

Dec. 12, 1967

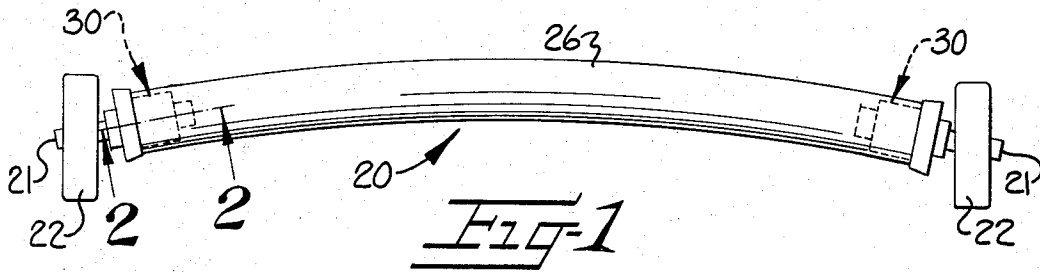
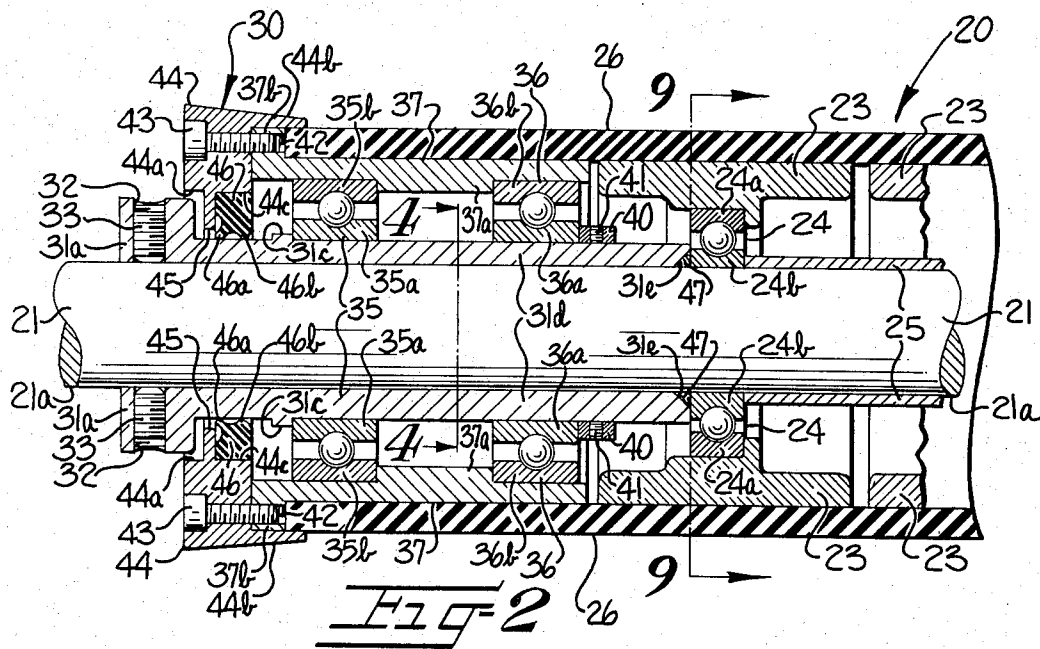
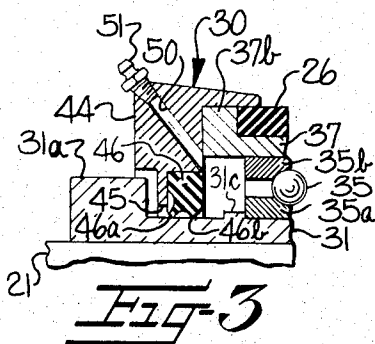
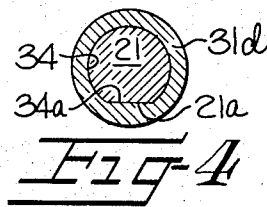
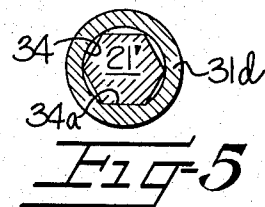
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3,357,073

