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K. ROSENFELD ETAL

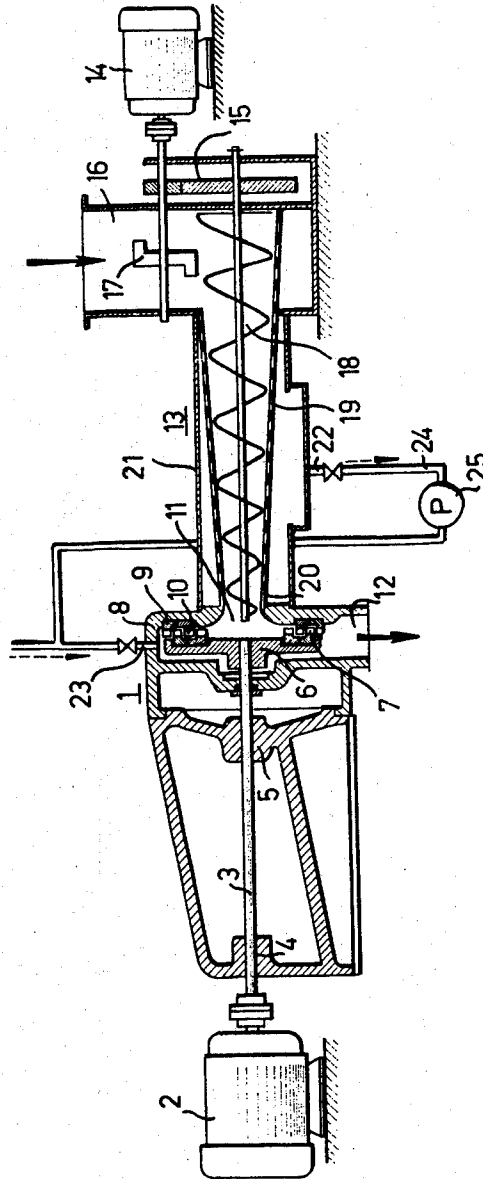
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PROCESS FOR THE PREPARATION OF FIBRE SUSPENSIONS

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2 Sheets-Sheet 1

Fig. 1



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Fig. 2

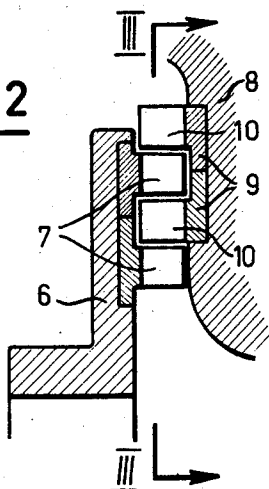
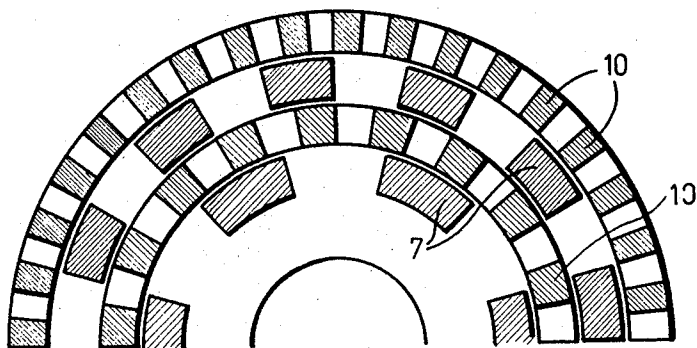


Fig. 3



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PROCESS FOR THE PREPARATION OF FIBRE SUSPENSIONS

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7 Claims. (Cl. 241—28)

This invention relates to a process for the preparation of fibre suspensions, more particularly in paper making, as well as to an application of this process and an installation for carrying out this process.

So-called dispersing devices are known, in which a hub disc with annular rows of teeth arranged coaxially on it relatively rotates with respect to a second disc with annular rows of teeth arranged coaxially on it, the said rows of teeth of one disc projecting into gaps left between the annular rows of the other disc, and the material to be treated flows between the two discs alternately through the teeth rows of the two discs from a central orifice of one of the discs from the inside outwardly. These known dispersing devices operate with pulp consistencies (i.e., the ratio of the weight of dry solids in the pulp to the total weight of the wet pulp expressed as a percentage) of 7 to 8%, and serve merely for removing specks from the material without mechanically working the individual fibres.

