Jan. 24, 1933. J. F. JOSEPH 1,895,039

SUCTION PRESS ROLL FOR PAPER MAKING MACHINERY

Filed July 30, 1932

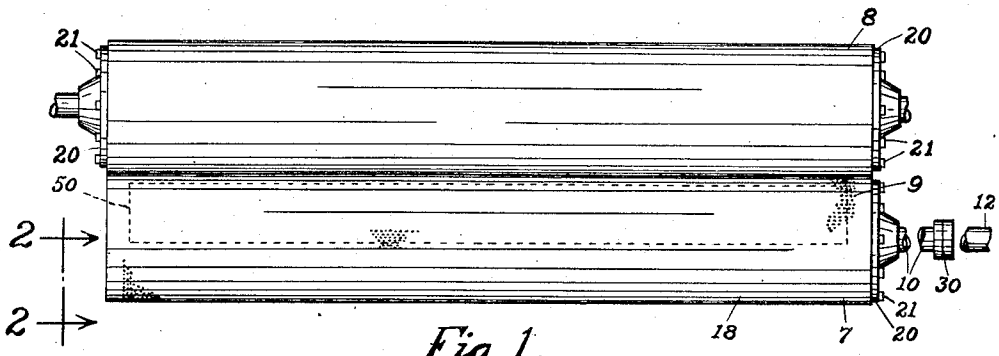


Fig. 1.

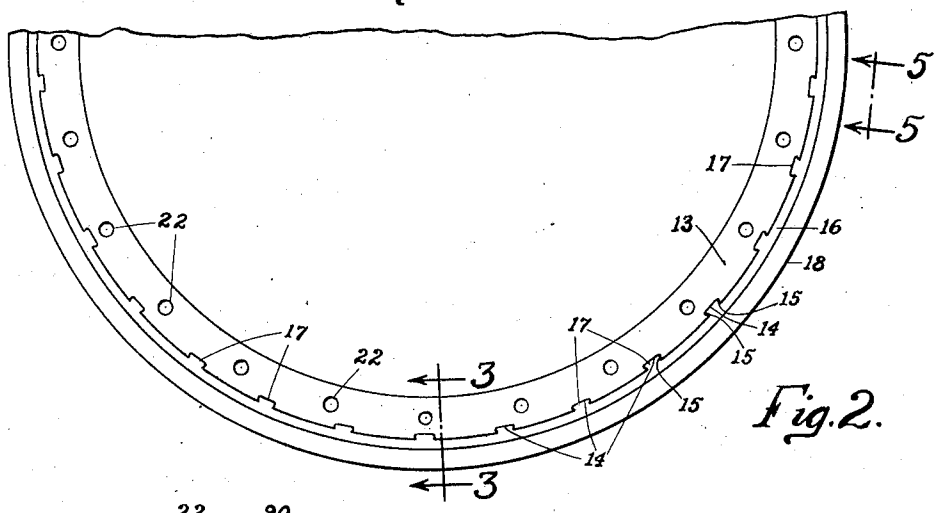


Fig. 2.

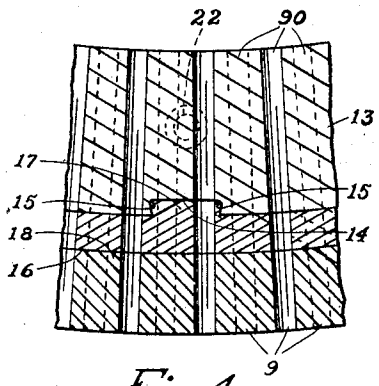


Fig. 4.

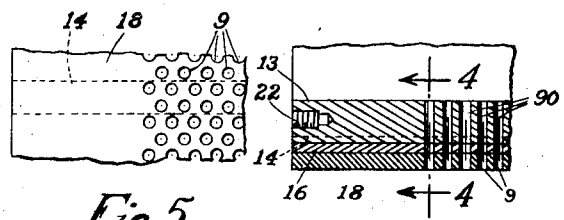


Fig. 5.

Fig. 3.

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UNITED STATES PATENT OFFICE

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SUCTION PRESS ROLL FOR PAPER MAKING MACHINERY

Application filed July 30, 1932. Serial No. 626,285.

This invention relates to an improvement in paper making machinery, and particularly to that part thereof known as the suction press roll.

An object of the invention is to provide an improved rubber covered suction press roll of maximum durability and capable of withstanding, for a long period of time, the destructive stripping action resulting from rotating the roll at high speeds while it is subjected to great laterally imposed pressures.

