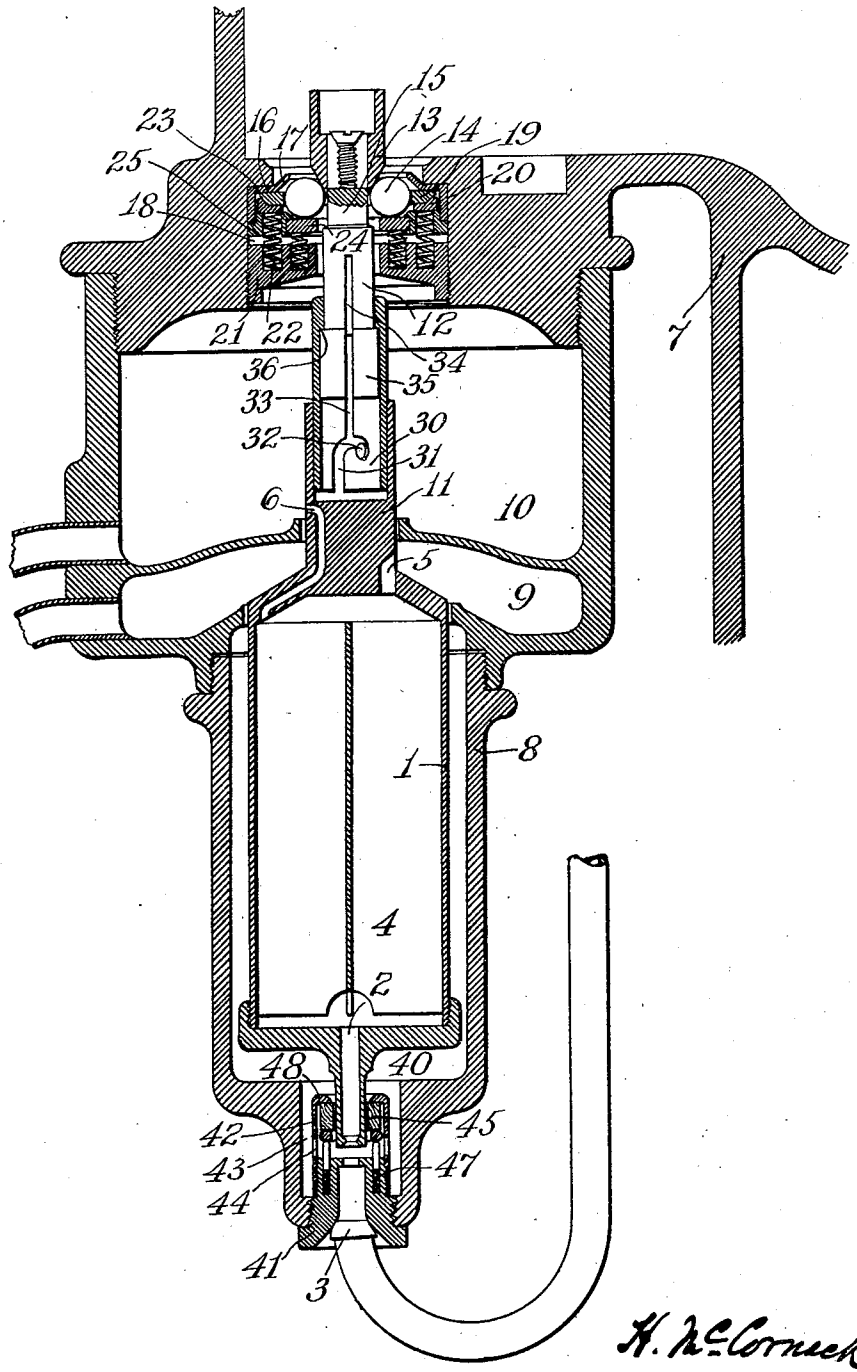
No. 706,088. Patented Aug. 5, 1902.

H. McCORNACK.

SHAFT MOUNTING.

