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WOOD PULP SCREEN PLATE

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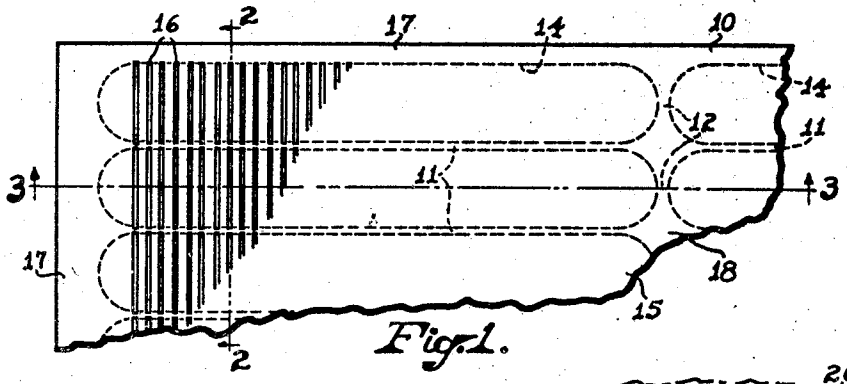

Fig. 1.

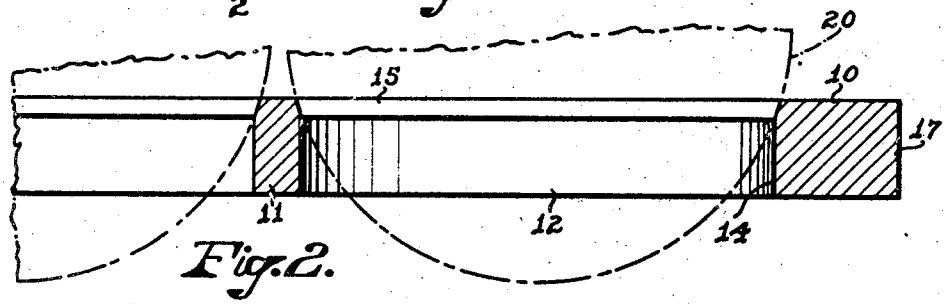

Fig. 2.

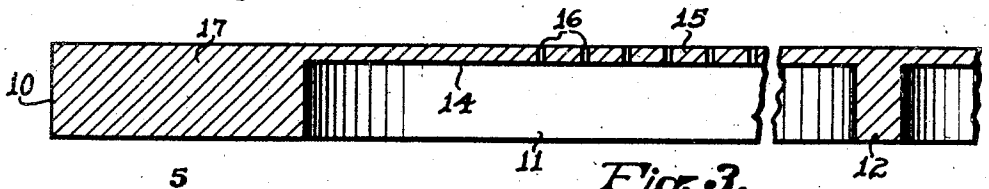

Fig. 3.

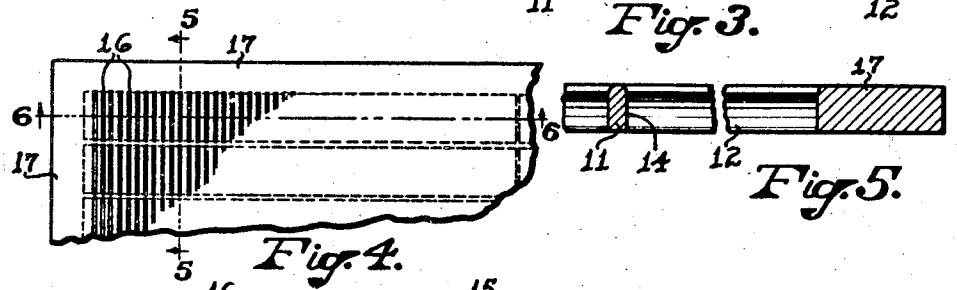

Fig. 4.

Fig. 5.

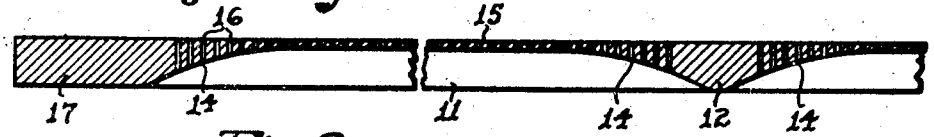

Fig. 6.

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WOOD PULP SCREEN PLATE

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1 Claim. (Cl. 92—30)

1

This invention relates to a wood pulp screen plate and more particularly to a screen plate employed for sizing wood pulp fibers required in the manufacture of paper.

