Aug. 15, 1939 F. C. LINN 2,169,877

SPINNING SPINDLE

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Fig. 1.

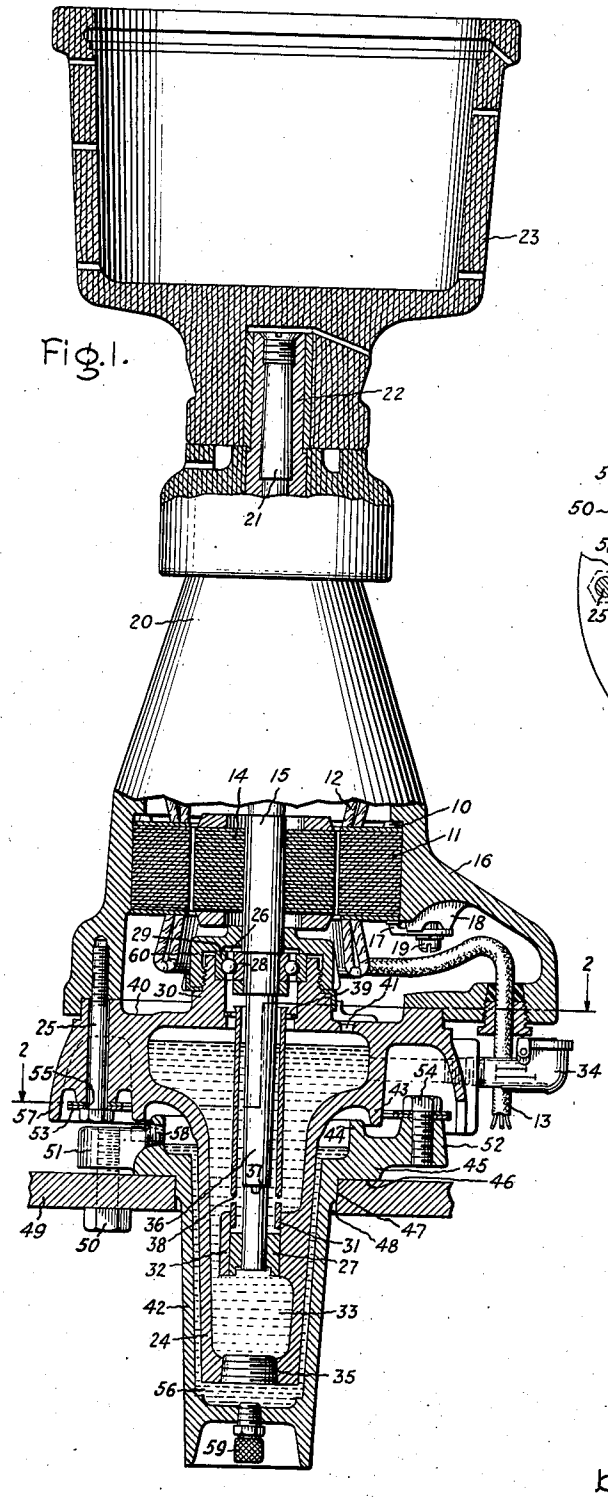
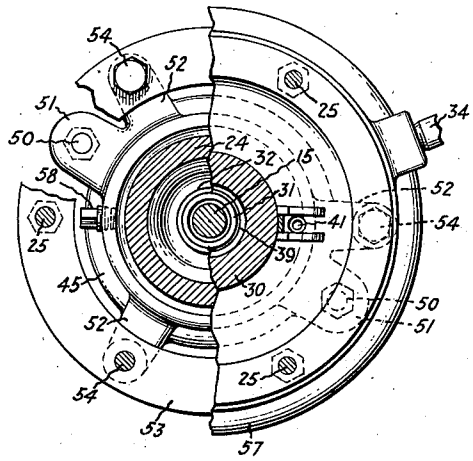


Fig. 2.



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SPINNING SPINDLE

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8 Claims. (Cl. 308—145)

My invention relates to high speed vertical snaft spinning devices, such as vertical shaft motors.

