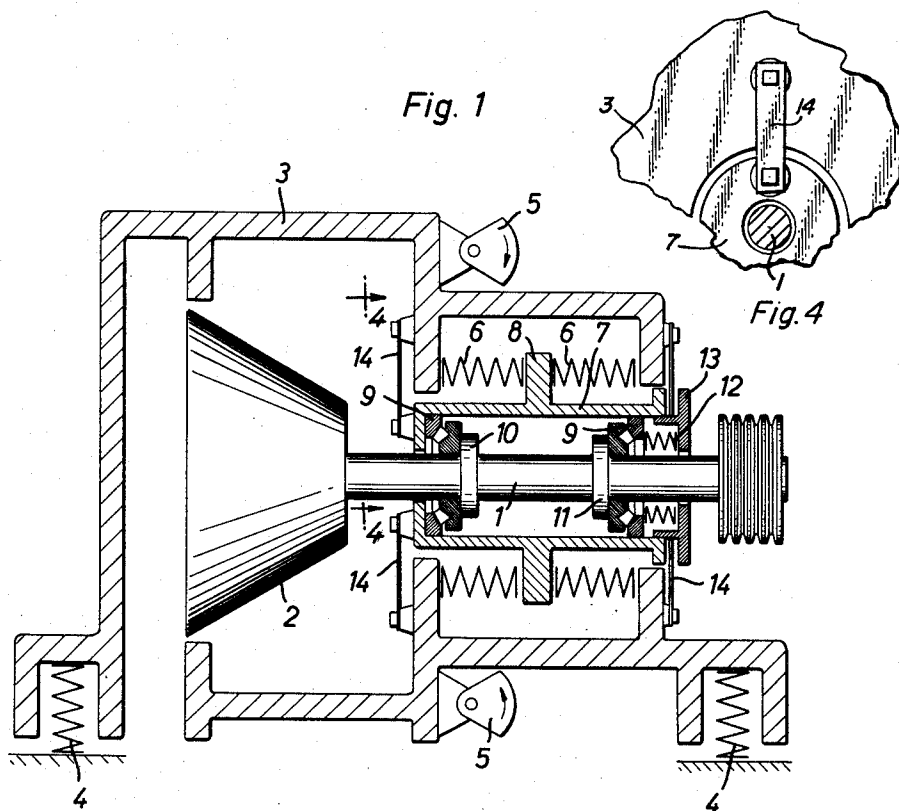
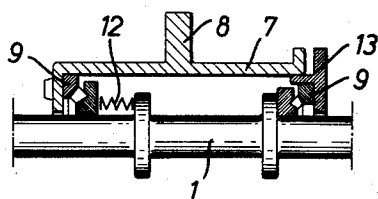


Fig. 2



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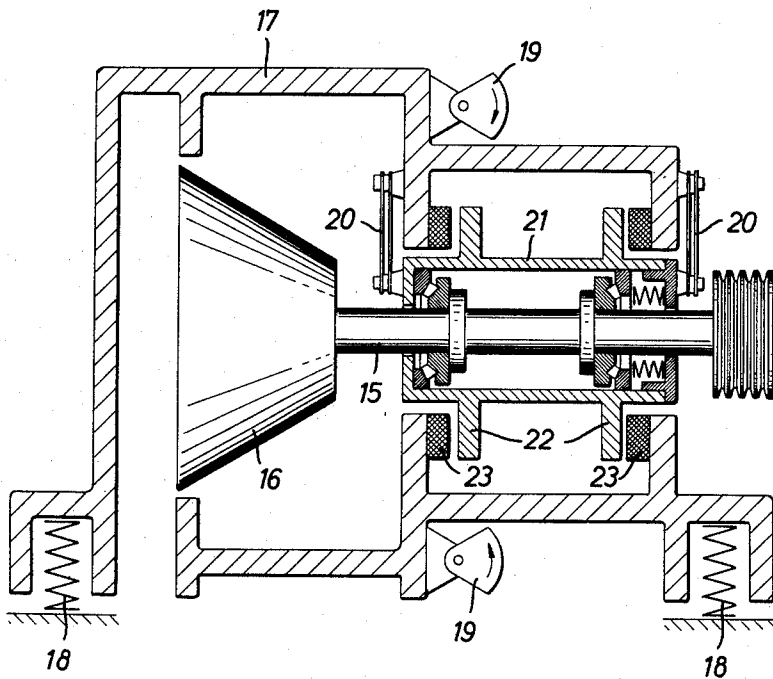
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Fig. 3



