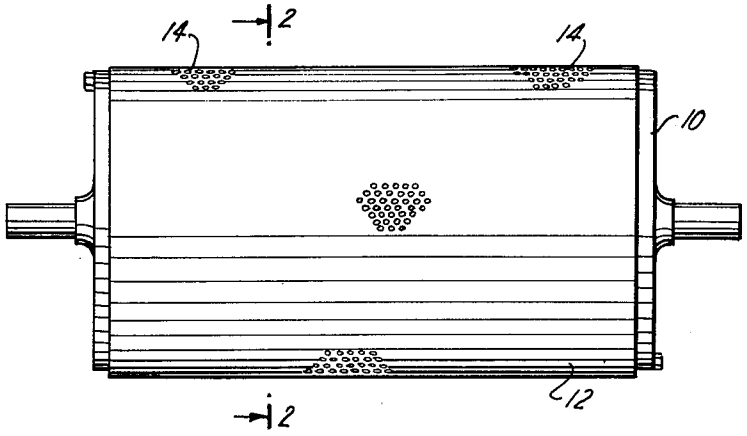
July 21, 1964 B. T. COLLINS ETAL 3,141,817

SUCTION PRESS ROLL

Filed Aug. 22, 1962

FIG. 1



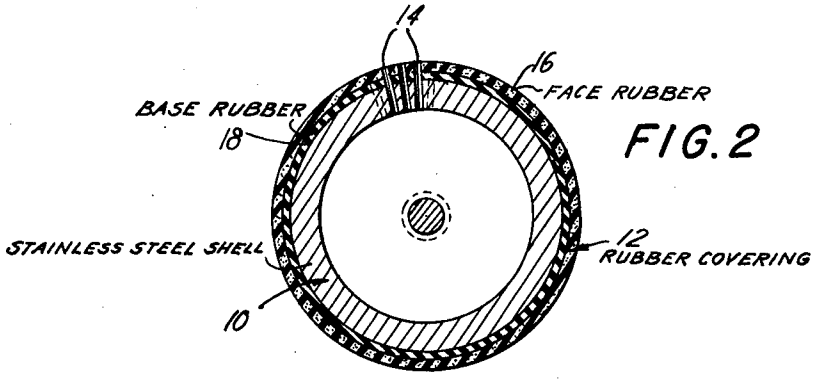


FIG. 2

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3,141,817

Patented July 21, 1964

3,141,817

SUCTION PRESS ROLL

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Filed Aug. 22, 1962, Ser. No. 218,712
8 Claims. (Cl. 162—372)

This invention relates to an improved press roll, and more particularly to improved suction press rolls such as are used in paper making machines.

Suction press rolls used in paper making machines consist of rubber covered metal shells drilled radially with numerous holes. Such suction press rolls are used in conjunction with mating press rolls as a wringer for wringing or squeezing out water from a woolen blanket or felt carrying a web of paper which is passed between the press rolls in the operation of the paper making machine. In modern press rolls, because of the increasing size of the rolls to accommodate larger paper making machines, the shells are made of stainless steel. The rubber covering is bonded to the stainless steel shell by a hard rubber base.

Although excellent initial adhesion is obtained between the rubber covering and the stainless steel shell through the use of the hard rubber base as a bonding agent; it is found that the adhesion deteriorates in use on the paper making machine with the result that the rubber covering separates and breaks away from the roll shell. Rapid loss of adhesion between the covering and the shell is found to be due to the alum and weak sulphuric acid solutions used on some paper making machines, and more generally to the corrosive action of mill water used, particularly where the pH is low (somewhere between 4 and 6) and to electrolytic action that takes place. This breakdown of adhesion results in frequent replacement of the rubber covers, which are themselves costly, loss of production due to shut down time and danger to personnel. Many attempts have been made to solve this problem, but these have proved ineffectual.

We have found that the retention of the adhesion between the stainless steel roll body and the rubber covering may be greatly enhanced by incorporating in the base or bonding rubber a sacrificial anodic metal powder selected from the group or class consisting of aluminum powder, chromium powder and ferrochrome powder. It may be noted that these metals, cationic in action, are in the group of metals above stainless steel in the E.M.F. series. It is found that the incorporation of such anodic metal powders in the bonding base rubber decreases the rate of loss of adhesion between the rubber covering and the steel shell to the point where the covering may be expected to be worn out before the covering loses its bond to the steel body. For example, in adhesion tests on test jigs, a 300% improvement in bond life has been obtained.

The prime object of our present invention thus specifically relates to the production of improved suction press rolls in which a sacrificial anodic metal is incorporated into the bond between the rubber covering and the stainless steel shell of the press roll for the purposes and to produce the results referred to.

To the accomplishment of the foregoing object and such other objects as may hereinafter appear, our invention relates to the suction press roll as defined in the appended claims taken together with the following description and the accompanying drawings, in which

FIGURE 1 is a front elevational view of a suction press roll embodying the present invention; and

FIG. 2 is a view thereof taken in cross-section in the plane of the line 2—2 of FIG. 1.

Structurally the suction press roll in which the feature of the present invention is incorporated comprises a stainless steel cylindrical shell **10** provided with a rubber covering **12**, the shell and the rubber covering being drilled radially with numerous holes **14**, over the body thereof. The rubber covering comprises a face rubber layer **16** and a base rubber layer **18**, the base rubber layer forming the bond between the rubber covering and the stainless steel shell.

For the stainless steel shell **10**, certain desirable types of stainless steel (because of modulus and machining characteristics) are desirable because of the excellent initial adhesion one may obtain between the stainless steel body and the rubber coverings. Usually the stainless steel shells are made of a thickness somewhat greater than 2 inches.