Vertical shaft high speed spinning spindles are widely used in the textile industry for driving spinning devices, rayon buckets, or the like, and since it is necessary for these spindles ordinarily to operate at speeds above 6,000 R. P. M. and well above one or more critical speeds of the shaft, some provision usually is made for damping oscillations of the shaft as it passes through its critical speeds to prevent excessive vibrations of the shaft and the transmission of these vibrations to the spinning frame.

An object of my invention is to provide an improved spinning device of this type, such that the shaft and the device driven thereby can pass through the critical speeds without excessive vibrations of the shaft or its support when coming up to normal operating speed.

Further objects and advantages of my invention will become apparent, and my invention will be better understood from the following description referring to the accompanying drawing, and the features of novelty which characterize my invention will be pointed out with particularity in the claims annexed to and forming part of this specification.

For a better understanding of my invention, reference is made to the accompanying drawing, wherein Fig. 1 is a partial sectional elevation of a spinning motor embodying my invention; and Fig. 2 is a sectional view taken along line 2—2 of Fig. 1, with a part of the bearing housing broken away.

Referring to the drawing, I have shown a rayon spinning motor having a stationary member 10 including a core structure 11 provided with a suitable stator field exciting winding 12. The motor is energized by current from a source of electrical power supply connected to the stator winding terminal 13. A rotatable member 14 having a squirrel cage winding is mounted on a vertically extending shaft 15 arranged to drive a spinning device. The stationary member of the motor is secured in a housing 16 by clamps 17 attached to flanges 18 by screws 19. An upper end shield portion 20 of the housing 16 is formed with an axial opening therein through which the upper end 21 of the shaft 15 extends. An adapter 22 is mounted on the tapered upper end 21 of the shaft and supports a removable spinning bucket 23. The portion 20 of the housing 16 extends vertically about the upper portion 21 of the drive shaft to protect it from material which may be spilled out of the spinning bucket. With such an arrangement it has been found unnecessary to make the motor shaft of corrosion-resistant material, as the casing 20 protects it from the deteriorating effects of acids used in the spinning process.

The lower end shield of the motor is provided with an elongated hollow bearing housing 24 arranged to support the motor and the spinning device, and is resiliently supported to aid in damping out oscillations which might produce harmful vibrations, and is secured to the stator housing 16 by three screws 25 equidistantly spaced about the upper periphery of the bearing housing 24. In order to support the rotatable member of the motor, a ball bearing 26 is arranged intermediate the ends of the shaft 15 and a sleeve bearing 27 is arranged about the lower end thereof. The ball bearing 26 is provided with an inner race 28 tightly fitted on the shaft 15 below the rotatable member 14 of the motor, and an outer race 29 fitted within a flange 30 formed on the upper end of the bearing housing 24. A bearing cover plate 60 is secured by threaded engagement with the flange 30 and extends over the ball bearing 26 about the shaft 15 so as to prevent the flow of lubricating oil past the bearing to the motor 14 and clamps in position the outer race 29 of the ball bearing. The sleeve bearing 27 is mounted below the lower end of a thin axially extending cylindrical sleeve 31 and in a boss 32 formed in the lower end of the bearing housing 24. The bearing housing serves as a lubricant reservoir and lubricating oil 33 can be supplied thereto through a filling cup 34 secured to the upper end of the housing. A drain plug 35 is threaded into an opening formed in the bottom of the bearing housing 24.

In order to lubricate the ball bearing 26, the lower end 36 of the drive shaft has a shoulder 37 formed thereon spaced above from the sleeve bearing and is tapered with increasing diameter from the shoulder 37 to the ball bearing. The cylindrical sleeve 31 is arranged in closely spaced relation about this tapered portion of the drive shaft and small openings 38 are formed in the sleeve below the shoulder 37 and above the boss 32 to provide a communication between the sleeve 31 and the lubricant reservoir 33. The lower end of the cylindrical sleeve 31 is secured in the bearing support 32 and the upper end is loosely arranged between an annular disk 39 supported within the flange 30 and communicates with the ball bearing 26. When the drive shaft rotates, oil is pumped by cavitation up between the

tapered end 36 of the shaft and the sleeve 31 to the ball bearing 26. The opening between the disk 39 and the upper end of the sleeve 31 provides for drainage of any excess lubricant from the bearing 26 back into the reservoir 33 within the bearing housing. The upper surface of the bearing housing 24 is formed with a groove 40 and is provided with an opening 41 communicating with the interior of the bearing housing, so that any oil which might flow past the cover plate 60 will drain back into the lubricant reservoir formed by the bearing housing.