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OSCILLATING CENTRIFUGE

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1 Claim. (Cl. 210—370)

The present invention relates to an axially oscillating centrifuge in which the centrifuge drum and the drum shaft are rigidly attached to one another, the unit formed by these two parts being coupled, through the medium of energy-storing springs, with the centrifuge casing which latter is caused to oscillate in an axial direction. In this centrifuge, the said energy-storing springs also provide the clamping force acting between the bearings of the centrifuge drum. The arrangement is such that the two oscillatable masses of the system are prevented from performing any undesirable wobbling motion, since the shaft carrying the centrifuge drum is supported in the casing in such a manner as to be movable in an axial direction.

It has now been discovered that it is possible, while preserving all of the advantages of a system of the nature just described, to provide for a considerable simplification of the construction of the centrifuge by dispensing with the provisions enabling the shaft of the centrifuge drum to move in an axial direction and by providing a sleeve member which co-operates with the said energy-storing springs on the one hand and with the means supporting the centrifuge drum in a longitudinal as well as transverse direction on the other, the said sleeve member being guided in relation to the casing, which casing performs the primary oscillations, in a direction parallel to the axis, by means of guide links or guide springs connecting the sleeve member with the casing. The necessary axial preload is applied to the bearings of the drum shaft by means of springs disposed between amply dimensioned flanges of the drum shaft and the rotating race of the thrust bearing, the said springs preferably having a steep characteristic of spring force, the springs thus requiring little space, and the preload applied by the said springs exceeding the peak value of the oscillatory force exerted by the oscillating masses.

According to another aspect of the present invention, an oscillating centrifuge of the type indicated can be further improved by providing for the springs serving to guide the said sleeve member along a straight line also to act as energy-storing springs. In an oscillating centrifuge according to the invention, the axial oscillations of the casing are transmitted by way of resonance to the rotating shaft of the drum through the medium of the guide springs which at the same time act as energy-storing springs. The omission of separate energy-storing springs results in a simplified construction of the oscillating centrifuge and in considerable savings in manufacturing costs and assembling time. Moreover, the said guide springs which are suitably reinforced so as to enable them to function also as energy-storing springs are made of steel and are therefore less susceptible to high temperatures of the material to be processed than are the rubber storing springs used in the centrifuge described earlier. According to still another aspect of the invention, additional adjustable buffers may be provided for the purpose of regulating the magnitude of the oscillatory movements.

Other objects and features of the invention will become apparent as the description proceeds, especially when taken in conjunction with the accompanying drawing illustrating several preferred embodiments of the invention, wherein

FIG. 1 is a schematic longitudinal sectional view of

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an embodiment of an oscillating centrifuge in which the axis of the drum is disposed horizontally, the drum being adapted to oscillate in an axial direction; this embodiment having separate energy-storing springs;

FIG. 2 illustrates a modified embodiment;

FIG. 3 is a fragmentary sectional view showing another modification having no separate energy-storing springs; and

FIGURE 4 is a fragmentary vertical cross-sectional view taken substantially on the line 4—4 of FIGURE 1.