CURVED ROLL

Filed May 10, 1965

2 Sheets-Sheet 1



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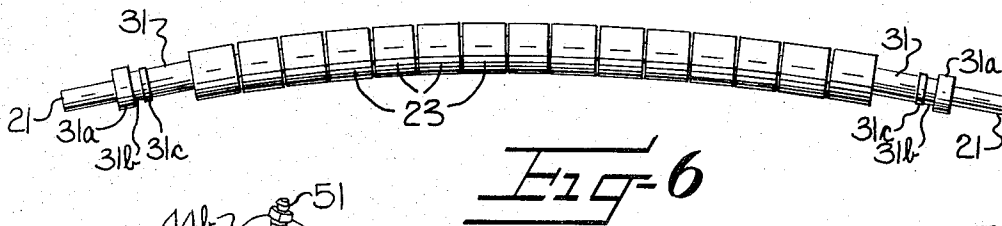
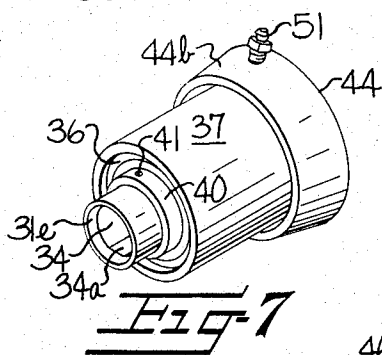
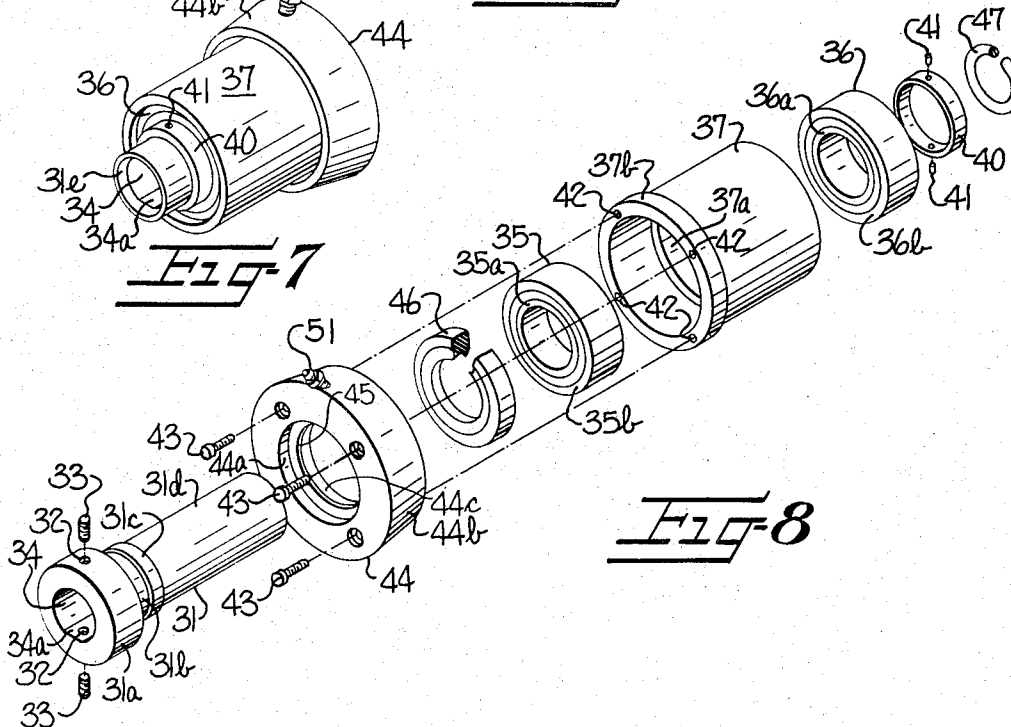
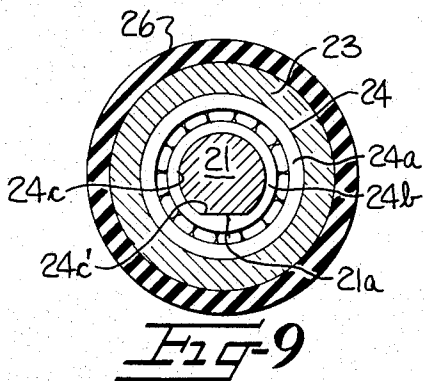
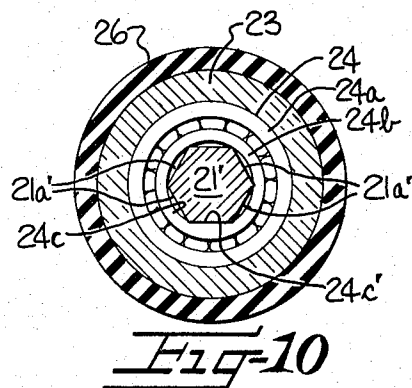
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3,357,073

CURVED ROLL

Filed May 10, 1965

2 Sheets-Sheet 2



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1

3,357,073

CURVED ROLL

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9 Claims. (Cl. 26—63)

ABSTRACT OF THE DISCLOSURE

A curved roll for spreading or contracting flexible sheet material including end assemblies provided at opposite ends of an elongate tubular sheath supported by a series of intermediate cylindrical roll sections on a curved shaft, each said end assembly comprising a mounting member, end segment, and end cap having a running, mounting-member engaging seal, said elements interconnected as a module for positioning on or removal from said shaft as a unit, and a stationary seal disposed between each mounting member and shaft.

