Aug. 22, 1933. C. F. GRAM 1,924,080

MIXER

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Fig. 1.

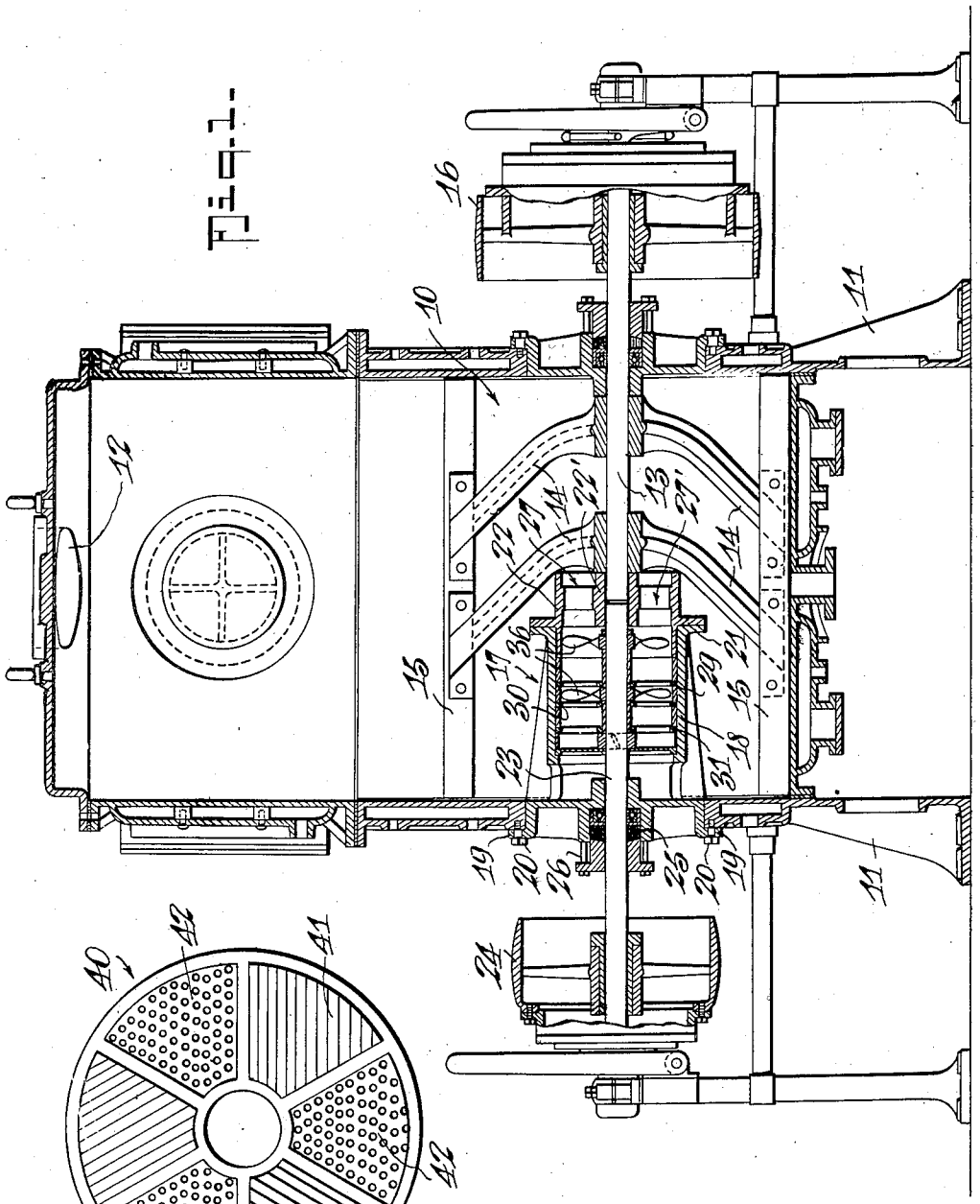


Fig. 6.

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Fig. 2.

