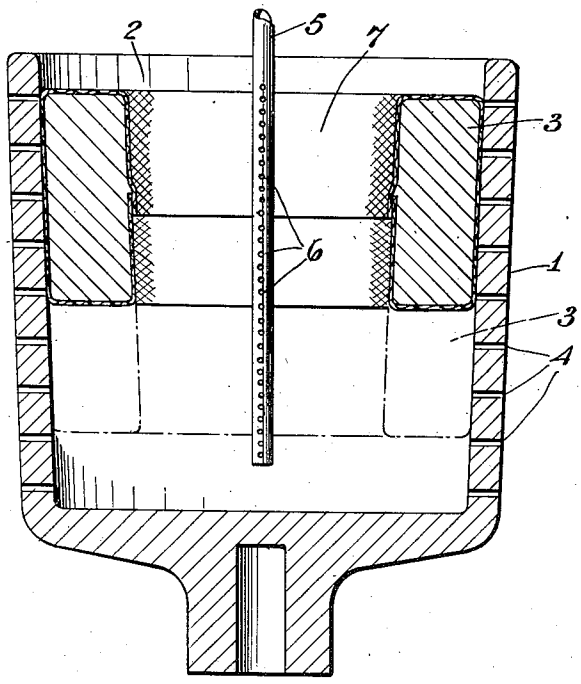
Oct. 27, 1942. L. G. JACKSON 2,300,254

YARN PRODUCTION

Filed Dec. 5, 1939



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Patented Oct. 27, 1942

2,300,254

UNITED STATES PATENT OFFICE

2,300,254

YARN PRODUCTION

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Application December 5, 1939, Serial No. 307,596

3 Claims. (Cl. 18—54)

This invention relates to an improved method and apparatus for centrifugally forcing purification liquids, and other treatment liquids, through coreless yarn packages which shrink as a result of such treatment. More particularly, it relates to such treatment of coreless yarn packages which have an external conical taper, such as bucket cakes of regenerated cellulose yarn produced by the viscose bucket spinning process.

It has been proposed, heretofore, to purify, wash and otherwise treat yarn cakes by centrifugally forcing liquids through such cakes. Heretofore, however, yarn cakes treated in this manner were positioned in centrifuging buckets with the cake resting on the bottom of the bucket or on some supporting means fixed in the bucket and bearing against at least some portion of the bottom surface of the cake. The use of such previously known centrifuging buckets is objectionable, in that the cake is supported therein from the bottom which makes it difficult to effectively purify the bottom outside corner of the cake. Various supporting means, such as screens and sloping ledges, have been built into such buckets to better distribute the treating fluid to this inaccessible part of the cake but the difficulty has not been entirely overcome. The use of such previously known buckets also makes no provision for cake shrinkage.

When placed in a bucket for treatment, the cake shrinks away from contact with the bucket wall. This tends to throw the entire assembly out of balance with a resulting adverse effect on both the uniformity and the rate of purification. Further, the fact that the outer edge of the cake is no longer rigidly supported by the bucket wall may cause the structure of the cake to be so damaged that the subsequent unwinding of the yarn from the cake is made difficult, if not impossible. Also, the fact that the assembly is thus thrown out of balance, places an eccentric overload on the driving mechanism of the bucket and thus causes an undue strain on these parts.

It is, therefore, an object of this invention to provide an improved process and apparatus for the centrifugal forcing of liquids through bucket cakes and similar coreless yarn cakes having conically tapered external side walls.

It is a further object of this invention to centrifugally force treatment liquids through bucket cakes and the like, which are subject to shrinkage during such treatment, and supporting the cakes solely from their external periphery during the entire treatment operation.

Other objects of the invention will appear hereinafter.

The details of the invention will be more clearly apparent by reference to the following detailed description when taken in connection with the accompanying illustration which shows in vertical cross-section, one constructional form of yarn cake treating bucket suitable for use in accordance with the present invention.

Referring to the illustration, reference numeral 1 generally designates a bucket for use in centrifugally forcing a liquid through the walls of a bucket cake or similar externally tapered annular yarn cake. The circular side wall 2 of the bucket is constructed with an internal surface having an outwardly flared conical taper approximately the same as the external conical taper of the cake. The wall is sufficiently long that a cake of yarn 3 being treated therein will be supported solely from the external periphery of the cake throughout the whole treatment cycle, regardless of the shrinkage of the cake. The internal diameter of the bucket 1 at the upper portion thereof is substantially the same as that of an untreated yarn cake.

In the illustration the yarn cake 3 shown in solid lines designates the position of the cake in the bucket at the beginning of the liquid treatment. The dotted line representation of the cake in the drawing designates the approximate position of the cake at the end of the liquid treatment, after the cake has been shrunk and slid down in the bucket.