The present invention relates to curved rolls and more particularly to such rolls having increased effective life and wherein assembly and maintenance thereof is facilitated.

Curved rolls for exerting an expanding, spreading, contracting, or bow correcting action upon flexible sheet material, such as textile fabric, are well known and are conventionally utilized in a variety of uses or situations in the textile industry and other industries. Examples of operations in which one or more curved rolls are conventionally utilized in connection with textile fabrics are washing and drying thereof, mercerizing, tentering and many other types of manufacturing and/or finishing operations. In such operations, water, caustic solutions, acid solutions, and other chemical solutions and materials are utilized which are potentially harmful to the curved rolls and, in addition, such rolls are subject to considerable torque and stress which results in considerable wear on the elements thereof.

Such conventional curved rolls usually include a longitudinally curved shaft, a plurality of cylindrical segments rotatably mounted on this shaft by suitable bearings, a tubular sheath of flexible elastomeric or fluid-impervious materials supported by the segments in surrounding relation thereto and adapted to engage the sheet material being acted upon, end caps or slingers at least attempting to close the ends of the tubular sheath to prevent the entry therinto of dirt, liquid, harmful chemicals and the like and the escape of lubricant and contaminants therefrom, and end collars which lock the roll in assembled relation. Due to the longitudinally curved nature of the shaft of such a roll, the axial openings through the inner races of the bearings mounting the segments on the shaft are required to be of larger size than the shaft to permit the bearings to be slipped along the shaft into proper position. This relatively loose fit of the inner races of the bearings on the shaft results in relative movement between the inner races of the bearings and the shaft upon rotation of the segments which accordingly causes excessive wear on the bearings and necessitates that such bearings be frequently replaced. This excessive wear on such bearings is particularly evident adjacent opposite ends of the roll where the greatest amount of torque occurs during the operation thereof.

The effective sealing of the interior of the curved roll from the exterior thereof to prevent the entry of dirt, liquid, harmful chemicals or other materials into and the escape of lubricants and contaminants generated or occurring during use of the roll from the interior of the roll

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is another real problem encountered in the use of conventional curved rolls. In this respect, the most cogent problem is the entry of liquids and/or harmful chemicals therinto which have a corrosive effect upon the bearings and segments of the roll which materially shortens the life of the roll. In fact, it has been determined that the corrosive action of liquids and/or harmful chemicals upon the elements of the roll immediately adjacent opposite ends thereof is the most frequent cause of failure of curved rolls used in operations where liquids and such harmful chemicals are utilized. It can also readily be appreciated that if the lubricant used to lubricate the bearings in the roll and contaminants generated by the oxidation of the lubricant and/or metallic components of the curved roll are permitted to escape therefrom, the same will collect upon the sheet material being acted upon with highly undesirable results.

Heretofore, no effective sealing system for opposite ends of a curved roll has been devised and no effective mounting arrangement for the end bearings of such a roll has been provided. Consequently, frequent maintenance, repair or reconditioning of conventional curved rolls is required. In this respect, curved rolls are usually assembled in a piece-by-piece manner on the shaft with the end collars being the last parts or elements placed thereon. Therefore, when the roll must be repaired or reconditioned, the same must be disassembled in the same manner which is sometimes very difficult and time consuming since the parts or elements of the roll, and particularly those elements that are immediately adjacent the ends of the rolls, frequently become seized to the shaft or to each other after only a short period of use. More specifically, if liquids or harmful chemicals enter into the interior of the roll and corrode the parts thereof, it is usually necessary that the parts be cut from the shaft since they are so tightly seized thereto that it is impossible to remove them in a normal manner.

The sheet material manufacturer, finisher or the like usually does not have the facilities, labor or time to engage in this difficult and time consuming roll maintenance, repair or reconstruction, and it is therefore common practice to send these rolls back to the manufacturer thereof or to someone specializing in the repair and reconditioning of such rolls for this maintenance. This practice is quite expensive since such rolls are very heavy and the packaging and freight thereof is costly. In addition, it is necessary that additional rolls be maintained in stock to replace the rolls which are returned for repair or reconditioning which necessitates increased capital investment and overhead due to the necessity of providing storage facilities therefor.