(Application filed July 26, 1901.)

(No Model.)



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SHAFT-MOUNTING.

SPECIFICATION forming part of Letters Patent No. 706,088, dated August 5, 1902.

Application filed July 26, 1901. Serial No. 69,817. (No model.)

To all whom it may concern:

Be it known that I, HERBERT McCORNACK, a citizen of the United States of America, and a resident of Westchester, in the county of Chester and State of Pennsylvania, have invented certain new and useful Improvements in Shaft-Mountings for Centrifugal Machines, &c., of which the following is a specification.

My invention relates to improvements in the mounting of rotary machinery of high velocity, and particularly of centrifugal machines having rapidly-rotated drums in which to subject material loosely carried therein to the centrifugal action developed by rapid rotation. In this class of machinery peculiar nicety of adjustment of the supporting mechanism to particular conditions is required in order to insure satisfactory operation, extraordinary speed of rotation being combined with a varying weight of mobile matter, the slightest shifting of which or the development otherwise of any undue influence tending to more or less seriously interfere with the proper operation of the machine.

The object of my invention is to so construct and arrange the rotary shaft or drum and its bearings as to provide for an automatic adjustment of the same to correspond with or correct any variations of the mechanical axis from the natural axis of rotation; and to this end my invention consists, first, in certain improvements in the supporting-bearing whereby the axis of the shaft may be shifted under stress, though constantly tending to return to normal; second, in providing a non-rebounding frictional steadying device adapted to limit and stop any swaying movement of the drum or shaft, and, lastly, in the combination of these several features with a flexible spindle to jointly effect the corrections called for by disturbing forces occurring during rotation.

The invention is fully described in connection with the accompanying drawing, and the novel features are particularly pointed out in the claims.

The drawing shows a sectional elevation of a portion of a centrifugal machine having my improvements applied thereto.

The illustration indicates a well-known type of centrifugal drum 1 for separating compound liquids suspended by means of my improved shaft and bearing and steadied at its free lower end by my non-rebounding steadying device, said drum being provided, as usual in this type of centrifugal machine, with a central feed-inlet 2, communicating with a fixed nozzle 3, wings 4 therein to rotate the inflowing liquid, and separate outlets 5 and 6, respectively, for discharging the different constituents and being carried by a fixed frame 7 and inclosed by a fixed casing 8. The fixed receiving-pans 9 and 10, commonly employed in these machines to catch the discharging constituents, as well as the other details of the particular mechanism indicated, form no part of my present invention, which relates exclusively to the shaft-mounting and is equally applicable to a mechanism differing considerably from that shown.

The top of the drum 1 is shown provided with a rigid spindle or shaft portion 11, which is coupled, as hereinafter described, to a separately-formed extension 12. This shaft extension 12 is shown provided at the top with a cone-sleeve 13 and is arranged to be rotated by any suitable driving mechanism. The cone-sleeve 13 bears upon a circular series of balls 14, arranged around the body 15 of the shaft in a circular raceway formed as follows: An inverted cup or sleeve 16, formed with a circular flange 17, overhanging the balls and fitted within a cylindrical recess 18, provided in the carrying-frame, is adapted to loosely receive a band-ring 19, which encircles the circular series of balls 14, and also a yieldingly-supported bearing-ring 20 for said band-ring 19. This bearing-ring 20 is supported by a follower-ring 21, adjustably secured beneath the same through interposed springs 22, which latter press it upward, so as to hold the upper face of the band-ring 19 in contact with the circular interior shoulder or offset 23 in the inverted cup. The balls 14 are also supported upon said follower-ring 21, preferably on an independent spring-seat 24, forming a yielding bearing such as is frequently provided in centrifugal machines, said spring-seat 24 being centered, as shown, in an intermediate ring 25, through which the springs 22 loosely pass to press upon the bearing-ring 20 and band-ring 19.

