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DRIVE MECHANISM FOR CENTRIFUGAL BUCKETS

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Fig. 1

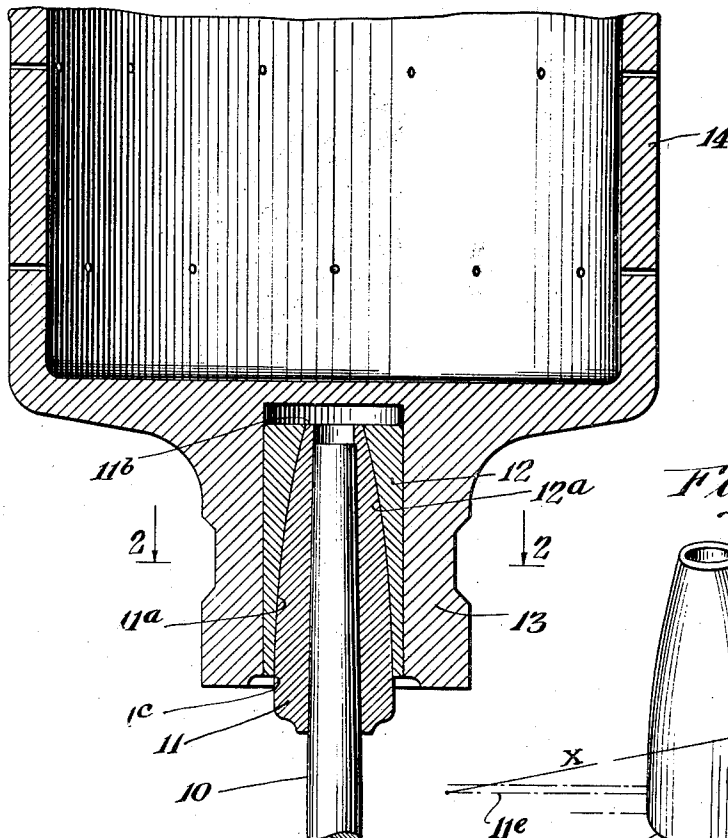


Fig. 3

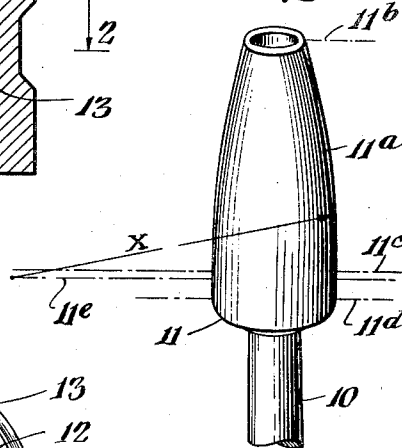


Fig. 2

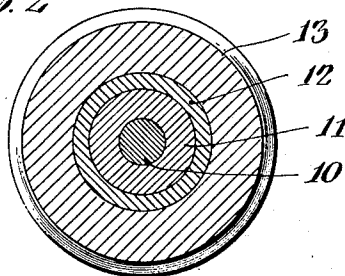
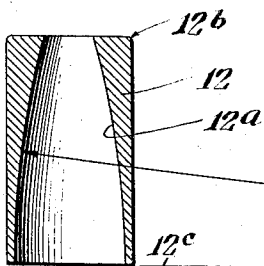


Fig. 4



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DRIVE MECHANISM FOR CENTRIFUGAL BUCKETS

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9 Claims. (Cl. 118—40)

This invention relates to the manufacture of artificial silk, and more particularly to a new and improved driving mechanism for centrifugal buckets, or "pots" as they are sometimes called.

5 In the manufacture of artificial silk such centrifugal buckets are used in spinning the silk according to the centrifugal or "bucket-spinning" method, and also in centrifugal washing, drying or other treatment of the spun yarn.

10 Difficulty has been encountered with the mechanisms heretofore proposed for connecting these buckets to their drive shafts. Each centrifugal bucket is ordinarily arranged to be rotated in a horizontal plane, and to this end is provided with its own vertical drive shaft, rotated at high speed mechanically or by an electric motor. When the spinning or other operation is completed the centrifugal bucket must be stopped and removed from the shaft and its contents—ordinarily a yarn cake—doed, as by turning the bucket upside down. The bucket is then replaced upon the shaft and the operation recommenced.