Several attempts have been made to overcome these problems, but in each instance, they have proved failures and have not resulted in successful solutions thereto. One such attempt has been successful to a limited extent in relieving some of the wear upon the bearings mounting the end segments of the roll and has accomplished this by providing a cylindrical sleeve on which the bearings are mounted which obviates the loose fit between the shaft and bearings of previous curved rolls. However, this roll still must be assembled in a piece-by-piece manner and must be disassembled in the same manner. Accordingly, the aforementioned problem of repair and reconditioning of the roll once the same did become worn was still present. In this respect, the end cap or slinger at each end of this curved roll is threadably connected to the end segment and such threaded connections are even more subject to the aforementioned seizure of these elements to each other. In fact, the disassembly of this roll creates problems even for an experienced and well-equipped shop specializing in the repair and reconditioning of such rolls.

This previous roll also has unsuccessfully attempted to overcome the aforementioned problem with the sealing of opposite ends thereof by providing sealing sleeves completely enclosing opposite ends of the shaft exteriorly of the roll and having a running seal between this sleeve and the end cap or slinger. These sealing sleeves around opposite ends of the shaft are very expensive and create problems in the handling and mounting of the roll. In addition, these sleeves are subject to frequent rupture during operation of the roll by blows accidentally directed thereagainst and by the frequent changes in the position of the shaft in its bearings. Upon such frequent rupture of these sealing sleeves, the seal at opposite ends of the roll is no longer effective and liquid and harmful chemicals and the like may readily enter thereinto and lubricant and other contaminants may readily escape therefrom.

It is therefore an object of the present invention to provide a novel curved roll for flexible sheet material wherein the aforementioned problems encountered with conventional curved rolls are obviated and wherein the assembly and disassembly thereof is facilitated to make the maintenance, repair or reconditioning of such rolls faster and easier and considerably less expensive.

A more specific object of the present invention is to provide a novel curved roll of the character described which includes novel end assemblies wherein a cylindrical mounting member is provided for the bearings for the end segment at each end of the roll and wherein the mounting member, bearings, end segments, and end cap are interconnected and mountable on or removable from the shaft as a unit so as to be readily and easily replaceable.

A further more specific object of the present invention is to provide a curved roll of the character described wherein improved sealing means is provided at each end thereof which effectively seals the interior of the roll from the exterior thereof to prevent the entry of dirt, liquids, harmful chemicals or other materials into the roll or the escape of lubricant and other contaminants therefrom.

Some of the objects of the invention having been stated, other objects will appear as the description proceeds, when taken in connection with the accompanying drawings, in which—

FIGURE 1 is a plan view of a curved roll embodying the features of the present invention;

FIGURE 2 is an enlarged, fragmentary, sectional view of the left-hand end portion of the roll shown in FIGURE 1 taken substantially along line 2—2 therein;

FIGURE 3 is an enlarged, fragmentary detail of the upper left-hand portion of the end portion of the roll shown in FIGURE 2 and illustrating means for the introduction of lubricants into the roll;

FIGURE 4 is a reduced sectional view taken substantially along the line 4—4 in FIGURE 2;

FIGURE 5 is a view similar to FIGURE 4, but illustrating the use of a poly-sided shaft instead of the generally round, single flat side shaft shown in FIGURE 4;

FIGURE 6 is a plan view similar to FIGURE 1 of a partially assembled curved roll embodying the features of the present invention;

FIGURE 7 is an isometric view of an end assembly of the curved roll of the present invention;

FIGURE 8 is an exploded isometric view of the end assembly shown in FIGURE 7 with the elements reversed;

FIGURE 9 is a reduced sectional view taken substantially along line 9—9 in FIGURE 2; and

FIGURE 10 is a view similar to FIGURE 9 illustrating the use of a poly-sided shaft instead of the shaft shown in FIGURE 9.

Referring now more specifically to the drawings and particularly to FIGURE 1, there is shown a curved roll 20 embodying the features of the present invention and

generally including a longitudinally curved shaft 21. Shaft 21 may be generally circular in cross-section with a single flattened side 21a (FIGURES 4 and 9) or may have a cross-sectional configuration corresponding to poly-sided shaft 21' (FIGURES 5 and 10) with a plurality of flattened sides 21a'. Generally, opposite ends of shaft 21 are fixed in spaced bearings 22 (FIGURE 1) such that the shaft is held against rotation.

A series of intermediate tubular, cylindrical segments 23 (FIGURE 6) are rotatably mounted on the medial portion of shaft 21 by intermediate bearings 24 (FIGURE 2). Intermediate bearings 24 include outer races 24a snugly received within the tubular segments 23 so as to be rotatable therewith and inner races 24b having generally circular openings 24c therein with one flattened side 24c' (FIGURE 9) which corresponds to the flattened side 21a of shaft 21 or which may correspond to one of the flattened sides 21a' of the poly-sided shaft 21' (FIGURE 10). The intermediate bearings 24 and therefore the intermediate segments 23 are maintained in proper spaced relation by tubular spacing members 25 positioned around shaft 21 between the inner races of each adjacent pair of bearings 24.