The wood pulp screen plate of standard commercial usage is shaped as a thin metal plate strengthened by transverse and longitudinal ribs on its under side. The screen is formed from a thick plate by milling out slots to make the ribs, and then slits are sawed through the thin portions of the plate into the milled slots, each slit being parallel with and located between the adjacent transverse ribs. The slots may be arranged 4 to 8 to the inch; hence the ribs between the slots are necessarily closely spaced and the spaces therebetween are deep and narrow. These spaces which communicate with the sawed slits tend to become plugged with wood pulp under the hammering action of the water caused, where flat plates are used, by a vibrating rubber diaphragm located beneath the screen plate which forces the water periodically upwardly through the slits. The pulp fibers tend to pack in the corners and angular spaces between the ribs and thus defeat the purpose of the vibrating diaphragm and prevent free operation of the screen plate. Hence these ribs are objectionable. But they have heretofore been deemed necessary to strengthen the plate against the rapid or violent vibration of the screen plate frame which is required to cause the pulp fibers to align themselves with the slits and pass therethrough. Another problem lies in the fact that the plate must be so constructed that the bridges of metal between the slits shall not vibrate vertically or horizontally, since this would tend to open and close the slits and thus alternately pass over-size fibers and cause the slits to become plugged with the fibers.

The primary object of this invention is to overcome the above disadvantages and provide a wood pulp screen plate having the under surface portion of the plate free from closely spaced ribs and yet which has transverse and/or longitudinal ribs so arranged as to prevent improper vibration of the screen plate bridges between the slits. Further objects will be apparent in the following disclosure.

Referring to the drawings illustrated in the preferred embodiment of this invention:

Fig. 1 is a fragmentary top plan view of one form of screen plate;

Fig. 2 is a section on the line 2—2 of Fig. 1;

Fig. 3 is a section on the line 3—3 of Fig. 1;

2

Fig. 4 is a fragmentary top plan view of a modified form;

Fig. 5 is a section on the line 5—5 of Fig. 4; and

Fig. 6 is a section on the line 6—6 of Fig. 4.

In accordance with this invention, I have provided a screen plate made of suitable material having widely spaced transverse and longitudinal ribs on its under side which form extensive, elongated, open channels, and wherein a multiplicity of pulp screening slits are cut through the plate between the ribs in these channel portions. The slits are arranged crosswise of the channels and preferably perpendicular to the longitudinal ribs forming the sides of the channels. The slits and channels may be so arranged that the slits extend either crossways of the plate or lengthwise thereof, so that the slits will be either parallel to or transverse relative to the flow of water and pulp over the screen plate.

As shown in Figs. 1 to 3 of the drawings, the plate 10 is provided with a set of longitudinal ribs 11 and transverse ribs 12 arranged to form extensive or long channels 14 adjacent to a thin top wall 15. The screen is formed by cutting a series of parallel slits 16 through the thin wall 15 of the plate. The slits are arranged transversely relative to the parallel ribs 11 and preferably at right angles to these ribs. That is, if the ribs 11 and the channels 14 therebetween extend lengthwise of the plate 10, then the slits are transverse relative thereto, and if the ribs 11 and the channels extend crosswise of the plate, then the slits will be lengthwise.

The number, spacing and sizes of the ribs 11 and 12 depend upon the strength requirements of the plate. A satisfactory plate which is 43" long and about 12" wide may be made with 4 sets of lengthwise channel ribs 11 and two cross ribs 12, together with marginal flanges 17 around the plate which may be about ½" wide, more or less. Each of the lengthwise ribs 11 may be ⅜" wide and the ends of the channels may be spaced from each other by about ⅜". The total thickness of the plate may be about ⅜" and the effective screen portion 15 may be approximately $\frac{1}{16}$" thick; hence the ribs are about $\frac{5}{16}$" high. These dimensions may be widely varied, however.

The screen plate may be made from a metal plate, such as bronze, of uniform thickness by first machining out the channels 14 and thereafter cutting the slits. The channels are machine finished to provide smooth surfaces and edges by means of a planer or shaper or by end or plain milling cutters. In the form illustrated

in Figs. 1 to 3, an end milling cutter has been employed; and this has formed channels 14 which are round at their ends and thus leave somewhat diamond shaped portions 18 between the ends of the five adjacent channels. These rib portions 18 are so extensive as to form rigid parts of high strength which will resist vibration of the plate. The slits are preferably cut through the thin portion 15 by means of a gang of parallel rotary saws 20, which are of such size that the ends of the cuts are nearly vertical and so do not form shoulders capable of catching the fibers and clogging the plate.

In the form shown in Figs. 4, 5 and 6, the channels 14 have been formed by plain milling cutters, which operate to produce a concave curved end in the channel, this curve having the radius of the cutter used as shown in Fig. 6. That is, the cross ribs 12 curve from a wide top to a narrow edge at the bottom, and they do not have the diamond shaped portions of Fig. 1. The tapered ribs 12 provide the necessary rigidity and strength. The slits 16 may be cut through the thicker rib portions at the ends of the channels, if desired.

