April 12, 1938. R. E. CLEVELAND 2,114,072

PRESS ROLL FOR PAPER MAKING MACHINES AND THE METHOD OF MAKING SAME

Filed May 7, 1935

Fig. 1.

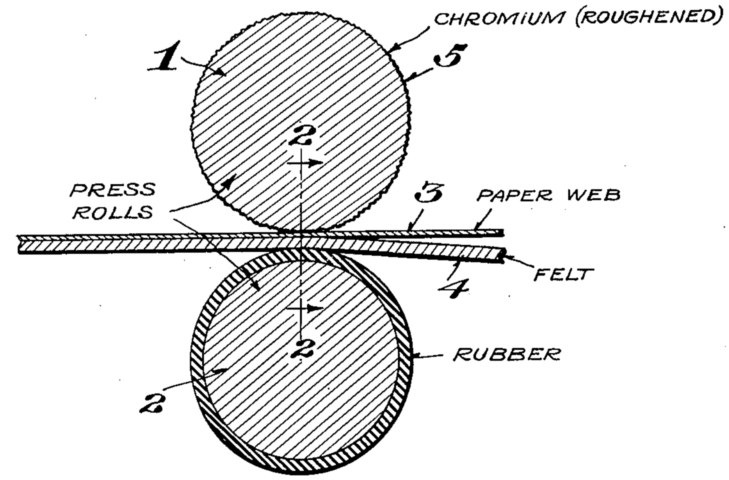


Fig. 2.

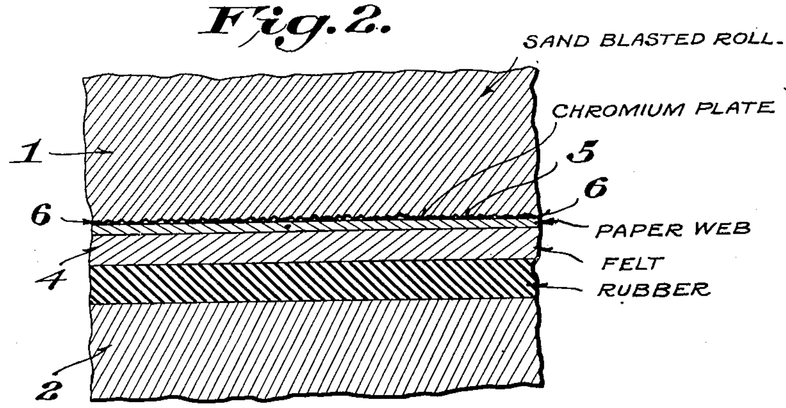
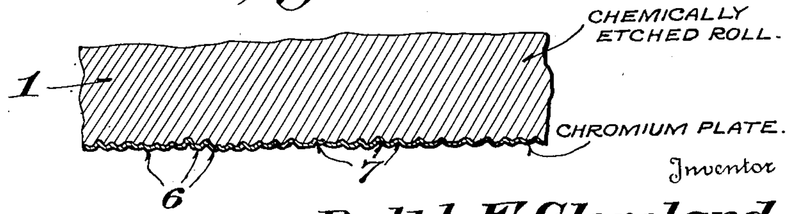


Fig. 3.



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PRESS ROLL FOR PAPER MAKING MACHINES AND THE METHOD OF MAKING SAME

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3 Claims. (Cl. 92—49)

The invention relates to certain improvements in press rolls for paper making machines and in the method of making same, and has more particular reference to the upper rolls of multiple sets or pairs of rolls employed for squeezing water from the wet pulp during the manufacture of the paper; the object of the invention being the provision of such a roll that will insure a better product, materially reduce wastage or "broke", and that will outlast rolls heretofore employed for this purpose without material impairment. To these ends, the invention comprises the novel construction of press roll and method of making same as hereinafter set forth in detail and more particularly pointed out in the appended claims.

In a paper-making machine, after the paper is formed on the Fourdrinier part, it is led through the press part, and then through the dryers. The function of the Fourdrinier part of the machine is to form the web; the rest of the machine removes the water from the wet paper. When a sheet of paper leaves the Fourdrinier part, it contains about 85% water; the press part reduces the water content to about 65 or 70%, and the dryers reduce the water to about 7%.

In the press part of the machine, the sheet of wet paper is carried on felts between the press rolls. These rolls are arranged in vertical pairs, and two, three or more pairs are used. The lower roll of each pair is usually rubber-covered, while the upper rolls have been made of maple, cast iron, brass-jacketed cast iron, or granite. Weights, operating through a system of levers, pull the upper press roll down on the sheet of paper, in order to squeeze out the water.

To obtain good paper, it is necessary that the upper press roll be straight along its lower edge, that it be hard, that it be smooth, and that it does not pick up paper. It must be straight in order to squeeze the water out evenly; it must be hard to reduce wear and keep its original contour; it must be smooth and free of scratches, to avoid marking the paper, and it must pick up no paper fibres, in order to prevent spoiling the sheet running under it. No roll hitherto used fills all these requirements perfectly. It has been found that, of all the materials referred to above, granite is the most efficient. Metal rolls corrode, maple rolls wear too rapidly. Moreover, and of the greatest importance in the functioning of a press roll of the kind in question, granite rolls have been found to tend to pick up the paper to a much less extent than metal rolls. Careful investigation has shown that this effect is due to the porosity of the surface. This porosity, which traps air between the roll and the paper, prevents the latter from sticking, as it does to a perfectly smooth metal surface. The pores break up the capillary action between the surfaces.