An elongate, flexible, tubular, cylindrical sheath 26 snugly surrounds the series of intermediate segments 23 so as to be rotatable therewith and extends outwardly beyond opposite ends of this series of intermediate segments but terminates in inwardly spaced relation from opposite ends of the shaft 21. Sheath 26 may be formed of any suitable fluid-impervious material, but preferably is formed of an elastomeric material which is fluid-impervious and resistant to relatively high concentrations of basic and acid solutions.

An end assembly generally indicated at 30 (FIGURES 2, 7 and 8) is disposed on shaft 21 at opposite ends of said series of intermediate segments 23. End assembly 30 comprises an elongate, tubular mounting member 31 (FIGURE 8) having a locking portion 31a at its outer end which has a plurality of threaded openings 32 therein in which suitable locking screws 33 are threadably mounted to releasably lock mounting member 31 on shaft 21. Mounting member 31 also includes a cylindrical sealing portion 31b immediately interiorly of and of less diameter than locking portion 31a, and a generally annular abutment portion 31c immediately interiorly of and of greater diameter than sealing portion 31b, but of less diameter than locking portion 31a. Mounting member 31 also has an elongate cylindrical bearing mounting portion 31d extending between abutment portion 31c at the inner end of mounting member 31. An axial opening 34 extends longitudinally through mounting member 31 and generally corresponds in diameter to the diameter of shaft 21 and has a flattened side portion 34a thereon which corresponds to the flattened side 21a of shaft 21 (FIGURE 4) and which may correspond to one of the flattened sides 21a' of a poly-sided shaft 21' (FIGURE 5). The inner end portion of mounting member 31 has the area thereof immediately surrounding the opening 34 beveled as indicated at 31e for reasons to be presently described.

Each end assembly 30 also includes a pair of end bearings 35 and 36 (FIGURES 2 and 8) which are mounted on the mounting portion 31d of mounting member 31 with the inner races 35a, 36a thereof snugly surrounding the same for preventing relative rotation or undesirable lateral movement between the inner races of these bearings and the mounting member and thereby considerably reducing wear on the bearings as compared with conventional curved roll constructions. Outer races 35b, 36b of end bearings 35, 36 are snugly positioned within a tubular cylindrical end segment 37 to rotatably mount the end segment on mounting member 31. It is noted that end segment 37 has an inwardly projecting annular portion 37a on opposite sides of which the outer races 35b, 36b

of bearings 35 and 36 are disposed and which maintains these bearings in proper spaced relation.

Inner race 35a of bearing 35 abuts against annular abutment portion 31c on mounting member 31 and a generally annular locking collar 40 is mounted on mounting member 31 on the side of the inner race 36a of bearing 36 remote from bearing 35. A pair of set screws 41 are threadably mounted in collar 40 and engage mounting member 31 to hold the bearings and end segment in assembled relation with the mounting member 31.

End segment 37 also has an annular flange portion 37b at its outer end which extends radially outwardly from the remainder thereof and has an outer diameter preferably slightly less than the outer diameter of tubular sheath 26. This flange portion 37b has a plurality of internally threaded, laterally extending openings 42 therein which receive bolts 43 which penetrate through an end cap 44 to mount the same on end segment 37 for rotation therewith. End cap 44 has an axial opening 45 therethrough through which penetrates the mounting member 31 and this opening 45 has a diameter slightly larger than annular abutment portion 31c but less than the diameter of locking portion 31a.

Preferably, end cap 44 has an outer recess 44a therein which receives a portion of the locking portion 31a of mounting member 31 therein. However, it should be noted that the threaded openings 32 in the locking portion 31a should remain exposed for ready access to the threaded set screws 33 for removal of the end assembly 30 from shaft 21 as a unit without the necessity of removing the end caps and/or other elements of the roll.

End cap 44 also has an annular flange portion 44b which extends outwardly from the main portion thereof toward the center portion of curved roll 20 and this flange portion has an internal diameter substantially the same as the external diameter of flange portion 37b of end segment 37, which is slightly less than the outer diameter of the tubular sheath 26. Flange portion 44b of end cap 44 extends inwardly toward the center portion of the roll a distance greater than the thickness or width of the flange portion 37b so as to overlie at least a portion of the end portion of the tubular sheath 26 and the relative diameters thereof is such that the tubular sheath 26 is tightly held between the flange portion 44b and the main body portion of the end segment 37.

