Aug. 8, 1933. G. HAMMOND 1,921,080

DEINKING APPARATUS

Filed Jan. 31, 1930 2 Sheets-Sheet 1

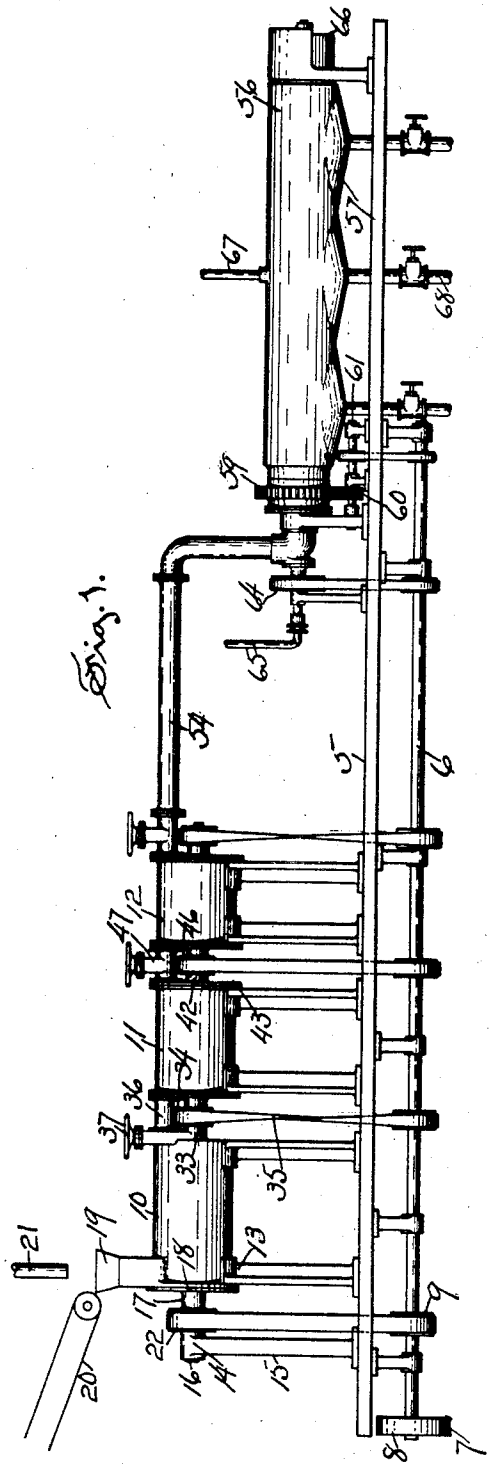


Fig. 1.

