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CENTRIFUGAL MACHINE

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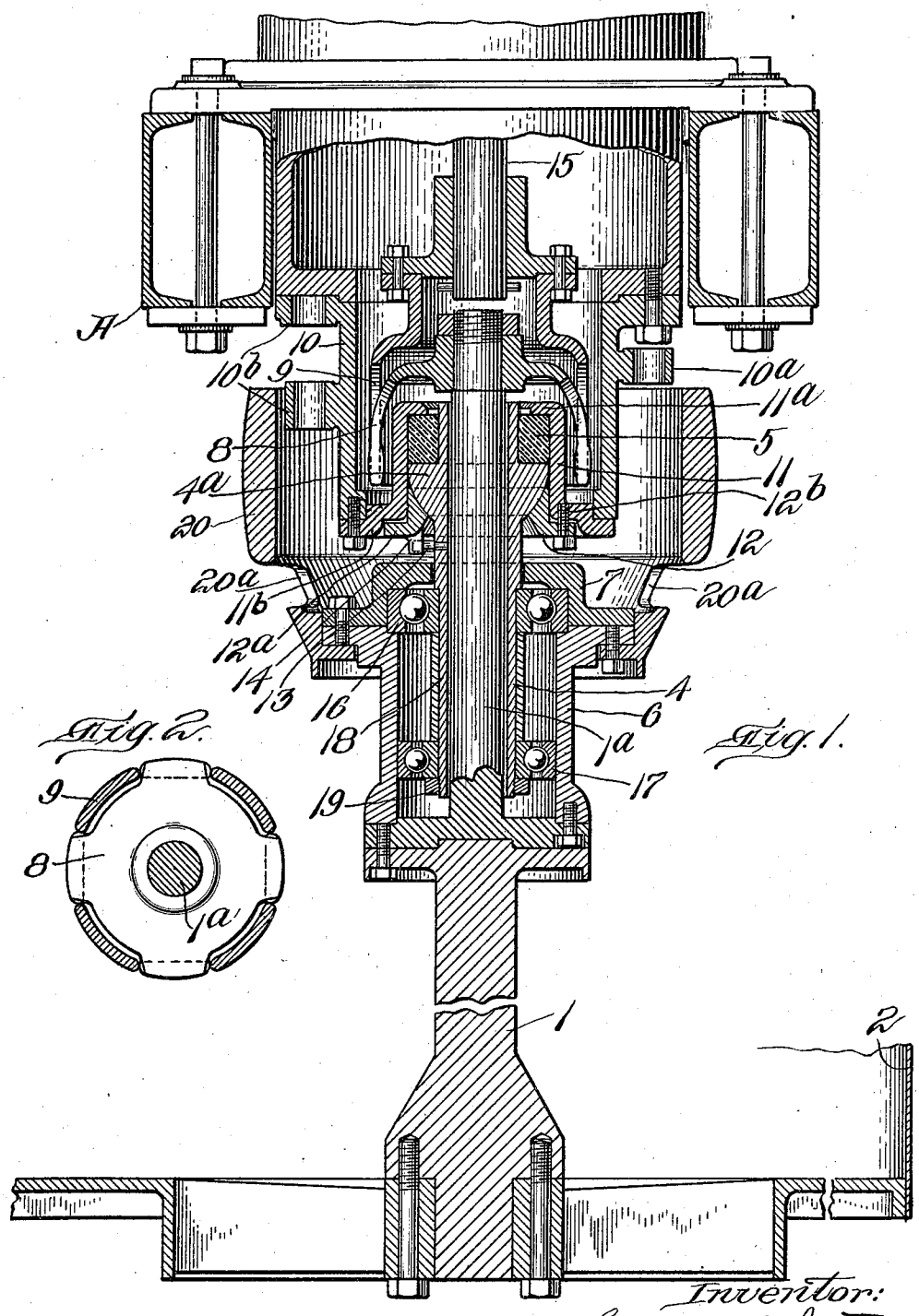


Fig. 2.

Fig. 1.

Inventor:
Eugene Roberts
by Geo N Goddard, Atty.

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UNITED STATES PATENT OFFICE

EUGENE ROBERTS, OF NEW YORK, N. Y., ASSIGNOR TO THE WESTERN STATES MACHINE COMPANY, OF SALT LAKE CITY, UTAH, A CORPORATION OF UTAH

CENTRIFUGAL MACHINE

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This invention relates to centrifugal machines of the suspended gyratory type, and is intended to provide a construction and arrangement which is simple and economical to construct, is easily dismounted for access to all the parts, any of which may be readily replaced with the minimum loss of time in the use of the machine and of labor in making the replacement. With these and other objects in view the invention comprises, generally speaking, a construction and arrangement embracing a ball-head suspension quill carrying upper and lower spaced ball-bearing elements below its center of gyration, in combination with a centrally disposed basket-shaft extending inside said quill and supported by said ball-bearing elements against axial thrust and lateral stresses, and driving means for rotating said basket-shaft located in the equatorial plane of said suspension-ball member.