It has been suggested to employ a straight-sided tapered (i. e. conical) adapter upon the drive shaft, fitting into a complementary tapered bushing forming part of the base of the bucket. It has also been suggested to employ a parallel-sided, so-called "mushroom" type of adapter, fitting into a parallel-walled bushing embedded in the base of the bucket, and driving by friction due to the weight of the bucket resting on a bottom flange or "mushroom". These and similar proposals have been found unsatisfactory when attempted to be used in actual practice.

35 A conical adapter and bushing have been found to stick excessively so that the bucket frequently cannot be removed for the purpose of doffing its contents. Hammering or the like must then be resorted to, with consequent frequent breakage of the bucket or the shaft, or bending or injury of various parts of the mechanism. Also, this straight-tapered or conical form has the disadvantage that if the bucket starts to rise, due to the bushing lifting on the adapter, there is a tendency for the entire bucket and its contents to be thrown upward and to fly off, with the likelihood of injury to the workmen and damage to the plant. Of course it is understood that these centrifugal buckets are rotated at very high speed, and the danger if a bucket flies from the drive shaft is sufficiently serious to necessitate that the design employed should reduce such risk to a minimum.

55 The mushroom type of drive mechanism is not satisfactory because the slippage is too great, and

the efficiency is consequently low. Also, lubrication of the adapter or bushing is usually required at doffing time, and this tends to increase the slippage.

An object of the present invention is to provide 60 a new and improved drive mechanism for centrifugal buckets, and particularly to provide such a drive mechanism which will eliminate the disadvantages inherent in other types of drive mechanism, including those mentioned above, 65 while securing their advantages.

A further object of the invention is to provide a drive mechanism of the so-called "semi-positive" type, in which substantial slippage between the drive shaft and the bucket or pot is permitted during starting and stopping, so as not to overload the motor or other driving means, but in which slippage is reduced to a minimum while the bucket is in operation at speed, thereby providing greater efficiency. 75

A further object of the invention is to provide such a driving mechanism in which sticking of the separable drive members is prevented when the bucket or pot is to be removed for doffing of its contents, and in which the necessity for lubrication is reduced to a minimum or eliminated. 80

Another object of the invention is to provide such a drive mechanism wherein risk of the bucket being thrown upward and flying off the drive shaft during operation is substantially eliminated, with consequent reduction of danger to employees and risk of injury to the plant. 85

Still another object of the invention is to provide a drive mechanism in which interchangeability of the buckets on the adapters fixed to different drive shafts is accomplished, even after substantial wear has occurred;—i. e. in which the fit of the drive members is not affected, nor their interchangeability impaired, by wear. In 95 this way, any bucket (with its embedded bushing) may be applied to the adapter on any drive shaft, even though wear may have occurred, and the efficiency of operation will not be diminished.

Other and further objects of the invention will 100 appear from the following description.

To accomplish the foregoing and other objects, I have invented the drive mechanism, or bucket assembly, which forms the subject matter of the present application for patent, all as 105 particularly pointed out and distinctly claimed in the appended claims, and of which I shall now describe what is at present my preferred embodiment in greater detail in connection with the accompanying drawing, in which: 110

Fig. 1 is a vertical sectional view through a centrifugal bucket with its bushing, an adapter and shaft, according to an embodiment of the invention;

Fig. 2 is a horizontal sectional view on line 2-2 of Fig. 1;

Fig. 3 is a detail of the adapter and shaft of Fig. 1; and

Fig. 4 is a vertical section through the bushing shown in Fig. 1.

Referring to Fig. 1, reference character 10 designates a tapered drive shaft, which may be the shaft of a suitable electric motor, for example. An adapter 11 is mounted on the shaft, to which it may be secured by a drive fit, for example, the shaft having a Morse or International taper. The outer surface 11a of the adapter 11, between the points marked 11b and 11c (Figs. 1 and 3) is curved. In the instance illustrated, the curve is the arc of a circle of radius designated X (Fig. 3). Below the point marked 11c, down to 11d, the outer surface of the adapter is substantially cylindrical. Between points 11b and 11c the adapter illustrated in Fig. 1 has the shape of a hollow truncated circular "spindle". In that connection I use the term "spindle" in its geometrical sense to designate a solid which is generated by the revolution of the arc of a curved line about its chord. Such a spindle may be circular, elliptic, hyperbolic, parabolic, or curved according to other suitable law, depending upon the shape of its generating curve. As applied to an adapter of the character illustrated, I use the expression "spindle-shaped" to include not only a hollow truncated spindle per se, but also a construction like that shown, in which the "spindle" surface per se merges into a cylindrical or other suitable surface at the base of the adapter.

