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MACHINE FOR DISSOLVING CELLULOSE XANTHATE AND THE LIKE

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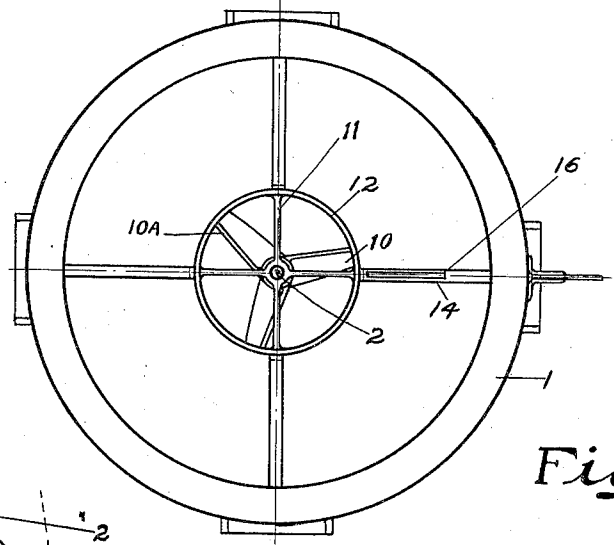


Fig. 2

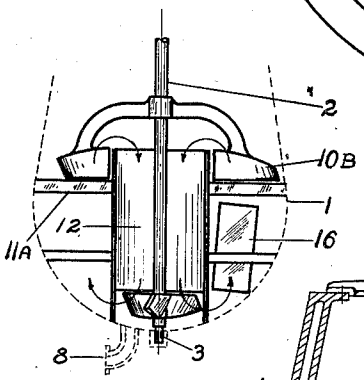


Fig. 3

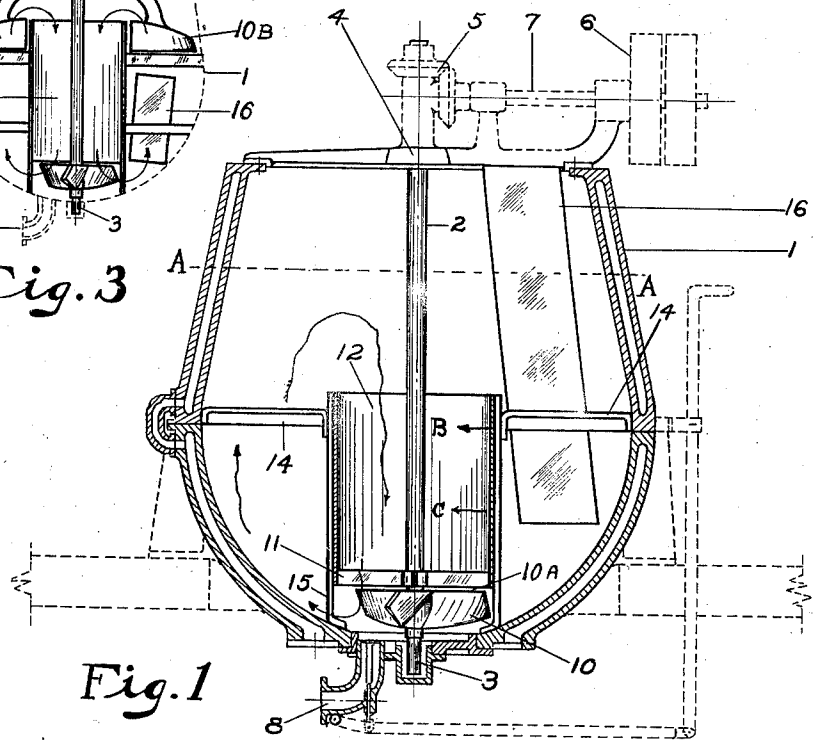


Fig. 1

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MACHINE FOR DISSOLVING CELLULOSE XANTHATE AND THE LIKE

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This invention relates to machines for dissolving materials such as cellulose xanthate used in the rayon industry, and similar materials.

The objects of the invention are to provide a vessel for containing the material to be dissolved, and a circulating, agitating, shearing and baffling mechanism located within the container, and power-driven, whereby the solvent liquor and the more solid portions that are to be incorporated in it for producing a complete solution are subjected to rapid circulation, shearing, mixing of the sheared particles with the solvent, and deflecting or baffling to increase fluid agitation and to promote intimate contact of the solvent liquor with the freshly cut areas of the suspended material.