These and other features of the invention will be set forth in the following specification and will be defined in the claims hereto annexed.

In the accompanying drawings:

Figure 1 shows a vertical central section of a centrifugal machine assembled and suspended from its overhead hanger, the lower portion of the basket-shaft and basket being broken away to permit illustration on a large scale.

Figure 2 is a detail view showing in plan a basket-shaft driving member in its relation to its corresponding coupling member, the latter being shown in section on the equatorial plane of the suspension-ball.

In the practice of this invention, according to the specific form illustrated in the drawings, I employ a basket-shaft 1, to whose lower end is secured the usual centrifugal basket, such as is used in sugar mills or the like for extracting liquid content from the solid grains or crystals.

The centrifugal itself is suspended from an overhead frame-work A, to which is secured a hollow annular suspension hanger 10 of novel construction.

As shown, this suspension hanger comprises a flanged cylinder or annulus with an open bottom to which is secured an annular centrifugal supporting member 11, provided at its upper end with an inwardly projecting flange 11^a, and having at its lower end an outwardly projecting attaching flange 11^b formed with a centralizing shoulder fitting into the open bottom of the hanger 10, and secured thereto by bolts or the like so as to form, in effect, a detachable part of the fixed hanger. The socket member, which forms the direct support of the centrifugal, comprises an annular member 12 provided with a spherically curved interior seat for the reception of the suspension-ball of the centrifugal machine quill and having, at its lower end, an outwardly projecting attaching flange 12^a, adapted to be bolted into the lower end of the removable supporting member 11.

The central basket-shaft, comprising lower section 1 and upper section 1^a, secured together in axial alignment by flanged or other connections, extends through the central bore of a quill or tubular suspension member 4 which, near its upper end, is provided with a spherically curved external ball 4^a, forming a suspension head adapted to be seated in the socket member 12^a of the hanger, thereby forming a universal suspension joint to permit gyration of the quill against a yielding centralizing resistance afforded by an annular elastic or compressible buffer 5, interposed between the quill and the surrounding member of the fixed hanger. It will be seen that as the socket member 12 is forced upward by its attaching screws 12^b, against the underside of the ball of the quill, it will compress the inserted buffer in the annular pocket formed by the top face of the ball, the overhanging flange 11^a and the inner and outer confining walls between which it is placed, the degree of compression depending upon the tightening of the attaching bolts or screws 12^b. The quill is preferably held against rotation without interfering with its gyration by means of a projecting pin 13, loosely engaging stops or lugs 14, on the fixed socket member 12.

In order to drive the centrifugal basket-shaft from an overhead aligned shaft 15,

which does not gyrate, I secure to the upper end of the basket-shaft a multiple armed spider 8, comprising a central hub portion and radial downwardly projecting arms which extend to the horizontal plane intersecting the center of gyration or, what may be termed, the equatorial plane of the suspension ball, the arms of said spider forming one member of a coupling which project between similar downwardly extending arms of a coupling member 9 that is secured to the non-gyratory overhead drive shaft 15.

To sustain the axial thrust of the centrifugal basket and its shaft, as well as the side stresses, I provide an upper ball-bearing element 16 and a lower ball-bearing element 17, in this case the upper bearing having its races deeply cut so as to sustain axial thrust either up or down as well as the radial or sidewise pressure, while preferably the lower bearing 17 has its races less deeply cut merely to serve as a radial bearing. Both upper and lower bearing elements are firmly secured to the quill in a definite or fixed spaced relation which, in this case, is effected by mounting the inner ring or race of the upper bearing against a slight overhanging shoulder of the quill, then passing a spacing sleeve 18 over the lower end of the quill, against which the lower bearing element is placed and secured by means of a fastening ring 19 screwed on the lower end of the quill.

In the form shown an external annular casing or hollow head 6 is secured to the flanged portion of the basket-shaft just below the lower end of the quill and extends upward so as to engage the exterior races of the bearing-ball elements. A flanged collar or cap 7 is secured to the upper end of this casing so that the outer ball-race of the upper bearing is clamped firmly between the upper end of the hollow casing or head and the inwardly projecting overhanging cap member, which latter receives and supports the downward thrust of the load. As there can be no axial movement of either the inner or the outer race of the upper bearing element, the shaft is rotatably supported without possibility of axial movement. Furthermore, since the annular buffer 5 is squeezed between the horizontal faces of the quill ball and of the overhanging flange 11^a, as well as between the quill and the surrounding hanger element, the quill is thereby held against lifting from its seat and a very smooth running machine, free from any pounding or chattering of the bearings, is provided.