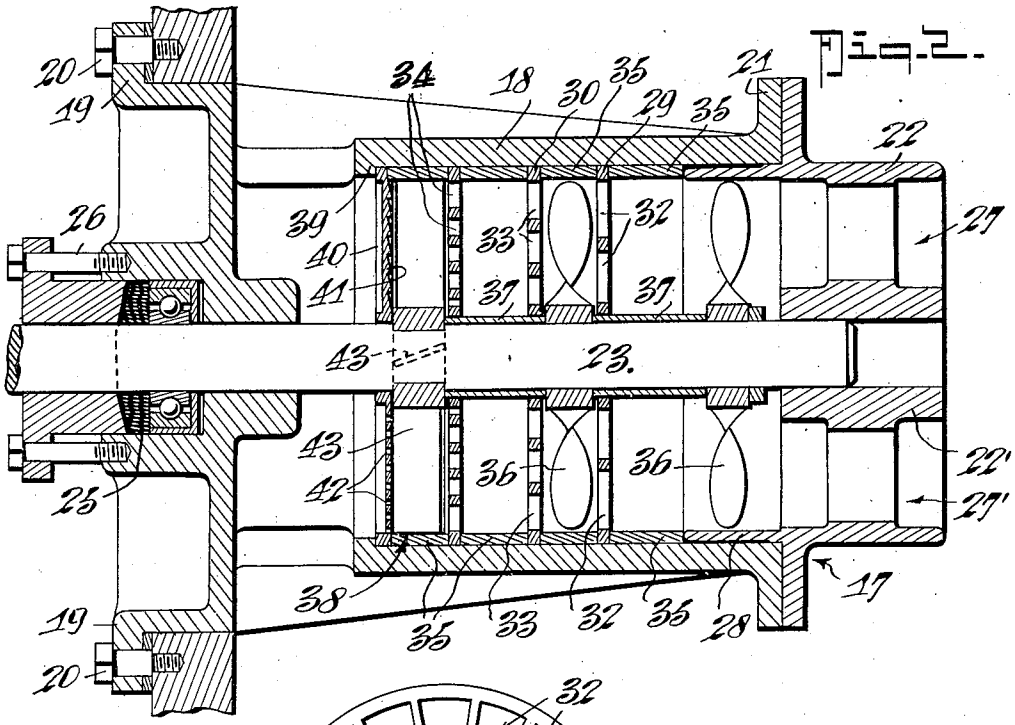


Fig. 3.

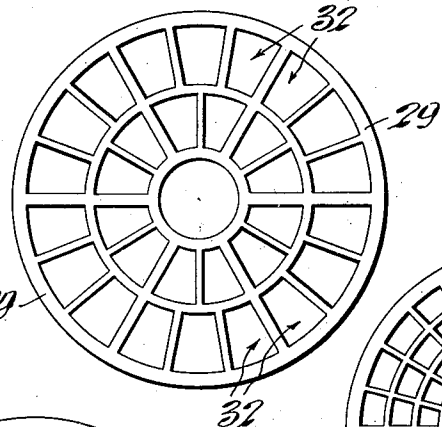


Fig. 5.

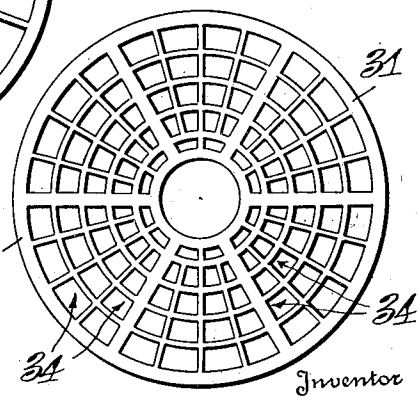
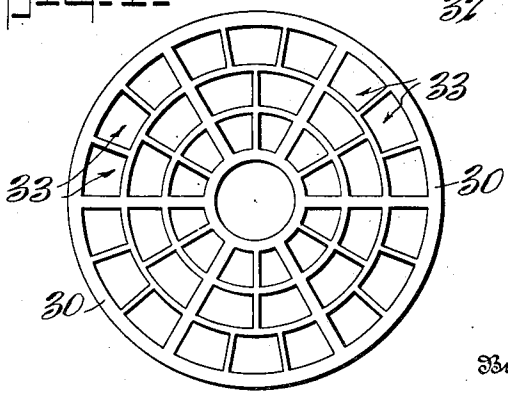


Fig. 4.