Referring now more in particular to the drawings, the shaft 1 of the embodiment of FIG. 1 may carry at one end a V-belt pulley serving to drive the shaft in rotation, and the said shaft carries at its inner end a drum 2 which is rigidly secured thereto, the drum being, for example of conical shape, the wider portion of the drum facing away from the shaft. The casing 3 may be supported from a suitable foundation by springs 4 or may be suspended in the foundation in a vertical position; the casing carries a plurality of counter-rotating out-of-balance weights 5 serving in a per se known manner to cause the casing to oscillate in an axial direction. These oscillations are conveniently transmitted by way of resonance, through a plurality of energy-storing springs 6, to a sleeve member 7 and thence to the rotating shaft 1 and the drum 2.

The sleeve member 7 which is of substantially cylindrical shape has an integrally formed flange 8 which is abutted on both sides by sets of energy-storing springs 6. Telescoped into the sleeve member 7 are two radial and thrust bearings 9 which are spaced apart to support the shaft 1 in a suitable manner. The two bearings are resiliently preloaded by a force exceeding the peak force produced by the oscillations of the oscillatable parts; for this purpose, the shaft 1 is provided with two integral flanges 10 and 11, and a plurality of springs 12 are disposed between the outer race of one of the bearings 9 and an adjustable closure member 13 engaging the sleeve member 7 and serving to adjust the force applied by the springs 12. The said springs and flanges may be arranged either according to FIG. 1 or according to FIG. 2. In order to prevent the occurrence of relative wobbling movements or pitching oscillations between the two masses of the oscillating system which perform axial oscillations in relation to one another, a plurality of guide members or guide springs 14 are provided, according to the invention, to connect the sleeve member 7 with the casing 14, such guide members or springs being disposed, depending on the size of the machine, and as schematically indicated in the drawing, either at one end only or at both ends of the sleeve member. Where the said guide members are intended not only to guide the sleeve member but also partly to assume the function of the energy-storing springs, guide members in the form of guide springs may be provided. It will be understood that the axially oscillating centrifuge may be arranged with the drum axis either in a horizontal or in a vertical position, and that the opening of the drum may face either inwardly or outwardly.

In the embodiment of FIG. 3, the shaft 15 one end of which may be fitted, for example, with a V-belt pulley to permit the shaft to be driven in rotation, carries at its other end a substantially conical centrifuge drum 16 which is rigidly attached to the shaft, the opening of the drum facing away from the shaft. The casing 17 is supported from the foundation by springs 18 and it carries rotatable out-of-balance weights 19 serving in a per se known manner to cause the casing to oscillate in an axial direction. By way of resonance, these oscillations are transmitted to a sleeve member 21 and further to the rotating shaft 15 and the drum 16 by means of guide springs 20 which comprise a larger number of leaf springs

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than are provided in the embodiments of FIGS. 1 and 2. The amplitude of the oscillations is limited in the present embodiment by resilient stop members or buffers 23 which co-operate with flanges 22 formed integrally with the sleeve member 21 supporting the bearings of the drum shaft. The said buffers 23 may be adjustable so as to permit the amplitude of the oscillations to be regulated.

What is claimed is:

An oscillating centrifuge system comprising a resiliently mounted centrifuge casing, a perforated centrifuge drum in the casing, a drive shaft rigidly supporting the drum and extending axially thereof, drive means connected to said drive shaft, a sleeve member disposed in said casing and surrounding said drive shaft, means on the casing for producing oscillations of the casing in a substantially axial direction of the drive shaft, bearing means mounted in the sleeve member and rotatably supporting said drive shaft, said casing having opposing inwardly extending wall portions extending adjacent the opposite ends of the sleeve member, cooperating means on said sleeve member and opposing wall portions lo-

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cated between said wall portions for yieldably limiting axial movement of the sleeve member relative to said wall portions, and a plurality of leaf springs each extending in a plane radial relative to the drive shaft and anchored externally to each wall portion and to the adjacent end of said sleeve member, said leaf springs defining resilient links to guide said shaft and the drum in an axial direction, whereby the drive shaft performs oscillations in an axial direction in addition to its rotational movement.

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