SCREEN PLATE FOR PAPER MAKING MACHINES

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The invention relates to screen plates of the type employed in paper making machines for screening the wet pulp during the course of its manufacture into paper sheets. These screen plates are formed of various sizes and materials, the most common size being about 42" long, 12" wide and 3/4" thick, and the materials of which they are made generally being copper, brass or bronze.

In structure, the plates are formed with successive sets or groups of parallel screen slots which, at the top or face side of the plates, are made very narrow in order to screen out all fibres and particles that exceed a certain desired size. These slots are usually provided by first cutting a group of relatively wide parallel grooves in the bottom side of the plate to a depth such that the remaining unremoved metal is of the approximate thickness of 3/4", and thereafter cutting the narrow face slots in communication with these grooves. Such formation of the slots, that is, the narrow portion at the face of the plate opening into the wide portion at the bottom, is intended to facilitate clearance of the slots of the particles of paper pulp which are carried therethrough in the screening operation. In service these screen plates corrode, and in consequence the slots, particularly the upper narrow portions thereof, become widened and their edges become rough. When this happens, oversized particles and fibres pass through the screen. Also particles of the pulp catch on the rough edges and tend to clog the openings and thereby substantially reduce the screening efficiency of the plate. Because of this, the plates must be mechanically cleaned either continuously or at frequent intervals, and the cleaning process tends to damage the plates and further enlarge the slot openings. For such reasons it has been found desirable to coat these screen plates with chromium.

Chromium plating provides a hard corrosion resistant coating. Through its use the wear and the roughening of the slot edges is much reduced with the resultant maintenance of high screening capacity and desired slot dimension. Moreover, chromium plated screens require much less cleaning, and the abrasive effects of the cleaning are more successfully resisted by the chromium than by the underlying cuprous alloy. It has however been found that because of the known low throwing power of chromium, the chromium deposit on the inside faces of the slots at the upper narrow portions thereof, is extremely thin.

In some uses of the plates, this extremely thin deposit has been found sufficient to withstand corrosion; in many cases however, its resistance is not sufficient and the screen plate corrodes inside the slots with the consequent undermining and collapse of the chromium plated edges.

Many expedients have been tried in an attempt to overcome this difficulty by increasing the amount of chromium deposited within the slots. For example, attempts have been made, by regulating the location of the anodes respective to the face and back of the plate during plating, to deposit a greater thickness of chromium on the back of the plate and inside the slot, without at the same time depositing too much metal upon the face of the plate. Another expedient has been to reduce the thickness of the screen plate to 3/4", with the intention of reducing the amount of metal, which would intercept some of the current, between the slots and the anode. Neither of these expedients nor others that have been tried have been satisfactory, either because they do not attain the desired end or because they weaken the plate too much in approximating it.

With the foregoing in mind, it has been the object of the present invention to provide an improved chromium plated screen plate in which the objectionable features of those now in use will be eliminated, and which consequently will be more durable and have greater screening capacity. Such object is attained by the improved screen plate hereinafter described and claimed, and as illustrated in the accompanying drawings in which—

Fig. 1 is a top plan view of a screen plate embodying my invention.

Fig. 2 is a bottom view of the same.

Fig. 3 is a cross section, on an enlarged scale, through line 3-3 of Fig. 1.

Fig. 4 is a longitudinal section, on an enlarged scale, through line 4-4 of Fig. 1.

Fig. 5 is a cross section similar to Fig. 3, showing a modified form of construction.

Fig. 6 is a bottom view, showing a modified form of construction.

Fig. 7 is a longitudinal section, on an enlarged scale, through line 7-7 of Fig. 6.

Fig. 8 is a cross section, similar to Fig. 3 showing a further modified form of construction.

Fig. 9 is a cross section, similar to Fig. 3, taken through a conventional form of screen plate, for the purpose of showing the difference between it and my improved plate.
Like reference characters indicate like parts in the several figures of the drawings.