To provide for permitting a slight lateral movement of the shaft during rotation, while

at the same time constantly tending to maintain it central, I make the band-ring 19 somewhat smaller in diameter than the bearing-ring 20, which latter also loosely fits within the inverted cup 16, and provide it with a conical seat within said bearing-ring, thus permitting it to be moved laterally therein, but only by acting as a wedge to compress the springs 22, which tend to return it to central position.

The spindle-shaft 11 of the drum is coupled to the extension 12, so as to conveniently permit of connection or disconnection and at the same time allow the shaft to bend during rotation, so that the rotating drum and contents may adjust itself to the normal axis of rotation passing through the actual center of gravity, which latter may vary slightly at high speeds from the mechanical axis notwithstanding the greatest care and accuracy in construction. As shown, the fixed shaft 11 is bored out at the end to receive the hollow coupling-sleeve 30, which fits loosely in said bore and is notched at 31 to engage an interiorly-projecting pin 32 in the bore. This coupling-sleeve is provided with a longitudinal slot 33, extending to within a short distance of its upper end, so that under the action of centrifugal force during rotation the slotted portion will tend to spread and so snugly engage the bore of the shaft 11. The shaft extension 12 also is provided with a longitudinal slot 34 and has an enlarged lower end 35, which fits loosely within the lower bore of the coupling-sleeve and seats against a shoulder 36 in the latter, the body of the shaft extension passing loosely through the reduced upper bore of the sleeve. When the machine is at rest, the latter is readily moved upon the shaft extension 12 and within the bore of the shaft 11 to couple or uncouple these parts. When rotated, however, the slotted parts are expanded by centrifugal force, so as to form a tight fit, giving increasing grip and stiffness as the speed of rotation increases, but at all times providing a flexibility, due to the adjustability of the slotted parts under a bending strain, which permits of such bending to the limited extent practically required to get the rotating mass into the proper axis of rotation without involving any torsional weakness in the shaft or objectionable lateral strain upon the ball-bearing above, which latter, however, as already described, is arranged to naturally adjust itself to such lateral strain as may be brought upon it.

The lower end of the suspended drum 1 has the central feed-inlet 2 formed in a bottom spindle extension 40, to which my steadying device is applied. The fixed nozzle 3, already referred to, is arranged to deliver into this hollow spindle through a fixed mouthpiece 41, screwed into the frame of the machine and carrying a sleeve 42, which rises through a chamber 43, formed above said mouthpiece, so as to serve as a drip-cup communicating through openings 44 in said sleeve, thus allowing drippings accumulating in said chamber or drip-cup to be caught up by the inflowing jet and delivered with the latter into the rotating drum. This feed arrangement itself forms no part of my present invention, being described and claimed in my application, Serial No. 24,860, filed July 26, 1900; but the sleeve 42, into the upper portion of which the hollow spindle 40 loosely extends, is provided with my non-rebounding steadying device. This device consists, as here shown, of a contact-ring 45, preferably formed of wood or other light material, which may be tightly inclosed in a shell of thin sheet metal to give it greater strength and wearing quality without adding substantially to its weight. The inner diameter of this ring is slightly greater than the diameter of the hollow spindle 40, which extends into it, and its outside diameter less than the bore of the sleeve 42, in which latter it is carried on a spring or springs 47, seated on the mouthpiece 41 and adapted to press it upward against an interior circular shoulder 48 in the sleeve. This pressure, which may be made more or less, as desired, pushes the contact-ring against the shoulder 48 sufficiently hard to prevent its movement thereon without overcoming a substantial amount of friction thus produced independently of the weight of the ring, which latter is so insignificant as to have practically no effect. The effect of this pressure arrangement, however, is to provide a yielding yet non-rebounding steadying device for the rotating spindle in case the latter tends to wabble or sway from the true axis of rotation, which very promptly and effectually limits and stops any such unsteadiness of movement, and I have found in practice that this satisfactory result is only attainable by practically eliminating any rebounding action such as occurs when the contact device is either in fixed position or has any spring action tending to return it to a normal position or a rebound due to the inertia of the device itself. The frictional resistance, which I provide independently of the weight of the contact device, enables me to practically avoid this rebound from inertia, and thus attain the desired result.