A preferred type of stainless steel which has been used in the manufacture of these stainless steel roll bodies or shells has the following composition.

	Percent
Carbon	0.15 max.
Chromium	11.5–14
Nickel	1.0
Manganese	1.0 max.
Silicon	1.5 max.
Iron	Balance

The face rubber layer **16** of the rubber covering is a resilient rubber having a standard composition of which the following is an example:

	Parts by weight
Rubber	100
Cumar resin	10
Phenyl B naphthylamine	4
Magnesium oxide	20
Carbon black	24
Tertiary phenyl guanidine	1
Sulphur	10
	169

The base rubber layer **18** comprises in the finished press roll a hard rubber; and to effect the desired enhanced bonding of the rubber covering to the stainless steel shell there is incorporated in the composition of the base rubber layer the sacrificial anodic metal powder referred to, namely, a metal powder selected from the group or class consisting of aluminum powder, chromium powder and ferrochrome powder. While the anodic metal powder may be incorporated throughout the thickness of the base rubber layer **18** (usually 3/16" to 3/8" thick), it is preferred to have only a part (the layer that is contiguous to the surface of the steel shell), such as from 1/4 to 1/2 of the thickness of the base rubber containing the anodic metal powder, in which case the remainder of the base rubber layer is made of a composition in which the anodic metal powder is substituted by whiting (calcium carbonate) or other filler. In building of such a press roll a first layer is laid onto the steel shell of say one-half the thickness of the base layer containing the anodic metal powder, a second layer completing the base thickness and containing whiting as the filler is then laid onto the first layer, after which the layer of the face rubber is applied, the assembly then being vulcanized under pressure.

In the composition of the bonding base layer containing the anodic metal powder, we have found that the amount of the anodic metal powder by weight should be comparable to and preferably greater than the amount of the rubber in the composition. We have found that a satisfactory metal powder is one in which 100% passes through a 20 mesh screen and 35% through a 325 mesh screen, it being found that a coarser powder yields better bond protection than a finer powder.

Example I

In this, and in the following examples, all parts given are by weight, unless otherwise specified.

This example illustrates the use of aluminum powder as the anodic metal in the composition of the base rubber bond. A typical base formula which gives good adhesion retention has the following composition.

Ingredients:	Parts
Rubber	100
2-naphthalenethiol	5/16
Lime	12
Zinc oxide	15
Tri-phenyl guanidine	3
Aluminum powder	200
Sulfur	60
	390 5/16

In this composition 2-naphthalenethiol is employed as a peptizer. Where only that part of the base rubber at the interface with the stainless steel shell is made to incorporate the anodic metal powder, the remainder, namely the upper layer of the base rubber may have a composition of the same formula as given above with the exception that the aluminum powder is substituted by whiting as a filler.

Example II

This example illustrates the use of chromium powder as the anodic metal powder which is incorporated in the base rubber bond. A typical formula which gives good adhesion retention is as follows.

Ingredients:	Parts
Natural rubber	90
GRS 1004 (styrene-butadiene copolymer)	10
2-naphthalenethiol	5/16
Lime	12
Zinc oxide	15
Chromium powder, 100 mesh	515
Tri-phenyl guanidine	3
Sulfur	60

Example III

This example illustrates the use of ferrochrome powder as the anodic metal powder which is incorporated in the base rubber bond. A typical formula which gives good adhesion retention is as follows.

Ingredients:	Parts
Natural rubber	90
GRS 1004 (styrene-butadiene copolymer)	10
2-naphthalenethiol	5/16
Lime	12
Zinc oxide	15
Ferrochrome powder, 50/325 mesh	533
Tri-phenyl guanidine	3
Sulfur	60

While we have described the preferred structure of the improved suction press roll of the present invention and preferred compositions of the base rubber bond or the bond layer of the base rubber, it will be apparent that many changes may be made in the structure of the press roll and in the compositions described without departure from the spirit of the invention defined in the following claims.

We claim:

1. A press roll comprising a stainless steel shell and a rubber covering bonded thereto, the bond between the shell and the covering comprising rubber having incorporated therein a sacrificial anodic metal powder selected from the class of metals above stainless steel in the E.M.F. series and consisting of aluminum powder, chromium powder and ferrochrome powder.

2. A suction press roll for paper making machines comprising a stainless steel cylindrical shell and a rubber covering bonded thereto, the bond between the shell and the covering comprising a hard rubber layer having incorporated therein a sacrificial anodic metal powder selected from the class of metals above stainless steel in the E.M.F. series and consisting of aluminum powder, chromium powder and ferrochrome powder.

3. A press roll comprising a stainless steel shell and a rubber covering bonded thereto, said rubber covering including a face rubber layer and a base rubber layer, the base rubber layer, forming the bond between the shell and the covering, having incorporated therein a sacrificial anodic metal powder selected from the class of metals above stainless steel in the E.M.F. series and consisting of aluminum powder, chromium powder and ferrochrome powder.

4. The press roll of claim 3 in which the face rubber layer is a resilient rubber and the base rubber layer is a hard rubber.

5. The press roll of claim 3 in which the sacrificial anodic metal powder is incorporated only in the part of the base rubber layer that is contiguous to the surface of the steel shell.

6. The press roll of claim 1 in which the sacrificial anodic metal powder is incorporated in the bond rubber in an amount by weight comparable to the amount of rubber in the bond.

7. The press roll of claim 3 in which the sacrificial anodic metal powder is incorporated in the base rubber layer in an amount by weight comparable to the amount of rubber therein.

8. The press roll of claim 1 in which the steel shell and the rubber covering are formed with through holes.

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