This machine, as has been stated, is adapted primarily for the dissolving of cellulose xanthate in dilute water sodium hydroxide. The xanthate is a material having somewhat the appearance of elastic dough, being neither a true fluid nor a true solid. Pieces are of a more or less dense character, somewhat jelly-like. The pieces of material remain normally in semi-suspension in the solvent liquor, especially when the liquor is slightly agitated.

Complete solution of cellulose xanthate is used in thread manufacture for making the individual strands of a thread. The extruding process of strand manufacture is only possible when the solution has a definite viscosity. Since the viscosity of cellulose xanthate solution increases in proportion to the time that elapses between the first steps in the manufacture of xanthate and the production of the complete solution it is absolutely essential that the various manufacturing processes, especially dissolving, be performed in the shortest possible time and that this time be under complete and accurate control.

Mere stirring, which heretofore has been the usual mechanical treatment for dissolving cellulose xanthate, is too slow a process, because the masses to be dissolved, especially in the later stages of dissolving, are of such a soft dough-like or jelly-like character that they do not disintegrate by granulation as most other materials do, thereby exposing new surfaces to solvent action. On the contrary, these xanthate bodies have a tendency to retain their original shape while going into solution by mere reduction in size under the surface eroding and rather ineffective solvent action of the liquor, which becomes less effective as complete solution approaches.

We have discovered that more perfect dissolving is possible and at more rapid rates when the individual xanthate masses to be dissolved are mechanically sheared into small pieces while they are in suspension and in uninterrupted circulation in the liquid, provided rapid agitation occurs at the instant of shearing. A maximum of dissolving effect immediately takes place upon the freshly cut areas. The viscosity of cellulose xanthate is also very strongly affected by variations of temperature, and for this reason the mechanism in which the dissolving is done must perform its work with a minimum increase in temperature of the material.

To that end we have incorporated in a mechanical dissolver of the usual bowl form certain mechanisms whereby the desired results are produced more rapidly and economically in the handling of cellulose xanthate and other materials of like physical properties.

With the foregoing and certain other objects in view, which will appear later in the specifications, our invention comprises the devices described and claimed and the equivalents thereof.

In the drawings Fig. 1 is a part diagrammatic vertical section of a dissolver with our improvement applied thereto.

Fig. 2 is a top plan view of the parts shown in Fig. 1, the driving wheels removed, the bowl shown diagrammatically.

Fig. 3 is a diagrammatic view of a modified form of the machine.

As is clearly shown in the drawings, numeral 1 indicates the usual approximately egg-shaped dissolver bowl having a central vertical spindle 2 mounted on a foot-step

bearing 3 in the bottom of the bowl, and a guide bearing 4 at the top. The spindle is provided with the usual drive gears 5 actuated by belt pulleys 6 and drive shaft 7. The dissolver is provided with a valved outlet 8 for emptying, all of which is usual in dissolving machinery practice.

Our invention consists in a bladed impeller 10, mounted on the spindle 2, the lower edges of the blades preferably corresponding in shape to the curved bottom of the bowl and the upper edges 10A of the blades being tangential to the hub and all in the same horizontal plane so as to produce a shearing action with the lower edges of the baffling bars which will now be described. Immediately above these shearing edges and separated from them by a small vertical clearance are stationary cutting and baffling bars 11, which are arranged like the spokes of a wheel with respect to spindle 2, but are not in contact with it, the spindle being revolvable and the cutting blades 11 stationary. The blades are secured at their outer ends to a tubular, preferably cylindrical, drum 12 suspended in the bowl a short distance above its bottom and coaxially with spindle 2 and impeller 10.

The drum extends up about half the height of the bowl and is open at both ends. It is supported in the bowl by any suitable means, as by braces 14 and legs 15. A radially disposed fixed baffle plate 16, secured to one of the braces 14 extends across the annular space between the cylinder and the bowl, as shown in Fig. 1.

In Fig. 3 we have shown a structural modification of the invention, in which the stationary cutting blades 11A are outside the cylindrical drum 12 and the impeller blades 10B are outside the drum and travel circumferentially in the annular space between it and the bowl.

In both forms shown herein the shearing bars 11 or 11A are located at the up-stream side of the impeller blades 10 or 10B, so as to dispel all tendency to vortex action of the material before shearing takes place. By preventing such whirling action the bars 11 or 11A insure the even distribution of the suspended masses as they pass through the shearing area.

