June 14, 1938. J. S. TATNALL 2,120,875

ROLL

Filed Nov. 11, 1935

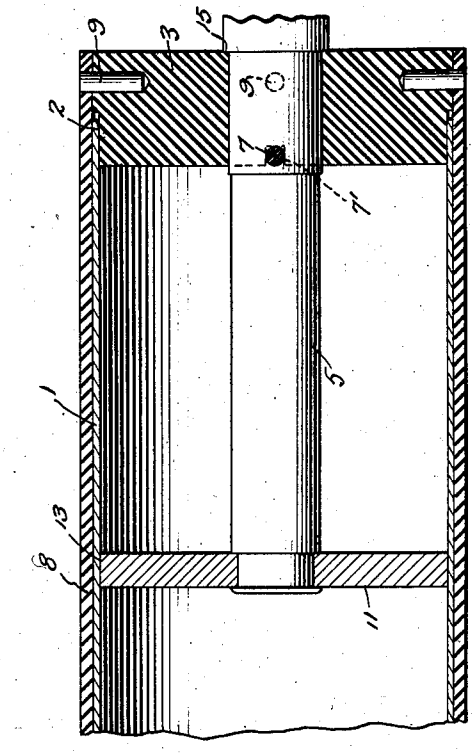


Fig. 3.

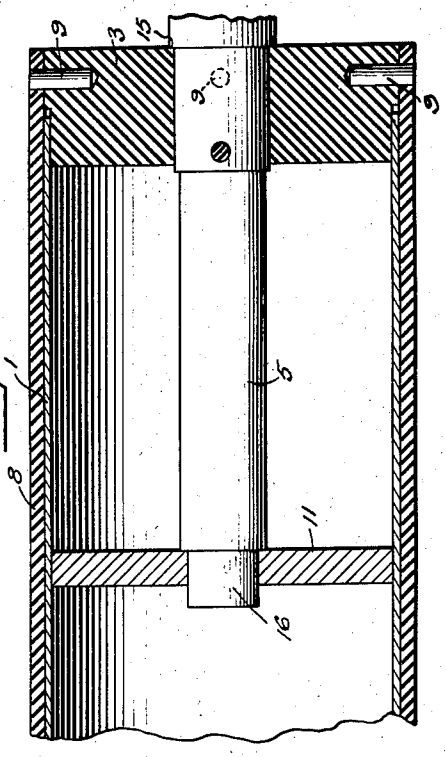


Fig. 1.

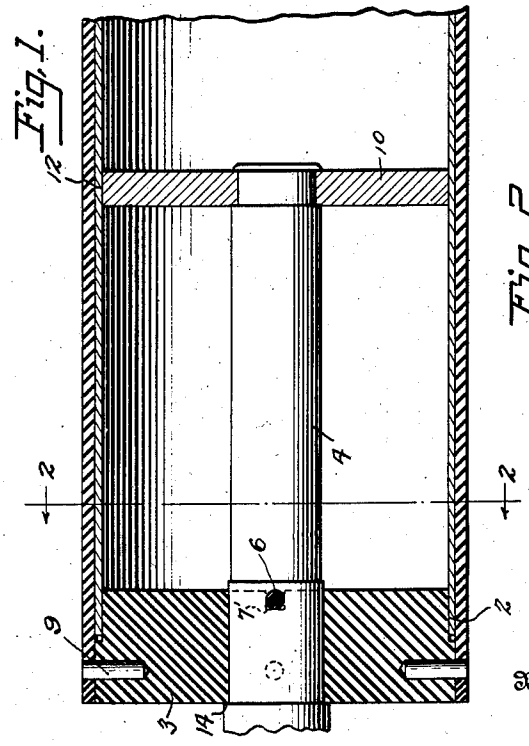
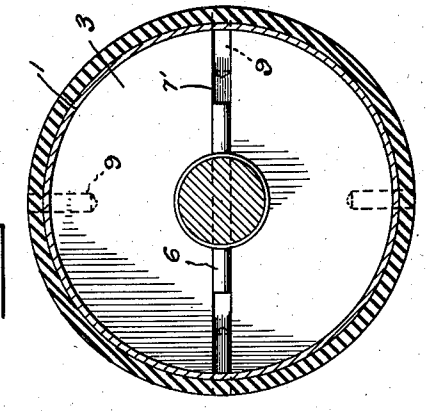


Fig. 2.



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ROLL

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10 Claims. (Cl. 74—230.17)

This invention relates to rolls for supporting, feeding or otherwise handling material in the course of its manufacture.

The invention appertains more particularly to rolls which are employed in processes involving the use of agents which would corrode ordinary rolls.

The roll which constitutes the present invention is general in its field of use, but by way of example, it is contemplated in the present description, as employed in the textile manufacture and similar industries, in which lightness, that is to say, a minimum of inertia, rigidity and immunity to corrosion are indispensable qualifications.