5 In the drawings, I indicates the screen plate having a series of successively arranged groups of juxtaposed parallel slots 2 opening from its top or face side downwardly through the bottom thereof. This plate, in use, is mounted in a so-called "screen" or "screen box", the bottom of a flexible diaphragm having a vibratory movement which is effective to suck the watery pulp downwardly through the slots 2. This sucking action draws the fibres that are smaller than the slots, and that hence are of the desired dimensions, downwardly through said slots, the overlying particles and dirt being screened out; and it is of the utmost importance that these fibres should drop or pass freely through the slots in order to maintain full screening efficiency. Free clearance of the slots will be substantially maintained provided the inner face of the plate is smooth, but in the event of their becoming roughened through corrosion or otherwise, as heretofore referred to, the fibres will catch on the rough surface and hang therefrom, forming "strings", which soon results in a clogging of the slots and a consequent impairment of the screening efficiency of the plate.

I have discovered, as the result of long experimentation, that by modifying the design of the usual screen plate, I am enabled to deposit chromium upon the inside faces of the screen slots to a markedly greater extent than heretofore, and to withstand corrosion for a practically unlimited period of time.

In the usual type of screen plate, as shown in Fig. 9, a series of successively arranged groups of parallel grooves 3' are cut in the underside of the plate 1'; these grooves usually being from 2" to 8" long, depending on the style or use of the plate, and of a depth about five-sixths of the thickness of the plate. Communicating with these grooves are the narrower screen slots 2' opening through the top or face side of the screen plate. In chromium plating screen plates of this construction, it has been found practically impossible, as heretofore indicated, to obtain a thick deposit of chromium on the inside faces of the screen slots. This has been due in large part to the deep and narrow grooves at the bottom of the plate, which constitute the lower part of the screen slots. In order to effect a deposit of chromium on the walls of these, and particularly on the walls of the narrower communicating face slots 2', it has been necessary to force the plating by the use of high electrical current. This plating current, in accordance with the known laws of electro-plating, has a tendency to deposit the metal primarily at the exposed faces and edges most accessible to its path, and also to deposit the metal in the areas within the slots at a very restricted rate. In addition, it has resulted in the production of gases which substantially filled up the deep narrow grooves between the ribs 4' and prevented such circulation of the plating solution through the slots as was necessary to effect a good chromium deposit.

In accordance with my invention, as illustrated in Figs. 1 to 4, I remove half the depth or more of at least every alternate rib 4 between the grooves 3' at the underside of the screen plate, whereby comparatively wide open grooves are left between the remaining ribs 4, into each of which open two of the narrow screen slots 2. The partially removed ribs form reinforcing ridges 5 interposed between the remaining ribs. With this construction of screen plate I have found that it becomes unnecessary to force the plating as heretofore, with the attendant objections, as the wide grooves formed by the elimination of certain of the ribs, each with a plurality of communicating screen slots, provides a sufficiently free circulation of the plating solution through the slots such as permits of the passage into and through them for the plating current, as to effect a good chromium deposit on the inside walls thereof.

With the old construction of screen plate, the plating operation required at least 2½ hours with the use of high current, in order to obtain even a thin, and usually incomplete, chromium deposit on the inside faces of the screen slots. With the improved plate of my invention, I am enabled to obtain the same deposit within the slots in a very few minutes, and a strong "healthy" deposit in about one hour and forty-five minutes. Also, in the plating of the old style of screen plate, the use of a high current in forcing the plating of the inside faces of the screen slots, resulted in a very brittle plating on the face of the screen plate, which was liable to crack and break off under the constant vibration to which the screen plate is subjected in use. When such cracking and breaking off occurs, corrosion sets in and undermines the adjacent chromium plate with resultant further breaking off of the same. All of these objectionable features incident to forced plating with the use of excessively high electrical current, are obviated by means of my improved construction, which assures a substantially uniform deposit of chromium on the entire surface of the screen plate, that is, on the inside faces of the slots as well as on the outer face of the plate, with the use of substantially less current and in substantially less time than heretofore.

While I have described my invention as comprising a screen plate in which alternate ribs are partly removed for the purpose of obtaining relatively wide grooves at the underside of the plate with at least two screen slot openings therein, it will be understood that the invention may be embodied in other forms of construction. Thus, in some styles of plates which are not subjected to heavy loads, the eliminated ribs may be wholly cut away, as shown in Fig. 5, or several adjacent ribs may be cut away, as shown in Fig. 8. The structures shown in Figs. 5 and 8 are advantageously employed with staggered grooves, as shown in Figs. 2 and 4, since this staggering assists in strengthening the plate. When this construction is employed, the grooves in adjacent sets are positioned in a general end-to-end relation while the individual grooves in one set are out of alignment with and staggered with respect to the opposed grooves in adjacent sets. It will be observed that each of these several constructions embody the essential feature of the invention, that is, the comparatively wide grooves at the undersides of the plate having most of the narrow screen slots opening into each of the same, whereby the free entry and circulation of the plating solution and of the current into and through the slots is obtained.