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Patented Aug. 22, 1933 1,924,080

UNITED STATES PATENT OFFICE

1,924,080

MIXER

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Application October 25, 1932. Serial No. 639,474

1 Claim. (Cl. 259—97)

My present invention relates to improvements for mixing and dissolving materials, and more particularly to an improved mechanism for mixing and dissolving cellulose xanthate with an alkali to form a solution suitable for spinning into threads of artificial silk and like materials.

In the manufacture of a solution suitable for the spinning of artificial silk and the like according to the viscose process, sulphite wood pulp is treated with an alkali to form alkali cellulose and then allowed to ripen. The ripened alkali cellulose is next treated with carbon disulphide to produce a cellulose xanthate. This xanthate is a material having somewhat the appearance of wet sawdust, and pieces of it are of a more or less dense character, somewhat jelly-like, and will remain normally in a semi-suspension in the solvent liquors.

The spinning solution consists of the cellulose xanthate completely dissolved in a suitable solvent such as dilute sodium hydroxide and can only be spun into threads when it has a definite viscosity. Since the viscosity of the solution depends to a large extent upon the time required between the first steps in the manufacture of the xanthate and the production of the complete solution, it is essential that the various manufacturing processes, especially the dissolving, be performed in the shortest possible time and at the same time be under complete and accurate control.

The usual mechanical mixing does not efficiently dissolve the material in the solvent, since during the latter stages of dissolving the masses of cellulose xanthate are of such a soft jelly-like character that they will not disintegrate by granulation as most other materials do. On the contrary, the pieces of xanthate 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 thus less effective as complete solution of the material approaches.

It is accordingly an object of my present invention to provide a vessel for containing the material to be dissolved in which is located a horizontally disposed shearing and baffling mechanism through which the material will be positively forced. By such action the material is broken up and allows the solvent to come in contact with the freshly cut surfaces of the material, thereby speeding up the dissolving process.

Another object of my present invention is to provide in a mixing mechanism, shearing mechanism, through which the material to be dissolved is forced, the said shearing mechanism consisting essentially of a plurality of rotatable shearing blades located between perforated plates, the size of the perforations gradually diminishing so as to reduce the size of the material to be dissolved, as it is forced through the shearing device.

With the foregoing and certain other objects in view, which will appear later in the specification, my invention comprises the mechanism described and claimed and the equivalents thereof.

In the drawings, Figure 1 is a sectional view of my mixer and grinder, Figure 2 is a detail sectional view of the grinding and shearing mechanism, Figures 3, 4 and 5 are detail views of the perforated plates, and Figure 6 is a detail view of the grinding plate.

Referring now more particularly to the drawings in which like numerals indicate like parts, I have shown a mixing chamber 10 secured to supports 11 and provided at its upper end with an opening 12, through which the material to be dissolved and the solvent may be introduced into the mixing and grinding chamber. The mixing mechanism consists essentially of a shaft 13 extending horizontally of the mixing chamber and provided with a plurality of arms 14 which carry at their outer ends paddles 15. This shaft is rotated by means of any suitable mechanism such as a belt drive as is shown at 16 and the inner end of the shaft 13 is journalled in one end of the grinding and shearing mechanism 17.

