Feb. 5, 1935. W. C. SMITH 1,990,102

ROLL FOR PAPER MACHINES

Filed April 2, 1934 2 Sheets-Sheet 1

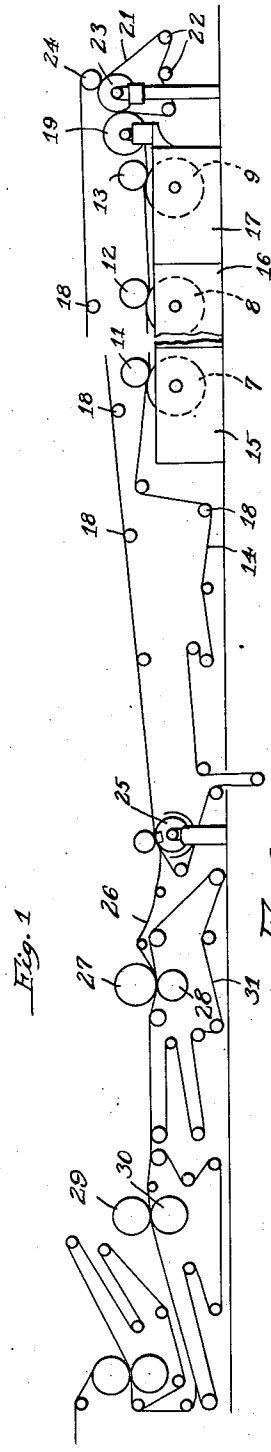


Fig. 1

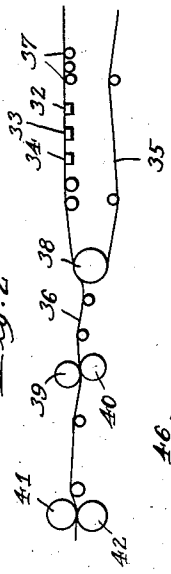


Fig. 2

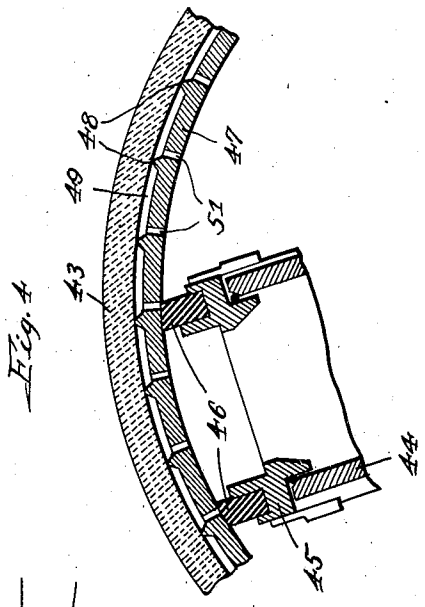


Fig. 4

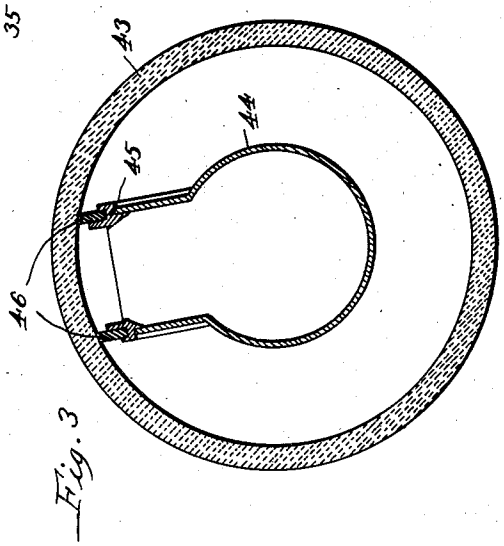


Fig. 3

Inventor
Wiley C. Smith
By
Wilson, Dowell, McCanna & Winterrowd
Attys.