End cap 44 preferably has an inner recess portion 44c with an internal diameter substantially greater than the diameter of sealing portion 31b and in which a running seal 46 is mounted for rotation therewith. Running seal 46 may be of any suitable sealing material, such as neoprene, rubber or the like, and is preferably of the "double-lip" type having a first lip 46a angled generally toward the end of shaft 21 and a second lip 46b angled generally toward the center of shaft 21. Lip 46a sealingly engages sealing portion 31b and cooperates therewith to seal against the entry of dirt, liquids, harmful chemicals and the like into the interior of the curved roll 20, and lip 46b similarly engages and cooperates with sealing portion 31b to seal against the escape of lubricants, contaminants and the like from the interior of the roll.

A sealing member 47 which is preferably an O-ring of suitable sealing material, such as neoprene or rubber, is disposed in surrounding relation to shaft 21 at the inner end of mounting member 31. This O-ring sealing member 47 is received within the beveled portion 31e of mounting member 31 and upon positioning of the mounting member on the shaft, this beveled portion serves to compress sealing member 47 around the shaft and, at the same time, to compress sealing member 47 against the inner race 24b of the endmost intermediate bearing 24. This provides a double-seal around the shaft between the shaft 21 and to prevent the entry of foreign matter into or escape of lubricants, contaminants and the like from the roll between the shaft 21 and the mounting member 31.

An opening 50 (FIGURE 3) extends inwardly through

end cap 44 above running seal 46 for the introduction of suitable lubricants into roll 20 and a suitable fitting 51 is mounted in the outer end of this opening for closing the opening except when lubricant is being forced therinto.

In the assembly of roll 20, the series of intermediate segments 23, intermediate bearings 24, and spacer members 25 are positioned on the medial portion of shaft 21. The two mounting members 31 are then positioned on opposite end portions of shaft 21 (FIGURE 6) and the inner ends thereof are pressed against the endmost intermediate bearings 24 until the series of intermediate segments 23 are as compact as they can be pressed together. The locking screws 33 are then screwed into engagement with shaft 21 to mark the shaft at that location.

Mounting members 31 are then removed and suitable openings (not shown) are then drilled into the shaft a fraction of an inch farther in from the end of the shaft than the marked places formed by the locking screws 33. The outer sheath 26 is then cut to a length slightly greater than the desired distance between the flange portions 36b of the two end segments 37 and is placed in surrounding relation to the intermediate segments 23. It is noted that the sheath 26 is compressed to a certain extent during placement thereof on the intermediate segment 23.

Sealing members 47 are placed around shaft 21 and are moved inwardly against inner races 24b of endmost intermediate bearings 24. End assemblies 30, which have been preassembled are then placed on opposite end portions of shaft 21 and are moved inwardly toward the center of shaft 21 to position end segments 37 within the end portions of tubular sheath 26. As an end assembly 30 is moved into position, the end portion of sheath 26 is tightly received between the flange portion 44b of end cap 44 and the main body portion of end segment 37, and the flange portion 37a of end segment 37 is moved into abutting relation to the end of the sheath. At the same time, the O-ring sealing member 47 is compressed into constructed surrounding relation to shaft 21 and also is compressed against the inner race 24b of the endmost intermediate bearing 24. This inward movement of end assemblies 30 is continued until set screws 33 may be moved into the openings previously drilled in shaft 21 as described hereinbefore. By this arrangement, tubular sheath 26 is maintained under compression which assures that, as the segments rotate, the tubular sheath will not be pulled from between the flange portion 44b of end cap 44 and the segment 37 which frequently occurs with conventional curved rolls. When this occurs, the seal therebetween is lost and undesirable foreign materials may readily enter into the interior of the roll through such a gap formed between the end of the sheath and the end cap of the roll. Also, the O-ring sealing member 47 is maintained under a substantial degree of compression at all times which enhances the sealing capacity thereof.

Since the mounting member 31 may be turned and milled to very close tolerances, a very tight fit can be achieved between this mounting member and the endmost bearings 35 and 36 which insures true rotation of the outer races 35b and 36b relative to the inner races 35a, 36a. This substantially reduces the wear to which these bearings is subject during operation of the roll 20 as compared with conventional rolls wherein the endmost bearings are mounted directly on the curved shaft. Also, the end segments 37 mounted on these bearings have a truer rotation than the end segments of conventional curved rolls which considerably reduces the torque and consequent flexing of the tubular sheath 26, which flexing contributes to the loss of the elastic properties thereof and consequently a reduced effective life. Accordingly, sheath 26 has a longer effective life than was heretofore possible. Further, the end assemblies 30 provide a tri-seal arrangement at each end of roll 20 which is not subject to damage during use on repositioning of the roll and which is not subject to being broken due to compression of the sheath by the material being acted upon by the roll. Accordingly,

each end portion of the roll 20 is sealed to prevent the entry of dirt, liquids, harmful chemicals and the like into the interior of the roll and the escape of lubricants, contaminants and the like therefrom. As stated hereinbefore, the entry of such harmful materials into the interior of the roll and their effect upon the internal elements thereof has heretofore been the most common reason for failure of curved rolls of this character.