Fitting over and engaging the male drive member or adapter 11 is a female drive member, or hollow bushing, 12, of which the interior surface 12a has the same size, shape and curvature as the exterior surface 11a of the adapter 11. The bushing 12 is embedded in the lower portion or base 13 of the centrifugal bucket or spinning pot 14. This may be accomplished by a drive fit, by molding the bushing into the bucket if the bucket is made of bakelite or other synthetic resin as is usually the case, or in other suitable manner.

Fig. 2 is a horizontal cross-sectional view on line 2-2 of Fig. 1 showing the drive shaft 10, adapter 11, bushing 12 and base 13 of the bucket 14.

Fig. 3 is a detail view of the adapter 11 showing also a portion of the shaft 10. The portion of the adapter between the lines marked 11b and 11c has the shape of a truncated circular spindle. Between the lines marked 11c and 11d the adapter is substantially cylindrical, the "spindle" surface merging gradually into the cylindrical one. The radius of curvature of the spindle surface is indicated at X, the center of curvature being located, as shown, on the line 11e, which is slightly below the line 11c.

Fig. 4 is a detail view of the bushing 12, of which the interior surface 12a conforms to the exterior surface 11a of the spindle-shaped adapter 11, between lines 11b and 11c of Fig. 3. The radius of curvature, X, of the surface 12a is the same as that of the surface 11a, as indicated, and the center of curvature is located on the line 12e, which is slightly below the base-line, 12c, of the bushing.

I have found that in the case of a circular spindle-shaped adapter such as that illustrated, suitable dimensions are:

For the greatest diameter of the base $1\frac{1}{4}$ "; for the outside diameter of the top $1\frac{1}{2}$ "; for the distance between lines 11b and 11c $2\frac{1}{8}$ "; for the distance between lines 11b and 11d $2\frac{1}{8}$ "; for the distance from line 11b to the base $3\frac{1}{8}$ "; for the radius of curvature, marked X in Figs. 3 and 4, of the curved surface 11a of the adapter and the curved surface 12a of the bushing $1\frac{1}{2}$ "; and for the distance of the lines 11e and 12e, respectively, on which the centers of curvature are located, below the lines 11c and 12c, $\frac{1}{2}$ ". The drawing is to scale.

Both the adapter and the bushing may suitably be made of brass or bronze. In certain cases it may be advantageous to make the adapter and bushing of dissimilar metals, preventing any tendency toward "freezing", and permitting adjustment of the co-efficient of friction to obtain the desired amount of slip, while reducing or eliminating the necessity for lubrication.

I find by actual test and industrial use that the feature of a nearly vertical face—i. e. a substantially cylindrical surface—near the bottom of the male driving member (adapter, Fig. 3) where the spindle surface merges into the cylindrical one, in cooperation with a similar surface near the bottom of the female driven member (bushing, Fig. 4) reduces the tendency for the bucket to lift from the shaft when rotated at speed. The increased contact surface of the male and female members of the drive mechanism, due to their curvature, reduces slippage during operation at speed, while permitting necessary slippage during acceleration and deceleration. And the curved or "spindle-shaped" contour of the male and female drive members substantially eliminates sticking, so that the buckets can be readily removed from the shafts for doffing of their contents.

The construction herein specifically illustrated and described is at present my preferred embodiment of the invention, but it is to be understood that the invention is not limited to that construction but can be carried out in other ways without departing from its spirit.

I claim:

1. A semi-positive drive assembly for a centrifugal bucket, comprising a drive shaft; a male drive member on said shaft having the form of a hollow truncated circular spindle merging, at its base, into a substantially cylindrical surface and with the center of curvature of the truncated spindle surface lying in a plane below and parallel to the plane of the base of said truncated portion; a female drive member having its interior surface conforming to the exterior surface of said male member and with the same radius and center of curvature as said male member; and a centrifugal bucket carried by said female drive member.