Another object is to increase the durability and enhance the proper performance of a cushioned suction press roll, without adding to its weight or dangerously weakening the roll structure.

These and other objects are attained by the means described herein and disclosed in the accompanying drawing, in which:

Fig. 1 is a view showing, in side elevation, the improved suction press roll in cooperative relationship with a top press roll, one head of the suction roll being removed.

Fig. 2 is an enlarged end elevational view, showing part of the suction roll, and taken on line 2—2 of Fig. 1.

Fig. 3 is a fragmental cross-sectional view taken on line 3—3 of Fig. 2.

Fig. 4 is an enlarged cross-sectional view taken on line 4—4 of Fig. 3.

Fig. 5 is a fragmental plan view taken on line 5—5 of Fig. 2.

Rubber covered or cushioned suction press rolls of the character set forth herein, are for use in conjunction with a Fourdrinier machine to operate upon paper during the process of manufacture, for removal of moisture by compression and vacuum media. These rolls are hollow and of immense proportions, many of them being two or three feet in diameter and upwards of twenty feet long, and they vary in weight from two thousand to twelve thousand pounds each. The rolls preferably have substantially their entire outer curved surface covered with rubber or a similar cushion material, which is drilled, like the body of the roll, with a great number of small radial holes 9 whereby moisture is vacuum-sucked from paper which is in contact with the roll surface during manufacture.

As is clearly shown in Fig. 1, the perforated suction press roll 7 cooperates with a top press roll 8 which in practice is mounted upon end bearings and held strongly in position against the roll 7 in parallelism therewith. Roll 8 may be of properly finished metal or other suitable material. Any suitable means, such as a hollow shaft or pipe 10, may be provided for connection of a vacuum line or pipe 12 with the hollow interior of the roll 7, by means of a suitable swivel coupling 30; however, to conserve the vacuum force there is ordinarily provided within the roll a longitudinal stationary vacuum box 50, connected with the vacuum line, which has a longitudinal open side (not shown), registering progressively with a given area of the roll interior as the roll is rotated. The provision of the stationary box, however, forms no part of this invention, and its mention is only for the purpose of clarifying the description and more fully setting forth the general character of the operation.

The paper making industry heretofore has been suffering great losses of time and money occasioned by frequent replacement of suction press rolls. These rolls are run at a surface speed of 250 to 900 feet per minute, and with the top press rolls bearing on them with great force, there is constantly present the tendency of the rubber covering to creep, just as soft asphalt creeps ahead of a heavy wheel rolling thereon. This creeping causes the rubber covering to be loosened from the metal core or roll body, and as a result the holes in the rubber covering and those in the roll body are thrown out of alignment, thereby defeating the purpose of the suction action. Further, should the cover become loosened on only a portion of the roll body, the speed and pressure would cause the covering to form a hump or humps and cause vibration, necessitating shut down of the machine. By the means of the invention, it is possible to operate the improved rolls at the very high speeds at which other parts of the machine are capable of operating.

When it is considered that each paper making machine represents an investment of hundreds of thousands of dollars, it becomes

readily apparent that any appreciable return on the investment requires that the machine be operated twenty-four hours a day, and every day, without interruption and at the greatest possible speed. The present invention constitutes an important step in the direction of properly securing said speedy and uninterrupted operation of paper machinery.

The suction press roll 7 comprises a seamless bronze shell or body portion 13 of hollow cylindrical formation, the outer curved wall of the roll being of a conservatively computed thickness because of the high cost of the special bronze or gun-metal constituting the roll. Economy, and safe speed limits determine the thickness of the shell wall, and therefore one of the problems confronting improvers of suction press rolls has been to increase the efficiency and durability thereof without adding weight and material to the roll, and to avoid dangerously weakening it in any way.

In accordance with my invention, the smooth outer curved surface of the shell is provided with a series of longitudinally extending channels or shallow grooves 14 each of which is under-cut in the nature of a dovetail mortise. In a preferred form of the invention, the longitudinal innermost corners 15 of the channels or grooves are not sharp, but are made rounded instead, with the object of leaving no sharp corners at which a crack or break may begin when the roll is placed under strain in service. The nature of the bronze or gun-metal of the shell is such that strains resulting from lateral pressure applied at high rotary speeds, may readily act upon any sharp-cornered points or lines of weakness to effect the beginning of a crack or break in the metal shell. The dovetailed longitudinal grooves provide a proper anchorage for a hard rubber base material, as will be fully explained hereinafter.