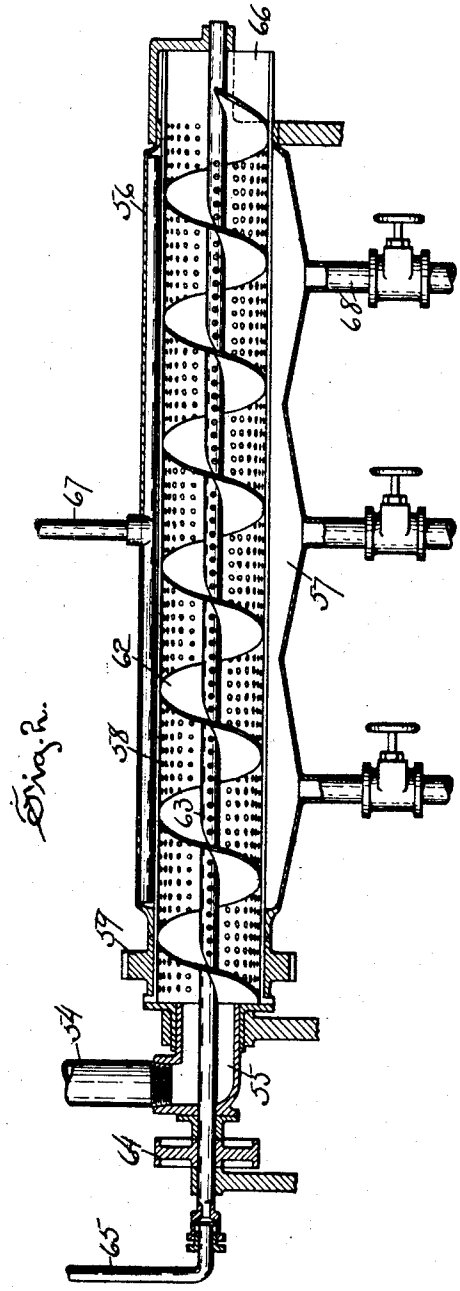


Fig. 2.

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Fig. 3.

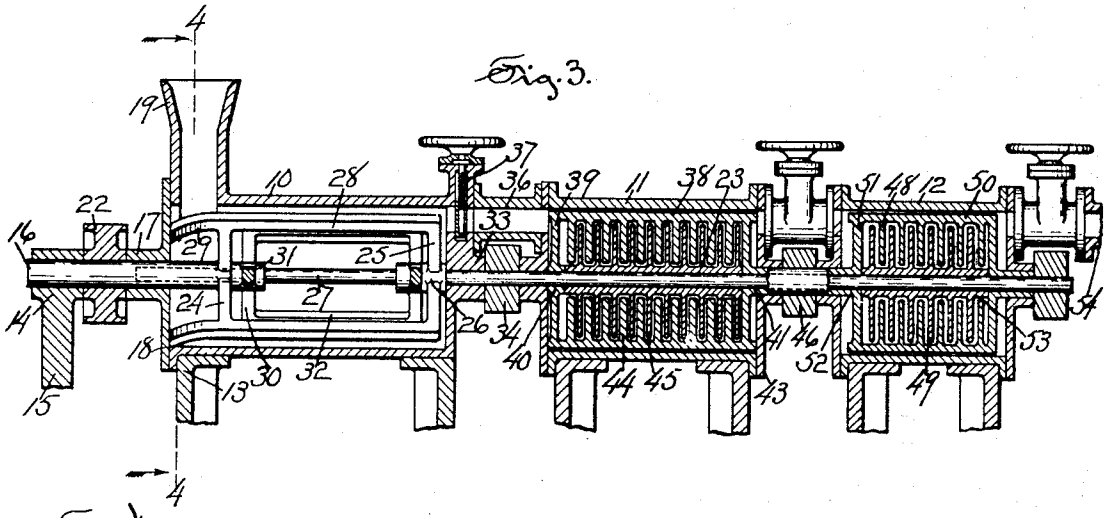
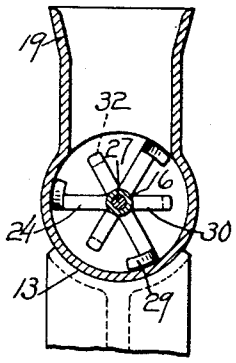


Fig. 4.



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UNITED STATES PATENT OFFICE

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DEINKING APPARATUS

Grant Hammond, New Haven, Conn.

Application January 31, 1930. Serial No. 424,808

21 Claims. (Cl. 92—20)

My invention relates more especially to apparatus for removing printing ink from paper and similar material for the purpose of rendering such material again usable for the manufacture of paper, and an object of my invention, among others, is the production of an apparatus of this sort by means of which printing ink may be rapidly, efficiently and thoroughly removed economically from paper material, and particularly such as has been employed in the making of newspaper.

One form of an apparatus embodying my invention, and in the construction and use of which the objects herein set out, as well as others, may be attained, is illustrated in the accompanying drawings, in which—

Figure 1 is a view in side elevation of my improved apparatus.

Figure 2 is a view in central longitudinal section through the washing section of my improved machine.

Figure 3 is a view in central longitudinal section through the dissolving section of my improved apparatus.

Figure 4 is a view in cross section on a plane denoted by the dotted line 4—4 of Figure 3.