Referring now more particularly to Figure 2, the grinding and shearing mechanism 17 consists of a chamber or shell 18 provided at its outer end with a flanged portion 19 by which the said grinding and shearing device is secured in place in the opening provided therefor in the wall of the mixing chamber by means of bolts and the like 20. The inner end of the chamber is likewise flanged as shown at 21 to which is secured the head 22 carrying a bearing 22' for the shearing and grinding shaft 23. This shaft is driven by means of a belt drive 24. To prevent any possible leakage of the material around the shaft, gland packing means 25 are provided which are held in place by means of the usual gland and nut arrangement 26.

The xanthate and the solvent is stirred up in the mixing chamber by means of the paddles 15 and this mixture enters the shearing and grind-

ing mechanism through openings 27 and 27' provided in the head 21. This head is also provided with a circular portion 28 which extends into the shearing and grinding chamber.

The shearing and grinding mechanism consists essentially of a series of grids or perforated plates 29, 30 and 31; the openings 32 formed in the grid or plate 29 being comparatively large in size, the openings 33 in the grid or plate 30 being medium in size and the openings 34 of the plate 31 being small in size. By such construction the mixture of cellulose xanthate and alkali containing pieces or lumps of material, when forced through these openings which progressively diminish in size, is sheared into smaller and smaller sizes. Suitable means are provided to hold the grids or plates in their proper position, and as shown, consist of a plurality of spacer rings 35. The mixture to be ground or sheared is forced through the openings in the grids or plates by impellers 36 which also exert a shearing force on the lumps in the mixture. These impellers are suitably secured to the shaft 23 and are held in spaced relation to each other by the spacers 37.

After the mixture has been forced through the grids or perforated plates, it is then subjected to a final grinding action in the sub-chamber 38. Located against the flange 39 by means of the aforementioned spacer rings 35 is a grinding plate 40. This plate (see Figure 6) is made up of a plurality of sectors, in the embodiment shown, six in number, each alternate sector being provided with saw teeth 41. The other sectors are provided with small openings 42 through which the mixture is forced by the impeller 43. The blades thereof are flat and are mounted at an angle to the hub so that the impelling force of the impellers 36 is not lost. All edges of the blades are very sharp so that any lumps in the mixture of cellulose xanthate and alkali may be readily cut; and the clearances between the sides of the blades and the perforated plates and grinding plate and between the ends of the blades and inner wall of the chamber is very small so that a strong mashing effect on the lumps will be obtained. The mixture is then forced through the perforated sectors of the grinding plate and out through the openings 44 into the mixing chamber.

In operation the mixer is charged with a mixture of cellulose xanthate and alkali and the mixing and grinding mechanism started. Circulation of the solvent and of the masses to be dissolved therein is compulsorily established through the grinding chamber by the rotating impellers 36 and 43 so that all the pieces must keep in motion and are forced through the brids or plates breaking up the lumps and promotes to the highest degree solvent and eroding action of the freshly cut surfaces. As the mixture passes through the sub-chamber 38 it is subjected to a shearing action between the saw-teeth and the impeller 43 and also between the inner walls of the sub-chamber and the impeller and then forced through the openings 42. Any small amount of heat unavoidably generated on the sheared surfaces of the material is immediately dissipated in the surrounding liquid. The material then passes into the mixing chamber and again through the grinding chamber being recut on its way and thereafter making cycles until dissolving is complete.

By the means above described, I have provided extremely effective mechanism for rapidly putting into complete solution cellulose xanthate and similar substances having the peculiar physical characteristics described herein.

Having now described my invention as required by the patent statutes, what I desire to claim is:

In a mixer, a container for a fluid material, a horizontally disposed chamber positioned in said container and provided with entrance and exit openings, a shaft extending coaxially of said chamber, a plurality of bladed impellers secured thereto for maintaining a recurrent flow of material through said chamber, means to maintain said impellers in spaced relation, plates positioned between said impellers and provided with openings, means to maintain said plates in spaced relation, a plate positioned at the exit end of said chamber provided with alternate grinding and perforated sectors, an impeller located adjacent said plate and provided with blades coacting with the grinding sectors and the inner wall of said chamber to shear the material flowing through said chamber.

CARL F. GRAM.