The inner or primary facing 16 of the roll is of hard rubber or equivalent material which is vulcanized upon the shell, and which, during the vulcanizing process, will shrink and firmly grip the shell. The tongues 17 are formed integrally with the facing 16 and are firmly vulcanized and seated in the grooves After application of the primary facing 16, there is applied the outer facing 18, which is of a somewhat softer grade of rubber. This outer facing is applied to and vulcanized homogenously upon the primary facing. After application of the facings, the holes 9 are drilled through the rubber facings to coincide with the holes 90 that were previously provided in the metallic shell. It is to be observed that none of the holes 90 pass through the corners 15 of the channels to provide sharp corners or a weakened condition of the channel walls, said holes being located either entirely within or entirely without the confines of the channels.

It has not been possible heretofore to secure rubber in a firm and durable manner to a bronze roll. However, by first shrinking a hard rubber onto the metal core in the manner above set forth, and then applying the softer rubber, the rubber facings are found to cling tenaciously to the roll even at very high speeds and in the presence of enormous pressures. The dove-tailed longitudinal grooves provide an especially apt anchorage for the hard rubber base material, as was stated before.

The ends of each roll 7 and 8 are provided with suitable end heads 20 which may be maintained in position by means of a series of bolts 21 the threaded inner ends of which may engage the threaded bores of the bolt holes 22.

What is claimed is:

1. A suction press roll for paper making machinery comprising a hollow cylindrical shell provided with a multiplicity of radial suction holes, said shell having a head at each end and means for associating the interior of the roll with a suction pipe, a series of shallow channels formed in the material of the shell, said channels being spaced apart in substantial parallelism to extend longitudinally of the shell, a covering of hardened elastic substance applied to the outer face of the shell and extended into the channels, and a second covering of resilient rubber superposed upon the first covering and vulcanized thereto, the suction holes of the shell being continued through both coverings.

2. A suction press roll for paper making machinery comprising a hollow cylindrical shell provided with a multiplicity of radial suction holes, means for associating the interior of the roll with a suction pipe, a series of shallow channels formed in the material of the shell, said channels being spaced apart in substantial parallelism to extend longitudinally of the shell, a covering of hardened elastic substance applied to the outer face of the shell and extended into the channels, and a second covering of resilient rubber superposed upon the first covering the suction holes of the shell being continued through both coverings.

3. A suction press roll for paper making machinery comprising a hollow cylindrical shell provided with a multiplicity of radial suction holes, means for associating the interior of the roll with a suction pipe, a series of shallow channels formed in the material of the shell, said channels being spaced apart in substantial parallelism to extend longitudinally of the shell, the channels being free of all sharp corners interiorly thereof, a covering of hardened elastic substance applied to the outer face of the shell and extended into the channels, and a second covering of resilient rubber superposed upon the

first covering the suction holes of the shell being continued through both coverings.

4. A suction press roll for paper machinery comprising a hollow cylindrical shell provided with a multiplicity of radial suction holes, said shell having end closures and means for associating the interior of the shell with a suction pipe, a series of shallow channels of dove-tail formation provided in the material of the shell, said channels being spaced apart in substantial parallelism to extend substantially the full length of the shell, the walls forming the dove-tail groove being shaped to meet in a curved fillet rather than along a sharp straight line, and a covering for the shell including tongues fitting within the grooves.

5. A suction press roll for paper machinery comprising a hollow cylindrical shell provided with a multiplicity of radial suction holes, said shell having end closures and means for associating the interior of the shell with a suction pipe, a series of shallow channels of dove-tail formation provided in the material of the shell, said channels being spaced apart in substantial parallelism to extend substantially the full length of the shell, the walls forming the dove-tail groove being shaped to meet in a curved fillet rather than along a sharp straight line, a covering of hard vulcanized rubber applied to the outer face of the shell and extended into the channels, and a second covering of softer rubber superposed upon and vulcanized to the first covering, the coverings being provided with suction holes coinciding with those of the shell.

6. A suction press roll for paper machinery comprising a hollow cylindrical shell provided with a multiplicity of radial suction holes, said shell having end closures and means for associating the interior of the shell with a suction pipe, a series of shallow channels of dove-tail formation provided in the material of the shell, said channels being spaced apart in substantial parallelism to extend substantially the full length of the shell, and a covering for the shell including tongues fitting within the grooves.

In testimony whereof, I have hereunto subscribed my name this 28 day of July, 1932.

JOHN F. JOSEPH.