In the accompanying drawings the numeral 5 indicates a base or table on which the apparatus as a whole is supported, a driving shaft 6 being mounted underneath the base, and driven from any suitable source of power, as by means of a belt 7 engaged with a driving pulley 8 secured to said shaft. Pulleys 9 are secured at suitable intervals along the shaft 6 for the purpose of driving different mechanisms embodying the apparatus.

Shells 10, 11 and 12 are supported by the base or table, as on saddle supports 13 rising from said base, and a shaft bearing 14 at the upper end of a post 15 receives one end of a mixing shaft 16 which extends through a bearing 17 in a hub projecting from a head 18 of the mixing shell 10. A hopper 19 extends upwardly from one end of the shell 10 to receive shredded paper and a deinking solution, as from a conveyor 20 and a supply pipe 21 respectively, such shredded paper and liquid solution being comingled as they enter the shell at one end thereof.

The shaft 16 is rotated as by means of a pulley 22 secured thereto and which receives a belt from one of the pulleys 9 on the shaft 6. Two mixing frames are rotatably mounted in the shell 10, the outer of said frames being secured to the shaft 16. This frame comprises a set of arms 24 secured to and projecting radially from the shaft 16 at one end of the shell 10, and another and similar set of arms 25 projecting from a hub 26 rotatably mounted on a shaft 27 to be more particularly hereinafter described. Mixer blades 28 or paddles are secured to the outer ends of the arms 24 and 25, there preferably being three of such arms in each set and consequently three blades or paddles.

The set of arms 24 is at one side of an opening at the inner end of the hopper 19 and the blades 28 at this end of the shell extend underneath said opening to make contact with the incoming material from the hopper. These extensions comprise feeders 29 that are curved lengthwise to promote flow of material toward the other end of the shell as such material comes in contact with said feeders.

An inner mixing frame comprises two sets of arms 30 extending radially from hubs 31 secured to the shaft 27 hereinbefore mentioned, and a set of mixing blades or paddles 32 are secured to the outer ends of said arms, the latter being of such length as to locate the blades 32 inside of the zone in which the blades 28 rotate. The shaft 27 extends through the shell 10 and is rotatably mounted at one end in a hole extending into the inner end of the mixing shaft 16. Said shaft is also mounted in a bearing in a hub 33 extending from an end of the shell 10, and a pulley 34 secured to said shaft adjacent said hub is belted to one of the pulleys 9 to be driven therefrom.

It is preferred that the speed of rotation or the direction of rotation of the two mixers shall be such that the blades 28 and 32 shall pass each other in their circular paths. By preference the two mixers are rotated in opposite directions and the belt 35 may be crossed, as shown in Figure 1, to secure this result. A conduit 36 leads from the shell 10 into the shell 11, such conduit preferably being located at the tops of the shells. A valve 37, of any suitable construction, preferably of the gate type, is arranged to control flow of material from the shell 10 to the shell 11, which material is sufficiently liquid in character to flow through said conduit.

A secondary mixer is mounted in the shell 11, this secondary mixer comprising interlapping elements extending from outer and inner supporting members. The outer supporting member includes diametrically located supporting bars 38 at the ends of arms 39, one set of said arms projecting from a hub 40 at one end of the

shell rotatably mounted on the shaft 27 and the other set of arms projecting from a sleeve 41 rotatably mounted on said shaft and in a hub 42 projecting from a head 43 of the shell. Mixing fingers 44 project inwardly from each of the bars 38 to a point near the center of the shell 11, said fingers being spaced apart to receive between them mixing fingers 45 arranged in sets and extending outwardly from a finger supporting sleeve 23 rigidly secured to the shaft 27, these fingers 45 extending nearly to the inner ends of the fingers 44. The sleeve 41 extends through a hub 42 projecting from a head 43 of the shell 11 and a pulley 46 is secured to the sleeve 41 as a means for rotating it.