Feb. 5, 1935. W. C. SMITH 1,990,102

ROLL FOR PAPER MACHINES

Filed April 2, 1934 2 Sheets-Sheet 2

Fig. 5

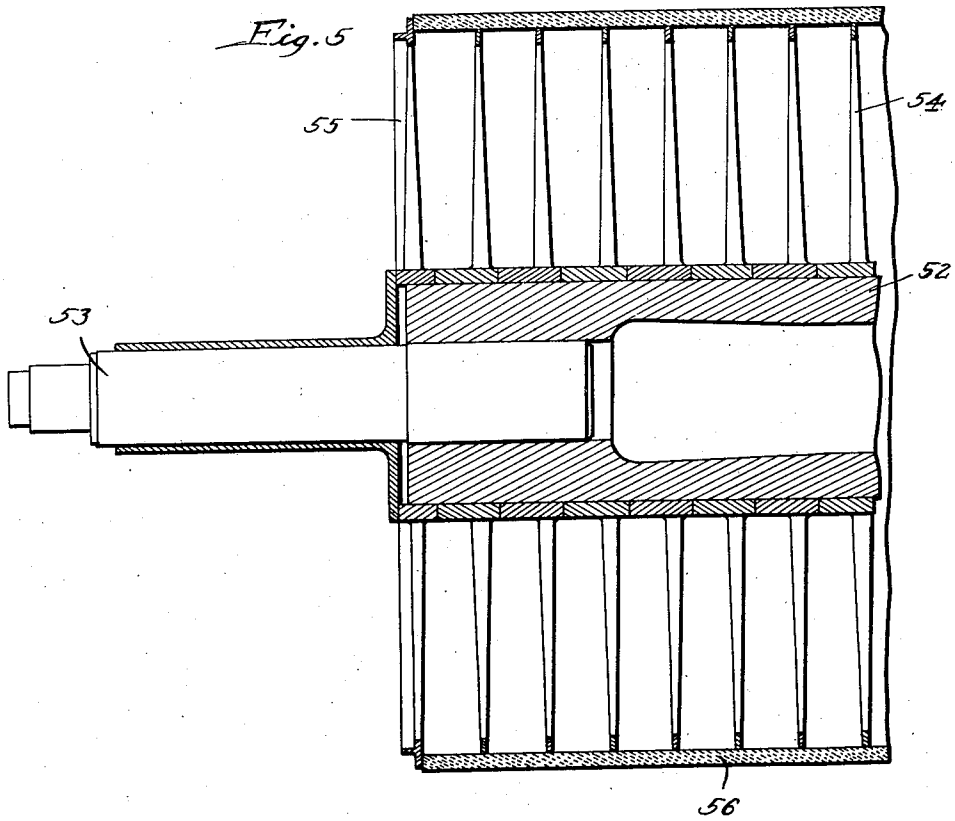
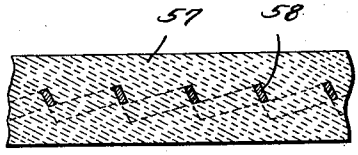


Fig. 6



Inventor:
Wiley C. Smith
By
Wilson, Dowell, McCann & Winterson
attys.

Patented Feb. 5, 1935 1,990,102

UNITED STATES PATENT OFFICE

1,990,102

ROLL FOR PAPER MACHINES

Wiley C. Smith, Beloit, Wis.

Application April 2, 1934, Serial No. 718,567

8 Claims. (Cl. 92—53)

This invention relates to paper making machines and has special reference to paper machine rolls of novel construction.

An object of the invention is to provide generally improved rolls for paper making machines of the type in which the fluids pass through the rolls to dehydrate the pulp.

Another object of the invention is the provision of rolls for paper making machines for removing the fluids from the pulp with greater uniformity than has heretofore been possible whereby to produce a sheet of greater uniformity.

A still further aim of the invention is the provision of rolls capable of retaining substantially all of the fines in the sheet under formation.

Other objects and attendant advantages will become apparent to those skilled in the art from the description and the accompanying drawings, in which—

Figure 1 is a diagrammatical showing of a well known form of cylinder machine;

Fig. 2 is a diagrammatical showing of a portion of a Fourdrinier machine;

Fig. 3 is a transverse section through a suction roll embodying my invention;

Fig. 4 is a fragmentary section through a suction roll showing a modified form of the invention;

Fig. 5 is a longitudinal section through a cylinder mold embodying my invention, and

Fig. 6 is a fragmentary section through the shell of one of the rolls.

