ABSTRACT

A roller particularly adapted for driving sheet material through a folding machine, which sheet material is folded by the folding machine. The roller has an elongated cylindrical body, with an axle connected to the body for rotatably supporting the body. The cylindrical body has a pair of recessed fastening flats in the body, each being adjacent to opposite ends of the body. An elongated strip friction belt has one end removable fastened to one of the fastening flats. The belt is helically wound on the cylindrical body, with adjacent edges of the belt abutting. The belt has the other end releasably fastened to the other fastening belt. The ends of the friction belt are easily released to allow the belt to be removed and replaced by a replacement belt.

3 Claims, 4 Drawing Figures
CROSS-REFERENCE TO RELATED APPLICATION

This is a continuation of U.S. Pat. application Ser. No. 270,218, filed July 10, 1972, now abandoned entitled FOLDING MACHINE ROLLER.

BACKGROUND OF THE INVENTION

Folding machines are used for folding many types of foldable sheet material. The material to be folded is carried through a folding machine by a plurality of rollers, which rollers drive the sheet material through the machine. The rollers are an integral portion of the operation of a folding machine. The speed of the operation of the machine is largely determined by the ability of the rollers to drive the sheet material.

Heretofore, the common construction of a roller in a folding machine has been one in which the rollers have a cylindrical body made of steel. The steel body has a knurled surface on its outer periphery for frictional engagement with the sheet material.

Rollers having a steel body with a knurled surface present several problems in normal operation of the folding machine. It is well-recognized that the slipperier the material is that is handled by the folding machine, the slower the machine must operate because the material tends to slip along the knurled surface of the rollers; and the speed of rotation of the rollers in the machine must be slowed down to the point where there is no slippage between the rollers and the sheet material. Though the knurling of the rollers is hardened, oftentimes foreign particles are carried into the machine; and some of these foreign particles pass between the knurled rollers, damaging the knurling. After usage, the knurling begins to wear down, so that the roller is not effective for driving the sheet material at a high rate of speed. Thus, either damage to the knurling or wearing of the knurling requires that the roller be replaced in its entirety.

SUMMARY OF THE INVENTION

The present roller construction is one which is particularly adapted for use in folding machines. The present roller construction utilizes an elongated strip friction belt helically wound on the roller. The friction belt is of such a construction that it has a friction surface on one side. This friction surface provides a surface which readily engages securely the sheet material and reduces the amount of slippage between the sheet material and the roller to allow the machine to operate at a higher rate of speed.

The use of removable belting on the roller allows the belt to be changed if there is any wear on the friction surface of the belt. Thus, the rollers may be maintained at a high level of efficiency. The construction of the friction surface of the belt is such that even though a foreign particle may be carried between two rollers, there is little or no damage to the friction surface which may require replacement. Furthermore, the surface of the belt is such that there is a greater friction force between the surface of the belt and the sheet material than there is between the surface of the prior art knurled roller and the sheet material, so that the improved roller may operate at a speed as great as 50 percent greater that the speed of the knurled roller. This greater speed of operation allows more sheets to be folded in a given time period.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a plan view of a roller embodying the present invention, with a portion broken away;

FIG. 2 is a plan view of a straight strip of a friction belt which is part of the roller of FIG. 1;

FIG. 3 is a cross-sectional view taken on Line 3—3 of FIG. 2, showing the interior construction of the friction belt; and

FIG. 4 is a cross-sectional view taken on Line 4—4 of FIG. 1, showing the attachment of one end of the friction belt to one end of a roller body.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawing, and especially to FIG. 1, a roller embodying the present invention is shown therein and is generally indicated by numeral 10. The roller 10 generally includes a steel body 12, an axle 14 rotatably supporting the body, a friction belt 16 helically wound on the body 12, and fasteners 18 and 20 releasably securing the belt 16 to the body.

The body 12 is an elongated circular right cylindrical body having a cylindrical outer surface 22, with opposed flat ends 24 and 26 formed in the body, as may be best seen in FIG. 1. The outer surface of the body is knurled to provide an improved frictional contact between the outer surface 22 and the interior surface of the friction belt 16. A recessed fastening flat 28 is formed in the outer surface 22 adjacent to the end 26. A second recessed fastening flat 30 is also formed in the outer surface 22, but adjacent to the end 24. The width of each of the flats 28 and 30 is substantially equal to the width of the belt 16, for reasons which will become apparent hereinafter.

The axle 14 includes a pair of neck portions 32 and 34, which neck portions are adapted for mounting in a bearing for rotatably supporting the roller to have the roller rotate about its longitudinal axis. It may be appreciated that the roller may also be connected to a drive gear to provide a source of power for rotating the roller.