It is essential that the outer and inner sets of fingers shall pass each other in their rotating movements, and this may be effected by rotating the sets of fingers at different rates of speeds or in different directions as in the case of the mixers in the shell 10. In the arrangement herein shown, this is effected by a belt passing from the pulley 46 to one of the pulleys 9 thereby rotating the sets of fingers 44 in one direction while the other sets 45 of fingers are rotated in the opposite direction by means of the pulley 34 secured to the shaft 37. The fingers are preferably somewhat wider than they are thick and a conduit 47 conducts material from the shell 11 to the shell 12.

A final mixer is constructed in a manner similar to that just described, this final mixer comprising the shell 12 having two sets of mixing fingers, an outer set 48 and an inner set 49, which fingers are by preference somewhat narrower than the fingers in the preceding mixer and they are rotated in a manner to pass each other as by rotation in opposite directions in the arrangement herein shown, the outer set of fingers projecting from a bar 50 supported by arms 51 projecting from a sleeve 52 to which the pulley 46 is secured thereby rotating the outer set of arms in the same direction as the outer set of arms in the shell 11. The inner set of fingers 49 project from a sleeve 53 secured to the shaft 27.

The shredded paper produced, usually from newsprint paper containing the printing ink thereon is conducted by the conveyor 20 to the hopper 19 and a liquid solution of proper ingredients to dissolve the ink and enable it to be removed from the paper is introduced through the supply pipe 21. The proportions of the shredded paper and liquid are such as to create a thick mixture in the shell 10 which mixture is, however, sufficiently liquid to permit it to flow through the conduit from one to another of said shells 10, 11 or 12. The action of the mixers or beaters in the shell 10 causes the liquid mass to be thoroughly agitated and such mass flows from one to another of said shells, being thoroughly agitated and stirred in each of the shells thereby causing the printing ink to be thoroughly loosened and separated from the paper.

A rinser and cleanser is connected as by a conduit 54 with the outlet end of the shell 12 by means of which conduit the liquid mass flows into the mouth 55 of the rinser and cleanser. This comprises an enclosing shell 56, preferably of substantially circular outline, with sumps 57 arranged lengthwise thereof on the bottom. A strainer in the form of a perforated cylinder 58 is rotatably mounted in the shell 56 as by means of a gear 59 meshing with a pinion 60 on a counter shaft 61 belted to be driven from the shaft 6, and as shown in Figure 1 of the drawings. A feed worm 62 is rotatably mounted in the shell 56, said worm being secured to a hollow perforated shaft 63 mounted in bearings at opposite ends of the shell 56, said shaft being rotated as by means of a pulley 64 belted to a pulley on the counter shaft 61. A water supply pipe 65 is suitably connected with the hollow shaft 63 for the supply of a rinsing liquid into the interior of the strainer 58. Relative rotation between the strainer 58 and the worm 62 is caused to effect feed of the liquid material supplied by the pipe 54 along the strainer 58 and to the outlet 66 thereof. In the arrangement herein shown, the worm is rotated faster than the strainer and the latter is rotated in a reverse direction to that of rotation of the worm.

By this arrangement the liquid mass is thoroughly agitated as it is fed along the strainer and the water is caused to drain into the sumps in the bottom of the shell. It has been found that most of the ink will be contained in the drainage into the sump nearest the inlet end of the shell and that the remainder of the water will be comparatively clear and may be re-used for rinsing purposes. This water may be reclaimed as by means of outlets 68 from the sumps 57.

A fluid supply pipe 67 is connected with the top of the shell for the supply of fluid under pressure into the shell for the purpose of cleaning the strainer by blowing therefrom such matter as may have collected in the perforations.

In accordance with the provisions of the patent statutes, I have described the principles of operation of my invention together with the device which I now consider to represent the best embodiment thereof; but I desire to have it understood that the device shown is only illustrative, and that the invention may be carried out by other means and applied to uses other than those above set out.

I claim:

1. A deinking machine including a mixer shell having an inlet thereto and an outlet therefrom both at the top thereof, a mixer movably mounted in the shell and comprising a plurality of blades supported on a horizontal shaft and movable past one another in adjacent paths, and means for operating said blades.