The general object of the invention is to provide a roll having the above characteristics. Other objects relate to the solution of problems arising in the construction of such rolls, and will appear as the following description of a preferred and practical embodiment of the invention proceeds.

In the drawing throughout the figures of which the same characters of reference have been employed to denote identical parts:

Figure 1 is a diametrical longitudinal section through a roll, the intermediate portion being broken away;

Figure 2 is a cross section taken along the line 2—2 of Figure 1; and

Figure 3 is a fragmentary diametrical longitudinal section through a slightly modified form of the invention.

It has been proposed to make rolls of aluminum in the interest of lightness and also to coat the outsides of rolls with substances which would resist corrosion. Aluminum rolls have the fault that they lack rigidity and therefore become sagged in the center, being unfit for use with expensive conveyors such as bronze belting or webbing and which are seriously damaged by running over rolls which are not truly cylindrical.

It has also been proposed to face the outside of rolls with shells of brass which resist corrosion by certain liquids and which may be turned down from time to time as they become untrue, or entirely replaced. Such rolls are expensive to manufacture and maintain.

Rolls have also been made and used in the paper industry comprising a molded fibrous facing applied to a metallic cylinder in sections, but such rolls have not achieved commercial success for one reason or other.

The present invention contemplates the provision of a roll comprising a skeletal or supporting portion consisting of a thin cylindrical shell 1 of steel or other metal of comparable rigidity preferably having the ends thereof telescoped upon the cylindrical surface of deep rabbets 2 formed on heads 3. A divided shaft comprising sections 4 and 5 passes axially into the roll, being fixed to the heads 3. Any suitable means may be employed for securing the shaft sections to the head as, for example, the pins 6 which pass through the shaft and rest in diametrical slots 7 formed in the inner faces of the respective heads.

The heads 3 are preferably formed of non-corrosive substance of which a phenolic condensation product may be considered an example. A preferable manner of securing the shaft sections to the heads in a water-tight manner is to form an aperture in the head slightly smaller than the shaft so as to interpose a slight interference and then to press the shaft into the hole thus formed, densifying the material adjacent the shaft. In use, the heads become wet and the phenolic condensation product absorbs moisture which in the densified region adjacent the shaft sections swells the heads against the shafts in a rigid water-tight grip.

The outer cylindrical face of the roll is constituted by a shell 8 of bakelite or other suitable phenolic condensation product or other material having similar characteristics, said shell being molded or pressed upon the inner shell and adapted to closely fit the peripheral surface of the heads 3. The shell 8 is preferably secured to the heads 3 in any suitable manner as by phenolic condensation product dowels 9, although, even if the shell 8 should be unsecured, the absorption of moisture in the use of the roll will expand the ends into immovable contact with the peripheral faces of the heads. The outer surface of the roll and the heads form a waterproof and corrosion-resisting covering for the entire roll down to the shaft.

The bakelite or other phenolic condensation product has a greater thermal coefficient of expansion than steel, in fact, greater than any other of the more commonly known metals. In addition to this, the phenolic condensation product, when wet or moist, expands through absorption of moisture.

It is one of the main objects of the invention to allow for the expansion of the outer shell of the roll without subjecting the inner or supporting shell to such strain as would result in its deformation. In the preferred form of the invention, this purpose is accomplished by seating the ends of the steel shell unsecured upon the

rabbets without securing the steel shell to the heads in any positive manner. However, it is within the purview of the invention, if desired, to secure the inner as well as the outer shell. In the latter instance, that is to say, where the inner shell is secured to the heads, the outer phenolic condensation product shell when contracted is subjected to a severe tensile stress which may result in its rupture. This renders the securing of the inner shell to the heads impracticable in the case of thin bakelite coatings, but where the outer shell has a thickness of one-fourth inch or greater, it is generally able to stand the stress without destruction.

If the steel shell were originally connected to the heads, the dominant expansion of the outer shell might cause the latter to bulge in the center, throwing the roll out of its true cylindrical contour. By resting the steel shell 1 unsecuredly upon the rabbets of the heads 3, the shell 8 can expand or contract with the heads 3, while the inner shell 1 will merely slide in one direction or the other upon the rabbets.

The steel shell which underlies the outer shell 8 is provided for the purpose of supporting the outer shell and maintain the contour of the roll truly cylindrical and rigid. As stated, aluminum does not serve this purpose well since it is not a stiff material.

The purpose of making the shaft discontinuous in the intermediate part of the roll is to make the roll light so as to keep its inertia at the minimum value.

Quite frequently the roll is rotated by stress transmitted through the substance supported upon the roll and it is of great importance that the roll should be light as possible so as to prevent the development of weakness or rupture in the material which moves the roll.