The primary action and effect of the band-ring 19 and its spring-backed bearing-ring 20 in the ball-bearing construction previously described are similar to those of the steadying device 45 at the free end of the suspended shaft, the bearing-ring 20 being slightly smaller in diameter than the interior of the cup 16, (about one-hundredth of an inch, for instance,) allowing of a slight lateral movement of the shaft by merely overcoming the frictional resistance of the band-ring against the circular shoulder 23, after which any further movement is opposed by the wedging action of the band-ring on the bearing-ring, with the resulting tendency to return the shaft to its central position, as already described.

The flexible shaft construction shown in connection with my present invention will form the subject-matter of a separate application.

The joint effect of the several features of my invention thus fully described is to provide for an automatic adjustment of the parts to the natural axis of rotation, thereby insuring the easy and steady running of the mechanism under the varying conditions already referred to.

What I claim is—

1. The combination with a suitably-supported shaft of an independently-supported steadying device therefor inclosing the shaft and movable bodily therewith in a lateral direction and means independent of the weight of the device for providing frictional resistance to such movement.

2. The combination with a suitably-supported shaft of a steadying device therefor inclosing the shaft, a seat on which said device is adapted to be moved bodily in a lateral direction by swinging of the shaft, and means for pressing said device against its seat independently of the weight of the device.

3. The combination with a suitably-supported shaft of a steadying device therefor inclosing the shaft, a seat on which said device is adapted to be moved bodily in a lateral direction by swinging of the shaft, and adjustable means for pressing said device against its seat to provide a regulated frictional resistance to such movement independently of the weight of the device.

4. The combination with a suitably-supported rotary shaft of a fixed sleeve loosely inclosing the same and provided with an interior flange, a steadying device loosely located in the annular space between the shaft and the inclosing sleeve, and a spring to press the device against said flange to provide frictional resistance to lateral movement thereof.

5. The combination with a suitably-supported shaft, of a laterally-movable steadying device therefor inclosing the same, a fixed ring or sleeve loosely inclosing the shaft and forming a seat for said steadying device, and a spring or springs for pressing the latter against said seat.

6. The combination with a suitably-supported shaft, of a laterally-movable steadying device therefor inclosing the same, a fixed seat for said movable steadying device, and means for pressing the latter against said seat and for yieldingly pressing the same laterally toward its normal central position.

7. The combination with a shaft, a supporting-bearing therefor and a fixed ring or sleeve loosely surrounding the shaft and forming a bearing-flange, of an independently-supported steadying device comprising a band-ring inclosing the shaft and a conical-seat bearing-ring, and a spring-support for said bearing-ring arranged to press the band-ring against said flange.

8. The combination with a shaft, a supporting-bearing therefor and a fixed sleeve loosely surrounding the shaft and formed with an interior flange, of an independently-supported steadying device comprising a band-ring inclosing the shaft and a conical-seat bearing-ring, and a spring-support for said bearing-ring arranged to press the band-ring against said flange, said band-ring and bearing-ring having jointly a limited lateral movement with the shaft.

9. The combination with a shaft and a suspension-bearing therefor, of a non-rebounding laterally-movable frictional steadying device arranged to contact with the dependent portion thereof when the latter is swayed from the normal axis of rotation.

10. The combination with a shaft having a flexible portion, of a suspension-bearing therefor located above said flexible portion, and a laterally-movable frictional steadying device therefor located below the same.

11. The combination with a shaft having a flexible portion, of a suspension-bearing therefor located above said flexible portion and laterally-movable frictional steadying devices located respectively above and below said flexible portion.

Signed at Westchester this 12th day of July, 1901.

HERBERT McCORNACK.

Witnesses:
MARY E. RUPERT,
WALTER C. MUNSHOWER.