2. A deinking machine including a mixer shell having an inlet thereto and an outlet therefrom both at the top thereof, a mixer movably mounted in the shell and comprising a plurality of blades supported on a horizontal shaft and movable past one another in adjacent curved paths, and means for operating said blades.

3. A deinking machine including a mixer shell having an inlet thereto and an outlet therefrom both at the top thereof, a mixer movably mounted in the shell and comprising a plurality of blades supported on a horizontal shaft and movable in opposite directions in adjacent paths, and means for operating said blades.

4. A deinking machine including a mixer shell having an inlet thereto and an outlet therefrom both at the top thereof, a mixer rotatably mounted in the shell and comprising a plurality of blades supported on a horizontal shaft and movable past one another in adjacent paths, and means for rotating said blades.

5. A deinking machine including a mixer shell having an inlet thereto and an outlet therefrom both at the top thereof, a mixer including a plu-

rality of shafts mounted on a horizontal axis in said shell, a plurality of sets of arms projecting radially from said shafts, mixer blades secured to the outer ends of said arms to travel in adjacent curved paths, and means for operating said shafts to effect travel of the blades on each set of arms past each other.

6. A deinking machine including a mixer shell having an inlet thereto and an outlet therefrom both at the top thereof, a mixer including a plurality of shafts mounted in said shell to rotate on a common horizontal axis, a set of arms projecting radially from each of said shafts, mixer blades secured to the outer ends of said arms to travel in adjacent curved paths, and means for independently rotating said shafts in opposite directions.

7. A deinking machine including a mixer shell having an inlet thereto at one end and an outlet therefrom both at the top thereof, a mixer rotatably mounted on a horizontal axis in said shell and comprising a plurality of sets of blades positioned to travel past each other in curved paths, feeders projecting from one end of said sets of blades opposite the opening into the shell and curved to direct flow into the shell and means for operating said blades.

8. A deinking machine including a mixer shell having an inlet thereto and an outlet therefrom both at the top thereof, with mixing apparatus therein, another shell to receive material mixed in the first shell, a mixer movably mounted on a horizontal axis in the last mentioned shell and comprising a plurality of sets of mixing fingers, the fingers in each set being spaced to receive between them the fingers of another set traveling in adjacent paths, and means for operating said mixer.

9. A deinking machine including a mixer shell having an inlet thereto and an outlet therefrom both at the top thereof, with mixing apparatus therein, another shell to receive material mixed in the first shell, a mixer rotatably mounted on a horizontal axis in the last mentioned shell and comprising two shafts each having a set of fingers projecting therefrom, the fingers in each set being spaced to permit passage therebetween in adjacent paths of the fingers of another set, and means for rotating said shafts.

10. A deinking machine including a mixer shell having an inlet thereto and an outlet therefrom both at the top thereof, a mixer movably mounted on a horizontal axis in said shell and comprising a plurality of blades movable past one another in adjacent paths, means for operating said blades, a second shell having an inlet communicating with the outlet of the other shell to receive material therefrom and having an outlet, a plurality of sets of mixing fingers movably mounted in the second shell, the fingers of one set being spaced to receive therebetween in adjacent paths the fingers of another set, and means for operating said fingers.

11. A deinking machine including a mixer shell having an inlet thereto and an outlet therefrom both at the top thereof, a mixer movably mounted on a horizontal axis in said shell and comprising a plurality of shafts with a set of blades extending longitudinally of said shell and supported by each of said shafts, said blades being positioned to travel in adjacent paths, a second shell having an inlet opening communicating with the outlet of the other shell and also having an outlet opening, a mixer located in the second shell and comprising a plurality of shafts each having a set of fingers projecting therefrom, said fingers being spaced to permit passage therebetween of the fingers of another set, and means for operating said shafts and including an operating means common to a shaft in each of said shells.