2. In a centrifugal bucket driving mechanism of the semi-positive type for use in the manufacture of artificial silk yarn cakes by the centrifugal spinning method, the combination of a shaft driven by an electric motor, an adapter secured to said shaft and having an exterior surface convexly curved axially of said adapter, a bushing fitting over and engaging said adapter and having an interior surface concavely curved axially of said bushing in conformity with the exterior surface of said adapter, and a centrifugal bucket carried by said bushing, said parts cooperating to

form a drive connection in which there is substantial slippage between shaft and bucket upon starting of the motor, to prevent overloading thereof, and in which said slippage is automatically substantially eliminated when the parts have attained operating speed, the surfaces of said adapter and bushing further cooperating to prevent sticking of the separable parts of the drive mechanism when it is desired to remove the bucket from the shaft for doffing the spun yarn cake from the bucket after operation thereof.

3. A semi-positive drive for a centrifugal bucket, comprising a pair of drive members of which one is a female member carried by the bucket, and the other is a driven male member, the exterior surface of said male member and the interior surface of said female member each having the form of the surface of a segment of a spindle, of which the surface is generated by the revolution of a curved line about a chord coinciding with the axis of rotation of said male and female drive members, said members co-operating to form a drive connection in which there is substantial slippage when the driven member is started in rotation, and said slippage is automatically substantially eliminated when the parts attained operating speed, the surface of said drive members further cooperating to prevent sticking thereof when it is desired to separate them after operation.

4. A drive mechanism for a centrifugal spinning bucket, comprising male and female torque-transmitting members adapted to transmit rotation by mutual frictional engagement alone subject to mutual rotative slippage at desired times in the operation of the spinning bucket, said male and female members having surfaces which are co-axially engageable for said frictional torque transmission in a surface comprising that generated by the revolution, about the driving axis of said members, of a curved line co-planar with said axis.

5. A drive mechanism for a centrifugal spinning bucket, comprising a male member having an exterior torque-transmitting surface of revolution which comprises a surface of revolution, about the driving axis, that is convexly curved axially of said member, and a co-operating female member having an interior surface of conforming configuration with the said curved surface of the male member, said members being thereby adapted for transmission of rotation by mutual frictional engagement alone, subject to mutual rotative slippage at times of substantial speed change in the operation of the centrifugal spinning bucket.

6. The drive mechanism of claim 5 in which the surface of the male member includes, at its end toward which the female member is urged by the friction-producing engagement of the

members, a cylindrical surface into which the said convexly curved surface is merged.

7. In a centrifugal spinning bucket driving mechanism for the manufacture of artificial silk, in combination, a drive shaft, an adapter on said shaft having an exterior surface generated by the revolution, about the driving axis of the shaft, of a curved line co-planar with the said axis, a bushing fitting over and engaging said adapter and having a curved interior surface conforming to the exterior surface of said adapter, and a centrifugal spinning bucket carried by said bushing, said adapter and bushing co-operating to provide a semi-positive frictional drive connection susceptible of rotative slippage at desired times and capable of supporting the bucket against displacement transversely of its axis of rotation when the parts are in driving relation, and said bushing and adapter being freely separable for removal of the spinning bucket for doffing operation or the like.

8. A centrifugal bucket assembly of the semi-positive drive type comprising a shaft, a centrifugal spinning bucket, and driving connections intermediate said bucket and shaft, said driving connections including a male adapter member having an exterior surface convexly curved axially of said member, and a female bushing member engaging said adapter member and having an interior surface concavely curved axially of said bushing member in conformity with the exterior surface of said adapter, said male and female members having their said respective surfaces engageable as aforesaid for frictional transmission of torque thereby from the shaft to the spinning bucket, subject to mutual rotative slippage at desired times in the operation of the latter, and said members being axially separable for removal of the bucket from the shaft in doffing operation or the like.

9. In a centrifugal spinning bucket mechanism for use in the manufacture of artificial silk, in combination, a drive shaft, a centrifugal spinning bucket, and driving connections intermediate said shaft and said bucket adapted to provide a frictional torque-transmitting drive of said bucket from said shaft subject to rotative slippage at desired times in the operation of said bucket, and constructed for removal of the bucket from the shaft in doffing operation or the like, said driving connections comprising a driving member rotated by the shaft and having a driving surface generated by the revolution, about the driving axis of the member, of a curved line co-planar with the said axis, and a driven member connected to the bucket for effecting rotation thereof and shaped to engage the driving member in conforming relation with the said curved driving surface of the same.

WALTER C. VOLK.

CERTIFICATE OF CORRECTION.

Patent No. 1,948,834.

February 27, 1934.

WALTER C. VOLK.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, line 27, claim 3, before "attained" insert have; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 20th day of March, A. D. 1934.

F. M. Hopkins

(Seal)

Acting Commissioner of Patents.