The bucket 1 is provided with numerous openings in the side wall thereof to provide for adequate drainage of the liquid from the bucket. The liquid is sprayed against the internal periphery of the cake 3 by means of a conduit 5 having a plurality of openings 6. The cake 3 is preferably covered with a fabric 7 to prevent entanglement of the yarn or yarn filaments.

The essential feature of the present invention is the use of a liquid treating bucket which has an internal taper approximately the same as the external taper of a yarn cake and which is sufficiently deep that a yarn cake, regardless of shrinkage during treatment, will be supported by its external periphery throughout the liquid treatment thereof. Instead of side drainage openings in the side walls of the bucket, the latter may be provided with internal grooves for drainage as disclosed in Patent No. 2,098,633 granted to Ovid S. Petrescu or with a top drainage construction as disclosed in Patent No. 2,073,840 granted to Paul E. Harrison. The liquid may be

applied to the internal peripheral surface of the cake in any desired manner.

The yarn cake may be wrapped with a fabric, or the cake may be positioned within a knitted tubing and the ends of the tubing positioned in overlapping relationship on the inside of the cake as illustrated.

The bucket may be made of any suitable material that will withstand the action of the treating fluids. For instance, a moldable, resinous substance may be used and, if desired, the bucket may be suitably reinforced in the known manner for operation at high speeds. The interior dimensions of the bucket may be varied widely, depending upon the size and taper of the package to be treated. If the taper of the bucket is only 1° or 2°, it will be necessary to have the bucket very much deeper than if the taper were quite large, for instance, 5° or 6°, because when the taper of the bucket is small, the cake will slide down therein much farther than when the taper is relatively large.

The bucket may be operated at any speed at which sufficient centrifugal force is developed to force the purifying fluid through the cake of yarn. The preferred speed is about 4,000 revolutions per minute but satisfactory results have been obtained at speeds throughout the range of 1,800 to 8,000 revolutions per minute.

While this invention has been described in terms of cakes of yarn spun by the bucket process, it is not so limited, but may be advantageously used in the centrifugal purification of any coreless tapered annular cake of yarn that shrinks during liquid processing.

This invention provides a means whereby cakes of yarn spun by the bucket process or formed by any other process that will yield a coreless, tapered annular cake of yarn may be well and uniformly treated by a centrifugal purification process which has a short cycle and which efficiently uses the treating fluid. This use of a short cycle is not only economical but also has the advantage of allowing the yarn cake but little opportunity to filter impurities from the treating fluid and thus become stained and discolored.

This invention also provides a means of allowing for the shrinkage of a yarn cake during the purification process and thus permits the side wall contact of the cake in the bucket to be accurately controlled at all times during the treating operation. This control of the side wall contact of the cake not only prevents the bucket assembly from being thrown out of balance with a resultant undue wear on the equipment involved, but also prevents the mechanical degradation of the yarn in the cake since the original shape of the cake is maintained throughout the purification operation. Thus, the invention also makes possible the production of a centrifugally purified yarn cake which is of good mechanical structure and which can be efficiently unwound to produce a high quality yarn.

The invention further provides a means whereby the excessive handling of such coreless, annular packages of yarn during the purification operation may be avoided, since the yarn cake may be satisfactorily treated in succession with all of the various necessary purifying fluids while still positioned in the one bucket, it only being necessary that the bucket be made of a material that will resist the action of the fluids used. This reduction in the handling of the yarn cake not only effects an economy in the purifying operation but also yields a yarn of better mechanical quality since the cake is not subjected to so many handlings, each of which tends to degrade the yarn contained in the cake.

Since it is obvious that many changes and modifications can be made in the details above-described without departing from the nature and spirit of the invention, it is to be understood that the invention is not to be limited to the detailed description except as set forth in the appended claims.

I claim:

1. A process for the centrifugal forcing of treatment liquids through tapered, annular yarn cakes which comprises the steps of rotating said yarn cake at a sufficiently high speed to force the treatment liquid outwardly through the side wall thereof, passing a quantity of treatment liquid against the internal periphery of said cake, and supporting said cake during the entire centrifuging treatment solely from the external periphery thereof.

2. A process for the centrifugal forcing of treatment liquids through tapered, annular yarn cakes which comprises the steps of covering said yarn cake with a fabric, rotating said covered yarn cake at a sufficiently high speed to force the treatment liquid outwardly through the side wall thereof, passing a quantity of treatment liquid against the internal periphery of said cake, and supporting said cake during the entire centrifuging treatment solely from the external periphery thereof.

3. A process for the centrifugal forcing of treatment liquids through tapered, annular yarn cakes which comprises the steps of rotating said yarn cake at a sufficiently high speed to force the treatment liquid outwardly through the side wall thereof, passing a quantity of treatment liquid which has a shrinking action on said cake against the internal periphery of the latter, and supporting said cake during the entire centrifuging treatment solely from the external periphery thereof.

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