Although granite rolls thus have a better surface for functioning as press rolls in paper making machines than any other material hitherto used, their use is not as trouble-free and inexpensive as could be desired. For one thing, granite rolls are very expensive. Formed as they are from a natural material, they tend to be non-uniform in texture. Often it occurs that a roll, when finished, develops or discloses cracks, which make it useless. Satisfactory granite rolls of course bear the cost of the work performed on unsatisfactory ones. Moreover, these rolls are, compared to metal rolls, very fragile, and must be handled with great care. When worn out they have practically no scrap or salvage value. Due to the low compressive, tensile and bending strength of granite, and the non-uniformity due to its origin, rolls made of this material must be made very massive, and hence heavy, in order to be strong. The weight of the roll, therefore, is very great, and depends upon its length, rather than upon consideration of the operating requirements.

Metal rolls can be made hollow or solid, as required, in order to obtain the desired weight, and this weight is independent of the dimensions of the roll. Such rolls can be made to any desired size, and can easily be made uniform. They have some scrap value, and originally cost less than half as much as a granite roll of the same dimensions. In spite therefore, of their surface short-comings, they have had some use.

I have now discovered that the mechanical advantages of a metal roll can be combined with the surface advantages of a granite roll, by means of a simple and inexpensive process. I find that, if a metal roll is produced with a roughened or indented surface, and thereafter is chromium plated, a porous permanent surface of the desired character is obtained. Such a surface may be obtained in a number of ways, for example, the surface of the roll may be sand blasted, or it may be etched by suitable chemicals.

These methods obviously produce a random distribution of the indentions resulting therefrom.

Any desired degree of porosity may be obtained by variation in the etching or sand blasting process, or by the choice of basis metal, or both. As a basis metal I may use cast iron, bronze, steel, or other metal suitable from the point of view of strength, hardness, price, and so on. If chemical etching is the roughening process to be used, I can do this with any of the known etching materials, and, by the choice of the one most suitable to the basis metal and the result desired, by regulation of its concentration and of its temperature, and by permitting the etching to proceed for a longer or shorter time, I can control the type of pitting quite accurately. If sandblasting is the process to be employed, I can likewise regulate the type of pitting by a suitable choice of abrasive material, size of abrasive particle, air pressure, distance between gun nozzle and object, time of action, and other factors. I find it usually advisable to grind the roll after sand blasting or etching, in order to remove wire edges and loose particles. I then plate this surface with chromium to a thickness between .001'' and .010'', although thicker deposits are quite usable.

My invention can be explained more specifically by reference to the accompanying drawing which shows, more or less diagrammatically, several press rolls having roughened surfaces (greatly exaggerated) with the purview of the present invention. In this showing:

Fig. 1 is a vertical cross section through a pair of press rolls, the upper roll being provided with a porous surface which is chromium plated;

Fig. 2 is an enlarged sectional view along the line **2—2** of Fig. 1, showing a roll which has been sand blasted prior to being chromium plated, while

Fig. 3 shows a modification wherein an upper press roll has been chemically etched prior to being chromium plated.

In the several figures like parts are designated by like reference numerals. The upper and lower press rolls are shown at **1** and **2**, respectively. The paper web **3** is carried between the rolls by means of the felt **4**. The pits produced by sand blasting are shown at **5** in Fig. 2, while **6** represents the layer of chromium plating. In Fig. 3 the pores or pits produced by chemical etching are shown at **7**, these pores having a shape somewhat different from that of the pits **5** of Fig. 2. These pores or pits serve to trap air during the pressing operation, this air preventing the wet paper from being pressed into the pits.

As a particular example of my invention, I shall describe the novel steps in the manufacture of a press roll with the use of a sand blast. This roll was made of steel, and was ground to size. I sand blasted it, using as abrasive ground chilled iron, adjusting the conditions so as to cause the surface to be uniformly covered with pits or indentions running from .005'' to .040'' in diameter, and of about half that depth. I then polished the roll enough to smooth the sharp edges raised by the sand blasting. The roll was then plated in the conventional chromic acid chromium plating bath, until a layer of chromium .005'' thick was deposited. Thereafter, the roll was again polished to bring up its luster.

It will be understood that the above description is merely illustrative, and that my invention is not to be limited to the specific materials, methods or dimensions therein given.

What I claim is:

1. A press roll for paper making machines, comprising a metal cylinder having a sand-blasted, chromium-plated and polished surface containing indentions in random distribution therein, said indentions ranging in diameter from about 0.005 to 0.04 inch and in depth from about 0.002 to 0.02 inch, the chromium plating having a thickness ranging from about 0.001 to 0.01 inch.

2. In the manufacture of press rolls, the process which comprises blasting the surface of a metal roll with projected abrasive particles of sufficient size and velocity to produce indentions in said surface having a depth ranging from about 0.002 to 0.02 inch and a diameter ranging from about 0.005 to 0.04 inch, grinding the blasted surface to remove sharp edges, electroplating said surface with a layer of chromium having a thickness ranging from about 0.001 to 0.01 inch and then polishing said surface, thereby producing a porous surface preventing the picking up of paper fibres and having pores too small to leave an imprint upon paper.

3. The process of claim 2 wherein the projected abrasive particles are of ground chilled iron.

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