In the interest of keeping the axes of the shaft sections 4 and 5 rectilinear, it is essential that the shaft sections 4 and 5 extend some distance inwardly on the heads 3. Figure 1 shows that the inner ends of the shaft sections pass through, and are secured to disks 10 and 11, said disks being arranged in planes perpendicular to the axis of the rolls, and the peripheral faces 12 and 13 of said disks slidably fitting the inner surface of the steel shell 1.

It will be observed in Figure 1 that the shaft is of slightly reduced diameter where it passes through the heads 3 forming external shoulders 14 and 15 which abut the outer faces of the heads 3. Thus when the heads move outwardly under the expansion of the shell 8, the shaft sections must move outwardly with them, carrying also the disks 10 and 11 which slide upon the inner surface of the shell 1. When the heads 3 move inwardly as the shell 8 contracts, the shaft sections move inwardly on account of the presence of the pins 6 and 7, carrying with them the disks 10 and 11 which are mounted on the reduced inner ends of said shaft sections.

It is not essential, however, that the disks 10 and 11 should travel with the shaft sections. Figure 3 shows a form of the invention which is similar to the showing of Figure 1 in all respects excepting that the disk 11 is not fixed to the shaft section 5 but on a reduced cylindrical portion 16 slidably passing through the disk 11, the latter having a fixed fit with the inner surface of the shell 1.

To those skilled in the art, it will be apparent that the details of construction as explained, and the arrangement of parts as shown and described are not to be regarded as limiting the scope of invention, but merely as exemplary of numerous other constructions of roll which may well be within the purview of the invention. For example, the steel cylinder might be fixed to the head and the phenolic condensation product outer cylinder slidable without respect to the heads. However, this latter construction would produce a circumferential joint on the outer surface of the heads which might be a source of leak of corrosive matter to the interior of the roll.

Those skilled in the art will understand that there are other rigid material beside steel that may be employed in the construction of the inner cylinder shell without departing from the invention and that a number of compositions of matter having resistance to corrosion are available for the manufacture of the outer shell.

What I claim is:

1. Roll comprising spaced heads and a cylindrical portion consisting of contacting laminae resting upon said heads, said heads and the outer lamina being composed of phenolic condensation product, a shaft pressed through said heads thereby densifying the phenolic condensation product of said heads in the regions surrounding said shaft causing the phenolic condensation product in said regions to expand by absorption when wet into intimate water-tight relation to the shaft.

2. Roll comprising spaced heads and a cylindrical portion consisting of inner and outer shells, the latter being of corrosion-resisting material of greater coefficient of expansion than the material of the inner shell and secured to both heads, the inner shell being supported by said heads and longitudinally slidable with respect to at least one head so as to be free from deformative strain when said heads approach or recede under expansion or contraction of said outer shell.

3. Roll comprising spaced heads, and a cylindrical portion consisting of outer and inner shells, the former being of greater co-efficient of expansion than the inner shell, and being secured to both heads, the inner shell being seated in rabbets on said heads and slidable with respect to at least one of said rabbets so as to avoid taking a deformative strain when said heads approach or recede under expansion or contraction of said outer shell.

4. Roll as claimed in claim 3, the outer shell being of non-metallic, corrosion-resisting material and the inner shell being of thin steel and supporting the outer shell at least adjacent its middle.

5. Roll as claimed in claim 3, the heads as well as the outer shell being composed of non-metallic corrosion-resisting material.

6. Roll as claimed in claim 3, the outer shell being of a phenolic condensation substance.

7. Roll as claimed in claim 3, including aligned shaft sections fixed with respect to said heads and extending therethrough to a distance within said rolls, said shaft being discontinuous through the middle portion of said rolls, and means at the inner ends of said shaft sections contacting the inner shell, giving support thereto and supporting the inner ends of said sections and maintaining them in axial alignment.

8. Roll as claimed in claim 3, including aligned shaft sections fixed with respect to said heads and extending therethrough to a distance within said rolls, said shaft being discontinuous through the middle portion of said rolls, and means at the inner ends of said shaft sections contacting

the inner shell, giving support thereto and supporting the inner ends of said sections and maintaining them in axial alignment, said means being unsecured to said inner shell permitting said shaft sections to move axially with said heads.

9. Roll as claimed in claim 3, including aligned shaft sections fixed with respect to said heads and extending therethrough to a distance within said rolls, said shaft being discontinuous through the middle portion of said rolls, and means at the inner ends of said shaft sections engaging said inner shell, supporting the inner ends of said sections and maintaining them in axial alignment, said means being fixed to said shaft sections and slidable relative to the interior surface of said interior shell.

10. Roll as claimed in claim 3, including aligned shaft sections fixed with respect to said heads and extending therethrough to a distance within said rolls, said shaft being discontinuous through the middle portion of said rolls, and means at the inner ends of said shaft sections engaging said inner shell, supporting the inner ends of said sections and maintaining them in axial alignment, said shaft sections being slidable with respect to said supporting means.

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