The operation of the preferred embodiment of the invention, shown in Fig. 1, is as follows:

The bowl having been filled approximately to line A—A with cellulose xanthate or other material to be treated, the impeller 10 is put in motion. Rapid circulation of the solvent liquor and of the dough-like masses to be dissolved therein is compulsorily established down through the central drum 12, so that all the pieces must keep in motion and are compelled to pass through the spaces between the bars 11 and thence between the blades of impeller 10. These blades revolve at quite high speed, say, approximately 225 R. P. M., and as the masses to be dissolved pass into the impeller 10 they are sheared between the cutting edges of the stationary bars 11 and the contiguous edges 10A of the impeller blades. The respective blades are machined to shearing edges for that purpose. The newly sheared faces of the masses thus expose, in gross, large areas to the dissolving action of the liquid, and the accompanying agitation and rapid flow promotes to the highest degree solvent and eroding action at the fresh-cut surfaces. Any small amount of heat unavoidably generated on the sheared surfaces of the material is immediately dissipated in the surrounding liquid. The material passes upward along the walls of the bowl and again down through drum 12 to the bottom of the bowl, being recut on its way, and thereafter making recurrent cycles until dissolving is complete. The annular areas around the cylinder, as well as all the other flow areas, are preferably equal to the cross sectional area of the drum.

The plate 16 prevents the material from taking up vortex or whirling motion, and by its baffle action causes additional desirable agitation of the material.

We have shown and described drum 12 as having horizontal cutting bars 11 that not only co-operate with the impeller blades for shearing, but serve a further useful function by preventing vortex action of the material as it approaches the impeller and is about to be sheared. For that purpose we prefer to make the bars, as shown, of suitable width to act as baffles and prevent such vortex movement.

We have shown, for purpose of illustration, only one impeller 10 and one set of cutting bars 11. In work where it is desirable to multiply the number of cutting and mixing actions per cycle, and thereby shorten the time required for the dissolving operation, we repeat the impeller and the set of horizontal bars as many times as may be found desirable for the purposes to be attained.

In the form illustrated in Fig. 1 an impeller may be placed at the top of the drum in approximately the location indicated by the arrow at B, and another may be located, say half way up the drum, as at C, each impeller having a plurality of shearing bars secured close to it in the drum, as in the manner illustrated in Fig. 1.

By the means above described we have produced a simple and extremely effective machine for rapidly putting into complete solution cellulose xanthate and similar substances having the peculiar physical characteristics described herein.

Having thus described our invention, what we claim and desire to secure by Letters Patent is:

1. In combination a dissolver bowl, an

open-ended cylindrical drum in said bowl and spaced above its bottom, a spindle, a rotatable bladed impeller mounted thereon with sharpened upper edges located tangential to the impeller hub, said impeller disposed at the lower end of said drum and adapted to maintain a recurrent flow of material therethrough, radially disposed stationary bars mounted within the drum and formed with shearing edges contiguous to and co-operating with the edges of the blades of said impeller to produce a shearing action upon pieces of material of the nature of cellulose xanthate while flowing in suspension.

2. In a dissolver a bowl for containing fluid material, an open-ended drum fixed in said bowl and spaced above the bottom thereof, a spindle, a bladed impeller co-axial with the drum and rotatable, a hub on said impeller, a stationary bar radially disposed in proximity to said impeller, the upper edge of said blade substantially tangential to the hub, so as to produce a shearing action with the lower edges of the bar, the upright sides of said bar comprising baffling surfaces to prevent vortex action of said material.

3. In a dissolver a bowl for containing fluid material, an open-ended drum fixed therein and spaced above the bottom of said bowl, a spindle, a bladed impeller co-axial with the drum and rotatable, a stationary bar disposed in said cylinder in proximity to said impeller, the upper edges of the impeller blades tangential to the hub so as to produce a shearing action with the edges of the bars, and a radially disposed baffle plate in the annular space between the walls of the bowl and said cylinder, said baffle plate extending approximately to the surface of the fluid material and adapted to prevent vortex action of the material in said annular space.

4. In combination, a dissolver bowl, an open-ended drum in said bowl and spaced above its bottom, a spindle, a rotatable impeller mounted thereon, blades on said impeller whose margins are machined to shearing edges, said impeller adapted to maintain a recurrent flow of material through the drum, stationary bars associated with the drum and formed with sharpened edges contiguous to and co-operating with the sharpened edges of said impeller blades, adapted to cut pieces of material of the nature of cellulose xanthate while flowing in suspension and thereby to expose increased fresh-cut areas thereof to the dissolving action of liquid in said bowl.

In testimony whereof, we affix our signatures.

RICHARD THURM.
EUGENE SCHMIERER.