Further, the end assemblies 30 of the present curved roll 20 are so constructed and arranged as to be capable of preassembly and storage and may be mounted on and removed from shaft 21 as a unit since the set screws 33 are exposed exteriorly of the end cap 44. The assembly and disassembly of the roll 20 is thereby materially facilitated and it is frequently possible to merely remove an old end assembly from a roll and mount a new one in position without the requirement that the remaining elements of the roll be replaced, with the possible exception of the outer sheath 26.

It is, therefore, believed apparent that the present invention provides a novel curved roll wherein assembly and disassembly is facilitated for easier and quicker manufacture, maintenance, repair or reconditioning, and wherein the effective life of the roll is increased over prior rolls of this type by a reduction in wear at opposite ends of the roll and by the provision of an effective sealing arrangement at opposite ends of the roll to prevent the entry of dirt, liquids, harmful chemicals and the like into and the escape of lubricants, contaminants and the like from the interior of the roll.

In the drawings and specification there have been set forth preferred embodiments of the invention and, although specific terms are employed, they are used in a generic and descriptive sense only and not for purposes of limitation, the scope of the invention being defined in the claims.

I claim:

1. An expander roll for flexible sheet material such as textile fabric, comprising an elongate, longitudinally curved shaft, a series of cylindrical intermediate roll sections rotatably mounted along the medial portion of said shaft, an elongate tubular sheath of resilient, flexible fluid-impervious material surrounding said intermediate roll sections and extending outwardly beyond opposite ends thereof, but terminating in inwardly spaced relation to the ends of said shaft, and a pair of end assemblies removably mounted on said shaft at opposite ends of said series of intermediate roll sections for supporting opposite end portions of said tubular sheath and for sealing opposite ends of said tubular sheath to prevent the entry of liquids, harmful chemicals and the like into the interior of said sheath and the escape of lubricant and contaminants therefrom, each of said end assemblies comprising a cylindrical tubular mounting member including at least a portion intermediate the ends thereof having an uninterrupted external cylindrical surface, an end segment rotatably mounted on said mounting member and being snugly positioned within one end portion of said tubular sheath to support the same and provide a sealing area therebetween, and an end cap rotatably mounted on said mounting member and being connected to said end segment for rotation therewith and sealingly engaging the adjacent end of said sheath; said end cap having a running seal of resilient, elastomeric material sealingly engaging said uninterrupted cylindrical surface of said mounting member, said mounting member and end segment and end cap being interconnected as a module for positioning on or removal from said shaft as a unit, and said mounting member being releasably connected to said shaft exteriorly of said end segment and end cap.

2. An expander roll according to claim 1 wherein each of said end assemblies includes a pair of spaced bearings having inner and outer races, said inner races being snugly positioned on said mounting member so as to be non-rotatable relative thereto, said outer races being

snugly positioned in said end segment for rotation therewith to mount said end segment on said mounting member for rotation relative thereto, means on said end segment maintaining said bearings in spaced relation, and means releasably locking said bearings on said mounting member and thereby releasably interconnecting said end segment and mounting member.

3. An expander roll according to claim 1 wherein each of said end assemblies includes a stationary seal of resilient, elastomeric material disposed between said mounting member and said shaft.

4. An expander roll for flexible sheet material, such as textile fabric, comprising an elongate, longitudinally curved shaft, a series of cylindrical intermediate roll sections rotatably mounted along the medial portion of said shaft, an elongate tubular sheath of resilient, flexible, fluid-impervious material surrounding said intermediate roll sections and extending outwardly beyond opposite ends thereof, but terminating in inwardly spaced relation to the ends of said shaft, and a pair of end assemblies removably mounted on said shaft at opposite ends of said series of intermediate roll sections for supporting opposite end portions of said tubular sheath and for sealing opposite ends of said tubular sheath to prevent the entry of liquids, harmful chemicals, and the like into the interior of said sheath, and to prevent the escape of lubricants and contaminants therefrom, each of said end assemblies comprising a cylindrical tubular mounting member, a pair of spaced bearings having inner and outer races with said inner races being snugly positioned on said mounting member so as to be non-rotatable relative thereto, a cylindrical tubular end segment snugly positioned within one end portion of said tubular sheath to support the same and provide a sealing area therebetween and being snugly positioned in surrounding relation to said outer races of said bearings for rotation therewith on said mounting member, an end cap connected to said end segment for rotation therewith and having a central opening therethrough through which said mounting member penetrates, sealing means disposed within the opening in said end cap and sealingly engaging said mounting member for sealing the area therebetween, and sealing means disposed between said mounting member and said shaft for sealing the area therebetween, said mounting member, end segment and end cap being interconnected for positioning on or removal from said shaft as a unit, and said mounting member being releasably connected to said shaft exteriorly of said end segment and end cap.