Figures 1 and 2 are diagrammatic showings of a cylinder machine and a portion of a Fourdrinier machine respectively, the general form of which constitutes no part of this invention but which are shown for the purpose of better illustrating the invention. In Figure 1, the numerals 7, 8, and 9 are cylinder molds of the construction shown in Fig. 5, and hereafter to be more fully described. 11, 12, and 13 are couch rolls cooperating with the cylinder molds to build up a web of paper on the under side of a felt 14. The cylinder molds are immersed in vats 15, 16, and 17 for supplying pulp fiber to the cylinder mold. The felt 14 is an endless belt and is carried through the machine on rolls designated generally by the numeral 18. Upon leaving the last cylinder mold 9, the felt passes over a contact roll 19 where it is brought in contact with a wire 21 passing over guide rolls 22 and a suction roll 23. The felt and web pass around a roll 24 and back over the top of the cylinder mold to a suction press roll 25 from which the web 26 passes to second and third press rolls 27 to 30, the web being supported upon a felt or wire 31 when passing through the second and third press rolls.

In Fig. 2, the numerals 32, 33 and 34 designate the suction boxes of a Fourdrinier machine over which a wire 35 carrying the paper webs 36 is carried by table rolls 37 in the conventional manner. 38 is a suction couch roll of the type illustrated in Figs. 3 and 4, and presently to be described. 39 to 42 are press rolls, the rolls 40 and 42 being of the form shown in Figs. 3 and 4.

The present invention is directed to rolls of the character shown at 7, 8, 9, 23, 25, 28, 30, 38, 40 and 42, which serve to separate the liquid from the fiber by passing the liquid through the surface of the roll. These rolls are, roughly, of two types; the cylinder molds such as shown at 7, 8, and 9 of Figure 1—which are adapted to be immersed in the fluid stock and which serve to form a fibrous web—and the suction rolls such as the remainder of the above-enumerated rolls, which operate against a formed web to remove the excess fluids therefrom. The suction rolls may be used at numerous places along the path of the web—wherever it is advantageous—but are commonly used as couch rolls and press rolls. Regardless of the use, suction rolls are of essentially the same construction, though they may vary slightly in structural details depending upon their use. I will, therefore, describe but a single suction roll made in accordance with my invention, and it will be understood that the invention is equally applicable to suction rolls adapted for the various uses.

It has been customary in the past to form rolls of this general type—that is, of the fluid transmitting type, as distinguished from the rolls which have solid surfaces—either by forming a solid cylinder of metal and thereafter perforating the same by drilled holes or by building up the cylindrical surface from a number of superimposed layers of latticework, each layer having smaller interstices, the outer layer being a fine mesh wire screen cloth. It will be obvious that with either of these constructions there is a limit on the fineness of the openings and upon the distance between the openings and, with the best rolls heretofore devised, a considerable amount of the fine pulp has invariably passed through the rolls resulting in a lower grade of sheet and in higher costs than would otherwise be the case. Furthermore, these types of rolls left an imprint or design in the paper, imparting a grain thereto.

The present invention contemplates rolls of the fluid transmitting type wherein the openings in the surface of the roll are extremely small and

very closely spaced as a result of which the foregoing objections are substantially eliminated. In the accomplishment of this purpose, I make the surface of the roll of a porous medium formed of bonded granular material, such as "carborundum" or "alundum". Where greater strength is desired than is possessed by the bonded material alone, the surface may be backed by a metal backing plate of suitable form, as will presently be described.

Referring first to Fig. 3, the shell 43 of the suction roll consists of a cylinder of porous bonded granular material, such as is an article of commerce in the form of porous plates, tubes, diaphragms, and the like. This material may be made in a number of different ways from different materials. They are commonly made of refractory grains such as silicon carbide and aluminum oxide, bonded with a vitreous material and baked, the grain size being regulated to control the permeability of the finished product. These mediums may be bonded in numerous different ways, such as by refractory material, synthetic resins, rubber derivatives or rubber-like materials, or other ways well known in the art.

The interior of the shell has a stationary suction box 44 of conventional form carrying a packing holder 45 provided with packing 46 for the purpose of sealing the junction between the suction box and the shell, whereby suction may be placed on a limited portion of the shell in the usual manner.