In the preparation of waste paper, for example, it is necessary to separate or disperse the printer's ink carried by the paper, as well as portions of dirt and wax, which adhere to the material broken up in a wet mixer.

The ink particles, for example, can be removed chemically by solution or flotation. It is also known to comminute and disperse the ink particles in the fibre material mechanically by treating the material in an edge-runner mill so finely that they are no longer perceptible to the eye.

Furthermore, a known process operates with a so-called one-shaft pulper at high pulp consistencies and at temperatures up to 95° C. For attaining these pulp consistencies extensive separate thickening apparatus is required, the high temperatures being obtained by the addition of steam.

It is now the object of the invention to simplify and improve substantially the preparation of fibre suspensions compared with the known processes. In a process of the kind hereinbefore described, for this purpose, according to the invention, the fibre suspension is concentrated to a fibre pulp of at least 15% consistency, and this pulp is conveyed to a dispersing device known per se, which (as described hereinbefore) comprises relatively rotating coaxially arranged interengaging annular rows of teeth, the said concentrated pulp being led through the interstices of said teeth in a substantially radial direction.

The invention is based on the discovery that the apparatus used heretofore only for low pulp consistencies and only as a speck remover is an extremely effective preparation apparatus, requiring little power, for the individual fibres and fibre agglomerates, and also represents an equally effective dispersing apparatus for the ink particles and the like contained in the material to be prepared, if the fibre suspension to be prepared is brought to a pulp consistency of at least 15% for the duration of stay in the apparatus.

In fact, in this condition of the material, the individual fibres are processed in the dispersing device, without being shortened or damaged mechanically in structure, by friction effects from fibre to fibre, so that they become completely pliant and flexible. Due to these new proper-

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ties, in the subsequent formation of the paper sheet, the fibres can be laid closer together and felted better, resulting in considerably greater strengths in the dried paper sheet. Heretofore, an increase in the paper strength has only been possible by so-called grinding in different grinding machines, in which, however, the individual fibres are shortened mechanically and damaged in their structure, the facility of removing water from the fibre fleece being thereby considerably reduced.

In addition to the improvement in the individual fibres, with a pulp consistency of at least 15% in the dispersing device, there is also obtained, likewise by friction effect, a temperature adequate for satisfactory dispersion, without the necessity for an external supply of heat. In addition, it is not only possible to disperse the printing ink and wax particles satisfactorily in the preparation of waste paper, but the chemical accessory agents and additives, for example, dyes, waxes, starch, resins and so forth can be added to the paper pulp for obtaining certain properties in the finished paper. The accessory agents and additives are advantageously added to the paper pulp after concentration to a pulp consistency of at least 15%.

The thorough mixing and dispersing of the chemical accessories and additives is so good in the process according to the invention that the chemicals are dispersed practically uniformly on or worked into the surfaces of the individual fibres. Compared with the usual processes, this results in a considerable saving of accessory substances, as well as substantial improvements in properties of the paper which are aimed at by the additions.

The best results can be obtained if, before introduction into the dispersing device, the fibre suspension is concentrated to a fibre pulp of 20 to 25% pulp consistency. The liquid removed from the fibre suspension during concentration can be returned at least partly to the concentrated fibre pulp after the latter has been treated in the dispersing device. This liquid, or another liquid, or both, can be used for washing the fibre pulp out of the outlet housing of the dispersing device and for re-diluting the fibre pulp to a fibre suspension which is suitable for further processing and which can be pumped. The application of the process according to the invention is particularly advantageous for the preparation of waste paper in dispersing printing ink, wax particles and the like, with simultaneous disintegrating of the fibre bundles and specks into individual fibres.

An installation for carrying out the process according to the invention is represented in simplified manner in the drawing by way of example.

FIG. 1 shows an axial vertical section through the installation,

FIG. 2 shows a portion of FIG. 1 on a larger scale, and FIG. 3 shows a section on the line III—III of FIG. 2.