Secured to the upper end of the casing 6 is a pulley 20 which projects upward so as to surround the center of gyration. The main element of the hanger 10 is provided with vertically bored lugs 10^a and 10^b, to form bearing supports for the vertical spindles of expansible brake shoes, of a well-known type, which are not illustrated herein as they do not form part of this invention. The exterior surface of this pulley is constructed to receive a driving belt in case it is desired to operate the machine as a belt-driven machine which can be done without in any way affecting the brake mechanism. This arrangement and utilization of the brake pulley makes possible the conversion of the machine from a direct connected overhead motor-drive to a belt-drive, the machine being designed to function with equal facility with one driving means or the other.

As shown at 20^a, the lower portion of the pulley is provided with hand-holds which not only admit air for the cooling of the interior brake surface of the pulley, but also afford access to the bolts which secure the removable hanger element 11 to the main body 10 of the hanger. It will be observed that the coupling member 8 is dimensioned so as to readily pass through the bottom opening of the hanger when the attaching bolts, secured to the supporting member 11, are released through the hand-holds, thereby permitting the demounting of the entire centrifugal and also its gyratory supporting ball-quill without rendering necessary to get access to the parts above the hanger, which would, in many cases, necessitate the removal of the overhead driving motor.

By arranging the parts so that the driving element or connection lies in the equatorial plane of the center of gyration, there is complete avoidance of any side stresses at the plane of drive tending to interfere with the gyration of the basket-shaft or tending to lift the suspension clear from its seat.

What I claim is:

1. An overhead suspension for a centrifugal embracing a hollow suspension-hanger adapted to be secured to a supporting frame, and an interiorly disposed buffer-confining member secured to and projecting upwardly from the bottom of the hanger to overhang an inserted buffer, and a downwardly removable socket member adjustably secured to the said buffer-confining member to form a seat for the ball portion of a gyratory suspension element and by its adjustment to compress an inserted buffer between the suspension element and the buffer-confining member of the hanger.

2. An overhead suspension for a gyratory centrifugal embracing a hollow hanger open at its bottom, an interiorly disposed buffer-containing member removably secured to the lower end of said hollow hanger, a socket member detachably secured to said buffer-containing member from below, a gyratory suspension element seated in said socket member for support, and a centralizing buffer compressed between the buffer-containing member and the gyratory element by the socket member.

3. An overhead suspension for a gyratory

centrifugal embracing in combination a hollow suspension-hanger having a downwardly removable socket member and a buffer compressing member, one of which is adjustably secured to the other to vary the compression of an interposed buffer, a gyratory suspension-sleeve seated in said socket member to gyrate against the yielding centralizing resistance afforded by said buffer, a basket suspending shaft projecting up through said sleeve and rotatably supported thereby, a drive transmitting member secured to the upper end of said shaft, said drive transmitting member being removable with the shaft through the lower end of the hanger when the socket and buffer members are disconnected from the hanger.

4. A centrifugal machine suspension embracing in combination an open bottom hanger, a gyratory sleeve suspended in said hanger in engagement with a yielding centralizing buffer, a sleeve supporting socket member and a buffer confining member secured to said hanger from beneath by detachable connections, a rotary basket shaft projecting up through said sleeve, a drive coupling member secured to the upper end of said shaft and projecting down between said hanger and said sleeve to the level of the center of gyration substantially as described.

5. In a suspended gyratory centrifugal, the combination of a non-rotating gyratory suspension sleeve supported on a ball and socket joint to gyrate against yielding centralizing resistance, upper and lower radial ball bearing elements mounted in spaced relation around the exterior of said sleeve below the ball and socket joint, a rotary basket carrying shaft having a drive-transmitting upward extension passing through said tubular suspender, and shaft supporting means comprising an upward hollow extension of said shaft surrounding and engaging both ball bearing elements to afford lateral bearing support for the basket shaft, one of said radial bearing elements also forming an antifriction thrust bearing for sustaining the axial thrust of the basket shaft.

6. In a suspended gyratory centrifugal, the combination of a non-rotating gyratory suspension sleeve mounted on a ball and socket joint to gyrate against yielding centralizing resistance, a rotary basket suspension shaft having an upward drive-transmitting extension passing axially through said sleeve and having also a hollow upward enlarged extension for rotatably supporting said basket shaft extended upward outside said sleeve, upper and lower radial ball bearing elements interposed between said hollow shaft extension and said sleeve to afford lateral bearing support for the shaft, an annular cover detachably secured to the upper end of said hollow extension to inwardly overhang the upper bearing element whereby releasing said cover allows the shaft to slip down said suspension sleeve and expose the ball bearing elements.

7. In a suspended gyratory centrifugal, the combination of a non-rotating gyratory suspension sleeve, upper and lower radial ball bearing elements surrounding said sleeve in fixed spaced relation, while permitting the removal of said bearing elements over the lower end of the sleeve, a rotary basket suspension shaft having an enlarged hollow upward extension surrounding both radial bearing elements for lateral support, means for detachably securing said upward extension to one of said radial bearing elements to sustain the weight of the basket shaft thereon, and drive-transmitting means secured to said basket shaft.

In witness whereof, I have subscribed the above specification.

EUGENE ROBERTS.