Where the suction roll is intended to carry loads greater than the capacity of the porous medium alone, I have found it advisable to use a backing plate to impart additional rigidity and strength to the roll. Thus, in Fig. 4, the cylinder of porous medium 43 is provided with a metal backing plate, designated generally by the numeral 47. The plate 47 has a plurality of longitudinal ribs 48 on its outer surface adapted to bear against the inner surface of the cylinder 43 to lend support thereto at points spaced circumferentially of the roll. These ribs form small suction chambers 49 between the cylinder 43 and the main body of the plate 47 to which reduced pressure is applied by means of a plurality of openings 51. In this instance, the packing 46 bears against the smooth inner surface of the plate 47 and limits the area of reduced pressure on the shell. The ribs 48 likewise cooperate with the openings 51 and the packing 46 to limit the area of reduced pressure. The ribs 48 are preferably triangular in cross-section, as shown in Fig. 4, whereby to limit the area of contact between the plate and the porous cylinder so that the movement of fluid through the porous cylinder will be substantially uniform in the area of reduced pressure.

The invention also contemplates a cylinder mold which may be of the construction shown in Fig. 5, wherein the numeral 52 designates the usual core of the cylinder mold, the numeral 53 designates the stub shaft, the numeral 54 a plurality of webs spaced longitudinally of the roll to lend support to the surface of the roll, and the numeral 55 is a rib adapted to cooperate with the end of the cylinder mold vat to prevent the passage of stock between the end of the cylinder mold and the end wall of the vat. According to my invention, I form the surface 56 of the cylinder mold from porous bonded granular material such as above described. It will be found that, in most instances, substantially all or at least a good many of the webs 54 may be eliminated, since in many cases the surface material will have sufficient strength to render much of this support unnecessary.

The strength of the porous bonded granular material will depend largely upon the method of manufacture and upon the particular binders employed. Consequently, when the weaker binders are employed, it is necessary to employ additional means for strengthening the surfacing material. One such method is shown in Fig. 6, wherein the numeral 57 designates the bonded granular material and the numeral 58 designates expanded metal such as that employed in expanded metal lath, the expanded metal being cast or formed into the bonded granular material during its manufacture. Likewise, wire or rods may be cast into the granular material upon its formation to increase the strength and rigidity of the surfacing material.

Attention is directed to the fact that paper machine rolls made in accordance with my invention have a great multiplicity of very fine and very closely spaced pores through which the liquid is drawn from the stock or web on the surface of the roll. These openings being very closely spaced, the liquid in the web has but a very short distance to travel to enter the closest opening in the roll surface. In other words, each opening needs to draw from only a very small area, and, as a result, the web will be very uniformly dehydrated which tends to eliminate grain in the fibrous sheet thus formed. Other new results obtained by my invention are that, because of the very small size of the opening, the fine fibers of the pulp are retained with the web instead of being carried through the surface of the roll with the liquid. These fines serve a valuable purpose in knitting together the larger fibers of the sheet, making for a more compact and a stronger, higher quality product. The fines also represent a considerable amount of stock and their retention in the sheet materially decreases the cost of operation by it eliminating the necessity for treating the white water to recover the fines, only a portion of the fines can be recovered in any event.

While I have thus described and illustrated specific embodiments of my invention, I am aware that numerous alterations and changes may be made therein without departing from the spirit of the invention and I do not wish to be limited except as required by the prior art and the scope of the appended claims, in which—

I claim:

1. A paper machine roll of the fluid transmitting type having a cylindrical porous shell of grains bonded together in sheet form.

2. A paper machine roll of the fluid transmitting type having a cylindrical shell of substantially uniformly porous bonded granular material.

3. A suction roll for paper machines having a fluid transmitting shell of substantially uniformly porous bonded granular material.

4. A suction roll for paper machines comprising a stationary suction box, a rotatable cylindrical shell of porous bonded granular material surrounding the suction box, and means extending longitudinally of the roll for establishing communication between the suction box and the inner surface of the shell through a limited area.

5. A suction roll for paper machines comprising a stationary suction box, a rotatable cylindrical shell of porous bonded granular material surrounding the suction box, a perforate metal backing plate on the inner surface of said material, and means extending longitudinally of the

roll for establishing communication between the suction box and the inner surface of the shell through a limited area.

6. A cylinder mold for paper machines having a shell of porous bonded granular material.

7. A cylinder mold for paper machines comprising a central core, a shell of porous bonded granular material supported on the core, and means for driving the core and shell.

8. A cylinder mold for paper machines comprising a core, a shell of porous bonded granular material, means spaced longitudinally of the mold for supporting the shell on the core, and means for driving the core and shell.

WILEY C. SMITH.