The installation shown has a dispersing device 1, driven by a motor 2 by means of a shaft 3 journaled in bearings 4 and 5. Mounted on the shaft 3 is a hub disc 6, which carries annular rows of teeth 7 arranged coaxially to the shaft 3 and rotates in a housing 8. On one wall of the housing, there is fixed, parallel to the hub disc 6, a stationary disc 9 carrying concentric rows of teeth 10. The housing 8 has an inlet orifice 11 and a radial outlet 12 of large cross-section. The dispersing device 1 is preceded directly by a thickening worm press 13. A motor 14 drives an agitator arm 17 arranged in the inlet 16 of the worm press 13 and, by means of gearing 15, a worm 18 which rotates in a perforated casing 19. The end 20 of the casing 19 joins directly on the inlet orifice 11 of the dispersing device 1. An outer shell 21 of the worm press 13 defines a water chamber having a liquid outlet 22, while the outlet part of the housing 8 of the dispersing device 1 is provided with a liquid inlet 23.

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From the liquid outlet 22, a pipeline 24, including a pump 25, leads to the liquid inlet 23.

The material to be prepared, broken up in a wet mixer of known kind is supplied at a still pumpable pulp density of 5 to 6% to the inlet 16 of the worm press 13, and in the latter, is freed from a part of its liquid. The liquid collects in the outer shell 21 and flows away through the connection 22. The material, thickened in the worm press to 20 to 25% pulp consistency is prepared in the dispersing device 1, in which it flows in a substantially radial direction alternately through the interstices of the rotating and stationary teeth rows. After the material passes through the interstices of the rows of teeth, it enters the diffuser or outlet section of the disperser where it is again diluted. For this purpose, dilution liquid is supplied to the diffuser section through inlet 23. In addition to diluting the material being processed, this dilution liquid also serves to wash the material out of the diffuser section. The diluted material is discharged from the disperser through the outlet 12 leading from the diffuser section.

The combination of the dispersing device and the worm press, arranged coaxially with it to form a machine unit, gives a particularly compact, efficient installation. The concentration of the material to the considerable pulp consistency of 20 to 25%, at which it can no longer be pumped, is limited in practice to the short processing period in the dispersing device itself. At the same time, the worm press is a much simpler and more economical concentrating apparatus than the thickening apparatus of the known processes.

The concentration of the material to be prepared may, however, also be carried out in some other way, in which case it is necessary to have a special conveying device for conveying the thickened, no longer pumpable material into the grinding and dispersing apparatus.

Such a special conveying device may be dispensed with if the shaft of the dispersing device is arranged vertical. In the vertical position of the device which is shown in the drawing, the pump 25 in the liquid pipeline 24 is also not required.

What is claimed is:

1. Process for the preparation of a fibre suspension, more particularly in paper making, which consists in concentrating the said fibre suspension by removal of liquid to a fibre pulp of at least 15% pulp consistency and treating the so-obtained fibre pulp by leading it in a substantially radial direction through the interstices of relatively rotating coaxially arranged interengaging annular rows of teeth.

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2. The process defined in claim 1 in which the concentration of the fibre suspension is effected to a pulp consistency of between 20% and 25% of the fibre pulp.

3. The process defined in claim 1 in which the liquid removed during the concentration of the fibre suspension is returned at least partly to the concentrated fibre pulp which has been led through the interstices of the said interengaging annular rows of teeth.

4. The process defined in claim 1 in which chemical accessories and additives, for obtaining predetermined properties of the finished paper, are added to the fibre suspension after its concentration.

5. The process defined in claim 1 as applied for the preparation of waste paper in dispersing printing ink, wax particles and the like with simultaneous disintegration of the fibre bundles and specks into the individual fibres.

6. An apparatus for treating fibre suspensions comprising a dispersing device having a hub disc with annular rows of teeth arranged coaxially on it and a second disc with annular rows of teeth arranged coaxially on it, the teeth rows of one disc projecting into gaps left between the teeth rows of the other disc and the said discs being mounted so as to allow relative rotation with respect to one another and one of said discs having a central opening for the concentrated fibre pulp to be treated; and a housing defining an outlet space for the treated pulp; and a worm press including a dewatering chamber and having an inlet for the fibre suspension to be concentrated and an outlet for the concentrated fibre pulp; said worm press being arranged coaxially with said dispersing device and being directly connected to the dispersing device in such a manner that the outlet of the worm press opens into the inlet of the dispersing device.

7. The combination defined in claim 6 comprising a pipeline leading directly from the dewatering chamber of the worm press to the outlet space of the dispersing device housing.

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