It will be appreciated that the screen plate may be made arcuate in shape to form a segment of a cylindrical surface, so that a plurality of the plates, such as 9 to 13 plates, may be mounted on a cylindrical screen supporting drum which is to be revolved in a vat carrying the paper stock. For such use, I may make a flat plate as above described and thereafter shape it by a rolling operation. The plates may be short sections or they may each extend the length of the drum, which may be as much as 100 inches long. The channels may run either lengthwise or transversely of the plate.

These screen plates, in accordance with my invention, comprise essentially a set of parallel strengthening ribs integral with the plate which form a plurality of parallel channels and a screen plate wall portion 15 of substantially uniform thickness between and bordered by each pair of the parallel channel ribs. The portion 15 has preferably smooth top and bottom faces arranged in parallel planes. A plurality of slits extend transversely of these channels through the wall 15, and these slits are separated by bridges of substantially rectangular cross section which extend from one rib to the adjacent parallel rib and so are supported and strengthened by the channel forming ribs. That is, the effective screen plate portion 15 is free from depending ribs and each slit has substantially vertical, smooth and non-angular, parallel walls. The slits are not individually separated by ribs, running parallel therewith, nor are there wide slots between closely spaced ribs communicating with narrow slits through the top of the plate, which can become choked with pulp fibers. Since the plate 15 is of uniform thickness and the slit walls are parallel, the bridge between adjacent slits is rectangular in cross section, and its width will depend on the number of slits per inch and the width of the slit. The latter is usually between 0.006" and 0.085". If the bridges run crosswise of the plate, the vibration waves tend to run lengthwise of these narrow metal strips and do not open and close the slits to a material extent. If a fatigue resistant metal is used, the plate will thus give a long life of useful service. Such a fatigue resistant metal is an alloy of copper containing from 1 to 2.75% by weight of beryllium which has been properly heat treated.

The channels 14 may be of desired lengths, depending on the strength characteristics of the plate substance and the need for cross ribs 12. The width of the channel may also be varied widely within the requirements of this invention. The channel width should, however, be narrow enough so that the bridges between the slits will not vibrate materially or break under the vibration stresses. One preferred type of plate may be made of a bronze having approximately 86% by weight of copper, 7% of tin, 5% of zinc and 2% of lead. The average ultimate tensile strength of this bronze is approximately 30,000 pounds per square inch. For such material made into a plate approximately 12 inches wide and 43 inches long and having a total thickness at the margin of ⅜ inch and an effective screen plate thickness (part 15) of 1/16 inch, I prefer to have a set of from 3 to 6 parallel channels, if they run lengthwise of the plate, and thus provide a slit length of from about 1¼ to 3 inches, depending on the rib and margin widths. The slits are preferably several times longer than the average length of pulp fiber to be passed therethrough. Since there are no ribs between and parallel with the slits, it is feasible to utilize the entire plate area effectively and thus provide a total slit length, i. e. the sum of the lengths of all the slits, which is materially greater than is obtainable with the standard commercial plates having the same number of slits per inch of plate but wherein the slits are individually separated by ribs on the plate bottom. The slits are usually cut of such widths and spacings as to provide from 4 to 8 slits per inch.

Some of the advantages of the screen plate have been set forth above. Other advantages, as well as the use and operation of the screen plate, will be readily apparent to those skilled in the art. It will also be understood that various modifications may be made in the construction and the arrangement of the parts; hence the above disclosure is to be interpreted as describing the principles of the invention and the preferred embodiments thereof and not as imposing limitations on the appended claim.

I claim:

A wood pulp screen plate comprising a one piece, long and narrow body, having its effective screening plate portions of thin metal of substantially uniform thickness, marginal flanges, long parallel spaced channel ribs, and at least one intermediate cross rib between the marginal flanges on the underside of the plate and which are integral with the plate portions and several times the thickness thereof and strengthen and support the same, said flanges and ribs providing long, narrow, parallel, downwardly opening channels on the under side of the plate which are not over 3 inches wide, each of the screening plate portions in the channels having a multiplicity of parallel, transverse pulp screening slits therethrough which extend lengthwise substantially perpendicular to the long channel ribs and substantially the entire distance therebetween, said slits being separated by bridges formed of said plate portions which are located close to the channel ribs and are reinforced thereby, the bridges being substantially rectangular in cross section and having vertical, non-angular, smooth walls extending substantially the entire thickness of the plate portions within the channels and thus forming slits of substantially uniform depth and width, all of each screening portion within each channel being smooth on the under side and devoid of ribs

and grooves between and parallel with the bridges so that the channel is wholly open beneath the transverse slits and the passage of pulp is unobstructed except by the slit walls, and said flanges, ribs and plate portions forming a continuous but slitted top plate surface that is smooth and unobstructed.

SAMUEL T. ORTON, JR.

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