Due to the improved plating upon the inside of the screen slots, the screen plate is less liable to crack and break off than heretofore.
faces of the screen slots resulting from my invention and the consequent longer life of the screen plates thus obtained, I have found it possible to further diminish the thickness of the uncut portion of the screen plate at the top of the grooves. As hereinbefore described, this in the conventional plate is of the order of \( \frac{1}{4}\). Through the use of my invention I have been enabled to reduce this thickness to a considerably smaller figure, as will be apparent by a comparison of Fig. 8 with Fig. 9. This diminished depth of slot results in an increased screening capacity without loss of accuracy in screen slot size.

In the usual type of screen plate, the successive groups of juxtaposed grooves at the underside of the plate are separated by intervening end walls extending the full depth of the plate, as indicated at 18, Figs. 2 and 4. I have found however, that better plating of the inside faces of the slots is obtained by reason of a more ready entry and circulation of the plating solution and current through the slots, if the grooves are made continuous by a meeting of their adjacent ends at a point within the plate above its lower surface, as shown in Figs. 6 and 7. However, when the plates are to be used for heavy loads, increased strength and stiffness may be obtained by keeping the intervening end walls between the successive groups the full depth of the plate, as in Fig. 4, and forming the ribs 8 of each group in staggered relation to those of the adjacent groups, as shown in Figs. 2 and 4.

It will be understood from the foregoing that by reason of my improved construction of screen plate, I can obtain a thick, uniform, and resistant chromium deposit on the entire surface of the plate, including the inside faces of the screen slots, and do this with less current and in a shorter period of time than heretofore done with the old type of plate. I thus obtain a cheaper, more durable, and consequently more useful chromium plated screen plate than heretofore produced.

What I claim is:

1. A screen plate for paper manufacture comprising a plate having successively arranged sets of parallel grooves with intervening ribs at its underside, and successively arranged sets of parallel slots in its upper or face side, at least two of which slots open into each of the said grooves, the said sets of grooves meeting at their adjacent ends at a point above the lower surface of the plate, said plate being coated with chromium.

2. A screen plate for paper manufacture, comprising a plate having successively arranged sets of juxtaposed parallel grooves with intervening ribs at its underside, and correspondingly arranged sets of juxtaposed parallel slots in its upper or face side, the slots running parallel with said grooves and at least two of said slots opening into each of the said grooves the slots and grooves in adjacent sets being positioned in a general end-to-end relation and, the individual grooves in one set being out of alignment with and staggered with respect to the opposed grooves in the adjacent sets, said plate being coated with chromium.

3. The screen plate of claim 4 wherein the depending distance of said reinforcing ridges is less than half that of said ribs.

4. A chromium plated screen plate for paper manufacture comprising a plate having an upper or face side and a lower or discharge side, successively arranged sets of juxtaposed parallel slots in its upper side and successively arranged sets of juxtaposed parallel grooves in its lower side, at least two of which slots open into each of said grooves, low reinforcing ridges between the slot openings in each groove, depending to a substantially lesser extent than the ribs forming the walls of the grooves, said grooves meeting at their adjacent ends at a point above the lower surface of the plate.

5. The screen plate of claim 4 wherein the individual grooves of each set run parallel to said slots and are staggered with respect to the opposed, parallel grooves in adjacent sets.

6. A chromium plated screen plate for paper manufacture comprising a plate having an upper or face side and a lower or discharge side, successively arranged sets of juxtaposed parallel slots in its upper side, the slots in each set being aligned with the slots of adjacent sets, correspondingly arranged sets of juxtaposed parallel grooves in its lower side, said grooves being parallel to and communicating with said slots, the individual grooves in each set being out of alignment with and being staggered with respect to the opposed grooves of the adjacent sets.

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