5. An expander roll according to claim 4 wherein each of said end caps has a laterally extending annular flange surrounding the outer end portion of the corresponding end segment, the internal diameter of said flange being greater than the outer diameter of said end segment an amount slightly less than the thickness of the wall of said tubular sheath so that the end portion of said tubular sheath is snugly held between said flange and said end segment to provide an additional sealing area therebetween.

6. A curved roll according to claim 4 wherein said sealing means between said mounting member and said shaft comprises an annular seal disposed at the interior end of said mounting member and being maintained under substantial compression.

7. A curved roll according to claim 4 wherein said sealing means between said end cap and said mounting member comprises an annular seal carried by said end cap interiorly of the outer surface thereof and having a double-lip inner sealing surface sealingly engaging the outer peripheral surface of said mounting member for preventing the entry of liquids, harmful chemicals and the like into and the escape of lubricants, contaminants and the like from the interior of said roll.

8. An expander roll for flexible sheet material, such as textile fabric, comprising an elongate, longitudinally curved shaft, a series of cylindrical intermediate roll sec-

tions rotatably mounted along the medial portion of said shaft, an elongate tubular sheath of resilient, flexible, fluid-impervious material surrounding said intermediate roll sections and extending outwardly beyond opposite ends thereof, but terminating in inwardly spaced relation to the ends of said shaft, and a pair of end assemblies removably mounted on said shaft at opposite ends of said series of intermediate roll sections for supporting opposite end portions of said tubular sheath and for sealing opposite ends of said tubular sheath to prevent the entry of liquids, harmful chemicals, and the like into the interior of said sheath, and to prevent the escape of lubricants and contaminants therefrom, each of said end assemblies comprising a cylindrical tubular mounting member, a pair of spaced bearings having inner and outer races with said inner races being snugly positioned on said mounting member so as to be non-rotatable relative thereto, a cylindrical tubular end segment snugly positioned within one end portion of said tubular sleeve to support the same and provide a sealing area therebetween and being snugly positioned in surrounding relation to said outer races of said bearings for rotation therewith on said mounting member, an end cap connected to said end segment for rotation therewith and having a central opening therethrough through which said mounting member penetrates, said end cap having a laterally extending annular flange surrounding the outer end portion of said end segment and having an internal diameter greater than the external diameter of said end segment an amount slightly less than the thickness of the wall of said sheath to tightly hold the end portion of the sheath therebetween, an annular sealing member of elastomeric material disposed within the opening in said end cap and having a double-lip inner sealing surface sealingly engaging the outer surface of said mounting member for sealing the area between said end cap and said mounting member, and an annular sealing member of elastomeric material disposed at the interior end of said mounting member and between said mounting member and said shaft for sealing the area therebetween, said mounting member, end segment and end cap being interconnected for positioning on or removal from said shaft as a unit, and said mounting member being releasably connected to said shaft exteriorly of said end segment and end cap.

9. An expander roll for flexible sheet material, such as textile fabric, comprising an elongate, longitudinally

curved shaft having at least one longitudinally extending flat surface thereon, a series of cylindrical, tubular, intermediate roll sections, a bearing disposed within each of said intermediate roll sections and having a generally circular axial opening therethrough having a single flat surface corresponding to the flat surface on said shaft to accommodate single or polygonal flat surfaced shafts, said bearings being mounted on the medial portion of said shaft to rotatably mount said intermediate roll sections along the medial portion of said shaft, an elongate tubular sheath of resilient, flexible, fluid-impervious material surrounding said intermediate roll sections and extending outwardly beyond opposite ends thereof, but terminating in inwardly spaced relation to the ends of said shaft, and a pair of end assemblies removably mounted on said shaft at opposite ends of said series of intermediate roll sections for supporting opposite end portions of said tubular sheath and for sealing opposite ends of said tubular sheath to prevent the entry of moisture, dirt, harmful chemicals or other materials into the interior of said sheath and to prevent the escape of lubricants and contaminants therefrom, each of said end assemblies including a cylindrical mounting member having a generally circular opening therethrough having a single flat surface corresponding to the flat surface on said shaft and including a portion intermediate the ends thereof having an uninterrupted external cylindrical surface, an end segment rotatably mounted on said mounting member and positioned in one end portion of said sheath to support the same, and an end cap rotatably mounted on said mounting member and sealingly engaging said cylindrical surface and being connected to said end segment for rotation therewith, said mounting member, end segment and end cap being interconnected for positioning on or removal from said shaft as a unit, and said mounting member being releasably connected to said shaft exteriorly of said end segment and end cap.

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