A hollow cup-shaped stationary housing 42 is arranged in closely spaced relation about the lower reduced portion of the bearing housing 24 and co-axial therewith. An annular overhanging flange 43 is formed on the upper portion of the bearing housing adjacent the lower reduced portion thereof, and extends about an upwardly extending flange 44 formed on the top of the stationary housing 42. This arrangement forms a seal about the top of the stationary housing 42 and excludes foreign substances, such as acids used in the spinning process. A radially extending annular flange 45 is provided with a finished surface 46 adjacent another finished surface 47 near the top of the stationary housing 42 and is arranged to engage finished surfaces around an opening 48 in a spinning frame 49 through which the lower portion of the housing 42 extends. The housing 42 is rigidly secured to the spinning frame 49 by screws 50 extending through the spinning frame and threaded into bosses 51 formed adjacent the upper end of the housing 42. Three axially extending arms 52, integrally formed with the housing 42, project radially and axially therefrom in equidistantly-spaced relation about the periphery of the stationary cup-shaped housing, and an annular flexible laminated disk 53 is secured at three equidistant points about its periphery by screws 54 to the arms 52. The flexible disk is provided with holes 55 at three other points equidistantly-spaced intermediate the first mentioned points, and the bolts 25 which secure the bearing housing 24 to the motor housing 16 extend through the holes 55 and secure the flexible disk 53 to the upper end of the bearing housing 24 in such a manner that the plane of the flexible supporting disk 53 is adjacent the upper end of the housing 42 and the lower portion of the bearing housing 24 extends below this plane of support far enough to provide for damping of oscillations thereof by a damping fluid 56 retained in the housing 42 in the space between the bearing housing 24 and the stationary housing 42. In this manner, the spinning device is flexibly supported by the annular disks 53, and is free to oscillate to a limited extent when passing through its critical speeds. An annular overhanging flange 57 is formed on the bearing housing 24 and extends over the entire supporting arrangement, thereby shielding it from foreign substances. A filling opening is formed on the stationary housing 42 and the damping fluid 56 can be supplied to the space between the bearing housing and the stationary housing by removal of a filling plug 58, and a drain plug 59 is threaded into an opening in the bottom of the housing 42 to facilitate removal of the damping fluid 56. When the spinning device is brought up to its normal operating speed of between 6,000 R. P. M. and 10,000 R. P. M., it passes through several of its critical speeds. The flexible annular disks 53 have such elastic properties that the flexing of these disks produces a restraining force tending to return the spinning device to its normal geometrically vertical axis. The damping fluid 56 within the space between the bearing housing 24 and the stationary housing 42 effectively dampens vibrations at the critical speeds, and prevents excessive vibrations at these speeds.

While I have illustrated and described one embodiment of my invention, modifications thereof will occur to those skilled in the art. I desire it to be understood therefore that my invention is not to be limited to the particular arrangement disclosed, and I intend in the appended claims to cover all modifications which do not depart from the spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A spinning device including a vertical shaft, a bearing arranged to support said shaft, a housing for said bearing, a second housing arranged about said bearing housing, and means including a fluxible annular member secured at spaced points to said bearing housing and at other points spaced intermediate said first mentioned spaced points to said second housing for flexibly supporting said bearing housing in spaced relation within said second housing, said second housing being arranged to contain a damping fluid therein surrounding said bearing housing.

2. A spinning device including a vertical shaft, a bearing arranged to support said shaft, a housing for said bearing having a lubricant reservoir, means for supplying lubricant to said bearing from said lubricant reservoir, a cup-shaped housing arranged about said bearing housing, and means including a flexible annular member secured at spaced points to said bearing housing and at other points spaced intermediate said first mentioned spaced points to said cup-shaped housing for flexibly supporting said bearing housing in spaced relation within said cup-shaped housing, said cup-shaped housing being arranged to contain a damping fluid therein surrounding said bearing housing.