12. A deinking machine including a mixer shell having an inlet thereto and an outlet therefrom, a second shell having an inlet communicating with the outlet of the other shell and also having an outlet, a shaft extending through both of said shells, a mixer frame secured to said shaft in each of said shells, one of said frames comprising longitudinally extending blades and the other comprising a set of radially extending fingers, a second mixer frame located in the first shell and comprising mixing members positioned to travel in proximity to the members of the other frame in said shell, a second mixer frame in the second shell and including a number of mixing members positioned to travel in proximity to the mixing members of the other frame in said shell, means for operating said shaft for simultaneous operation of one set of mixing members in each shell, and means for operating the other set of mixing members in each shell.

13. A deinking machine including a mixer shell having an inlet thereto and an outlet therefrom, a second shell having an inlet communicating with the outlet of the first mentioned shell, a shaft projecting through both of said shells, a mixer frame secured to said shaft in the first mentioned shell and comprising blades extending longitudinally in said shell, a set of mixing members in the second shell projecting radially from said shaft and spaced apart, a set of mixing members rotatably mounted on said shaft in the first mentioned shell and including blades extending longitudinally and positioned to travel in proximity to the other blades in said shell, a set of mixing members rotatably mounted on said shaft in the second shell and comprising radially extending fingers positioned to pass between the fingers of the other set in said shell, means for rotating said shaft, and means for independently rotating the frames mounted on said shafts in each shell.

14. A deinking machine including a mixer shell having an inlet thereto and an outlet therefrom, a second shell having an inlet communicating with the outlet of the other shell, a shaft projecting through both of said shells, a mixer including a set of mixing members in each shell secured to said shaft, a second set of mixing members in each of said shells mounted on said shaft, means for rotating said shaft, and means for simultaneously and independently operating the second set of mixing members in each shell.

15. A deinking machine including a plurality of mixer shells having communicating passages at the tops thereof for flow of material from one to the other, a mixer operatively mounted in one of said shells and including a plurality of sets of blades rotating on a horizontal axis and extending longitudinally in the shell and positioned to pass each other in adjacent paths, a mixer operatively mounted in the other shell and comprising a plurality of sets of fingers, the fingers in each set being spaced to receive the fingers of the other set for passage therebe-

tween, and means for operating the mixers in each shell.

16. A deinking machine including a rinsing and cleansing shell, a worm extending lengthwise in the rinsing and cleansing shell to pass material therethrough, means for operating said worm by imparting rotation thereto, a strainer surrounding said worm and through which said material is passed, and means for introducing a washing liquid to said shell.

17. A deinking machine including a rinsing and cleansing shell having an outlet therefrom and an inlet thereto at the end thereof, a plurality of sumps arranged lengthwise of said shell and having outlets therefrom, a strainer extending lengthwise within said shell, a worm located within said strainer, means for operating said worm by imparting rotation thereto, and means for introducing a washing liquid to said shell.

18. A deinking machine including a rinsing and cleansing shell having an outlet therefrom and an inlet thereto at the end thereof, a strainer of cylindrical form extending lengthwise in said shell, a hollow perforated shaft rotatably mounted in the shell, a liquid inlet pipe connected with said shaft for supply of liquid thereto, a worm secured to said shaft, and means for rotating said worm.

19. A deinking machine including a rinsing and cleansing shell having an outlet therefrom and an inlet thereto at the end thereof, a strainer of cylindrical form extending lengthwise within said shell and rotatably mounted therein, means for rotating said strainer, a worm extending lengthwise within said shell, means for rotating said worm, to effect relative movement between it and said strainer, and means for supplying a washing liquid to said shell.

20. A deinking machine including mixer shells, a shaft projecting into said shells, mixers secured to said shaft in each of the shells, means located between the shells for rotating said shaft, a set of mixers rotatably mounted on said shaft in one of said shells, and means outside of said shell for rotating the last mentioned mixers.

21. A deinking machine including a plurality of mixer shells, a shaft extending into said shells, mixers secured to said shaft in both of said shells, means located outside one of said shells for rotating said shaft, a set of mixers rotatably mounted on said shaft in each shell, and means located between said shells for rotating both of said loosely mounted mixers.

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