3. A spinning device comprising an electric motor including a stationary member and a rotatable member having a vertical shaft, a bearing for said shaft, a bearing housing arranged to support said bearing, a stationary housing arranged in closely spaced relation about the lower portion of said bearing housing forming a fluid reservoir thereabout, a plurality of radially projecting axially extending arms arranged in spaced relation about said stationary housing, and means including an annular flexible disk arranged in a plane adjacent the upper end of said stationary housing and secured at spaced points about the periphery of said flexible disk to said bearing housing and at other points spaced intermediate said first mentioned points to said axially extending arms for resiliently supporting said bearing housing on said stationary housing, said fluid reservoir being arranged to contain a damping fluid therein about said bearing housing.

4. A spinning spindle comprising an electric motor including a stationary member and a rotatable member having a vertical shaft, a bearing arranged at the lower end of said vertical shaft and a second bearing arranged intermediate the ends of said shaft to support said vertical shaft, said stationary member having a bearing housing arranged to support said bearings, a stationary housing arranged in spaced relation about the lower portion of said bearing housing forming

a fluid reservoir thereabout, means including a flexible annular member secured at spaced points to said bearing housing and at other points spaced intermediate said first mentioned spaced points to said stationary housing for resiliently supporting said bearing housing on said stationary housing, and a damping fluid within said fluid reservoir about said bearing housing.

5. A spinning device comprising an electric motor including a stationary member and a rotatable member having a vertical shaft, a bearing for said shaft, a bearing housing arranged to support said bearing and having an axially extending lower portion of reduced diameter, an annular flange formed on the upper portion of said bearing housing adjacent said portion of reduced diameter, a stationary housing arranged in closely spaced relation about said lower portion of said bearing housing and forming a fluid reservoir thereabout, a plurality of radially projecting axially extending arms arranged in spaced relation about said stationary housing, means including an annular flexible disk arranged in a plane adjacent the upper end of said stationary housing and secured at spaced points about the periphery of said laminated disk to said bearing housing and at other points spaced intermediate said first mentioned points to said axially extending arms for resiliently supporting said bearing housing on said stationary housing, and a damping fluid contained within said fluid reservoir about said bearing housing.

6. A spinning device comprising an electric motor including a stationary member and a rotatable member having a vertical shaft, a bearing for said shaft, a bearing housing provided with a lubricant reservoir and arranged to support said bearing, means for supplying lubricant from said lubricant reservoir to said bearing, a stationary housing arranged in closely spaced relation about the lower portion of said bearing housing forming a fluid reservoir thereabout, a plurality of radially projecting axially extending arms arranged in spaced relation about said stationary housing, and means including an annular flexible disk arranged in a plane adjacent the upper end of said stationary housing and secured at spaced points about the periphery of said laminated disk to said bearing housing and at other points spaced intermediate said first mentioned points to said axially extending arms for resiliently supporting said bearing housing on said stationary housing, said fluid reservoir being arranged to contain a damping fluid therein about said bearing housing.

7. A support for a vertical shaft motor having a housing, a stationary housing arranged in spaced relation about a part of said motor housing, and means including a flexible member arranged in a plane adjacent the upper end of said stationary housing and secured at spaced points to said motor housing and at other points spaced intermediate said first mentioned spaced points to said stationary housing for resiliently supporting said motor on said stationary housing, said stationary housing being arranged to contain a damping fluid therein surrounding said motor housing.

8. A spinning device comprising an electric motor including a stationary member and a rotatable member having a vertically extending shaft, a bearing for said shaft, a bearing housing arranged to support said bearing and having an axially extending lower portion of reduced diameter, a stationary housing arranged in closely spaced relation about said lower portion of said bearing housing and forming a fluid reservoir thereabout, a radially projecting element extending from said stationary housing, and means including a flexible disk secured at spaced apart points about the periphery thereof to said bearing housing and at other points spaced intermediate said first mentioned points to said radially projecting element for resiliently supporting said bearing housing on said stationary housing.

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