The friction belt 16 is an elongated strip, as shown in FIG. 2, which strip is helically wound on the knurled outer surface 22, with opposed edges of the belt abutting. The belt is wound so that the angle of the length of the belt is 80° to the longitudinal axis of the body, as may be seen in FIG. 1. The belt 16, as may be seen in FIG. 3, is made up of three laminar plies or webs 36, 38 and 40, which are molded into a rubber body 42. The rubber body has an exterior or outer friction surface 44 formed therein for engagement with a sheet material. Each of the webs 36, 38 and 40 is a woven fabric web of cotton; and the rubber body 42 extends through each of the webs, so that the rubber body has its inner surface frictionally engaging the knurled outer surface 22. Between the webs 36 and 38, there is a body portion 46; and between the webs 38 and 40, there is a second body portion 48. These body portions 46 and 48 space the webs from each other.

The construction of the friction surface 44 is best seen in FIGS. 2 and 3. A plurality of regularly spaced concave indentations 50 and 52 cooperate with each other to form a plurality of straight gripper edges 54...
Each of the straight gripper edges 54 is a mirror image of each of the edges 55. As may be best seen in FIG. 3, the edge 55 is defined by concave indentation 50 on one side and concave indentation 52 on the other side to form an upstanding tapered knife edge having an angle less than 90° between the sides forming the edge. As was mentioned above, the edge 54 is a mirror image of edge 55; and a repetition of a detailed description of edge 54 is not made herein.

The edges 54 and 55 are arranged in parallel pairs, which pairs are parallel to the other pairs of edges. It may be seen that the edges 54 and 55 terminate at indentations 50 at the ends of pairs of respective edges. The parallel pairs of edges 54 and 55 are regularly staggered, as may be best seen in FIG. 2.

The indentation 50 is substantially wider and deeper than the indentation 52. The indentation 52 has a semicircular cross-section, so that sides of the uppermost portion of adjacent straight edges 54 and 55 are substantially parallel to each other and are substantially perpendicular to the plane surface of the friction surface 44. As was mentioned above, the indentation 50 is wider and deeper than the indentation 52. The indentation 50 forms a slope on the side of the gripper edges, as is best seen in FIG. 3.

The gripper edges 54 and 55 are made of rubber. The configuration of alternating edges and indentations provides a surface which has a high degree of compliance between the friction surface and a sheet material, so that there is a high frictional force between the friction surface and a sheet material as a result of the increased area of control and the high coefficient of friction between the material of the friction surface and the sheet material. It is also important to note that when the belt 16 is wrapped on the body 22 at an 80° angle, the edges are set at 80° to the longitudinal axis, which provides an improved gripping surface and further improves the compliance of the friction surface.

Each of the fasteners 18 and 20 has an identical construction to the other. The construction of fastener 18 is shown in FIGS. 1 and 4. The fastener 18 includes a flat fastener plate 56, which has mounted therein a flat head screw 58. The flat head screw extends through the fastener plate 56 and through an end 60 of the friction belt. The screw 58 is threadedly secured in the body 12 so that it may be removed as desired. As may be seen in FIG. 4, the belt 16 has end 60 mounted on the flat 28, with the fastener 18 securing the belt to the body. As was mentioned above, the belt is helically wound on the knurled outer surface. The belt has another end 62 mounted on flat 30 and secured thereto by fastener 20. The belt on the outer surface 22 is above the height of the fasteners 18 and 20, so that the fasteners do not interfere with the normal operation of the roller.

In its normal operation, the roller 10 is mounted in a conventional folding machine in sets, as is required by the particular construction of the folding machine. As was mentioned above, the angle of the belt is 80° to the longitudinal axis of the roller, so that the gripper edges 54 are not arranged perpendicular to the axis, but rather at an angle of 80° to the longitudinal axis. This particular arrangement of the gripper edges provides an excellent frictional coaction between the gripper edges and sheet material passing through the folding machine. The gripper edges firmly engage the sheet material. In actual operation of a folding machine, the old and well-known steel knurled rollers were replaced by rollers having a construction such as roller 10, described above. There was a 20 percent to 50 percent increase in speed of operation over the previous speed of operation.

As is well-known, the conventional knurled rollers wear and have a substantial decrease in effectiveness in driving sheet material through a folding machine. Also, foreign particles may enter into the machine and damage the knurling. When there is substantial damage or when the knurled roller is worn, it is necessary to discard the prior art roller and substitute a new roller. When roller 10 is used in a folding machine and the roller loses some of its effectiveness, the roller 10, with its belt 16, need not be substituted in its entirety. The belt 16 is simply and easily removed and replaced. It is a simple matter to release the fasteners 18 and 20 by removing the respective screws of fasteners and to unwind the belt 16. A new strip of belt 16 is applied by securing end 60 of the belt to flat 28 with fastener 18, then winding the belt on the roller at an angle of 80° to the longitudinal axis of the roller, and finally fastening end 62 of the belt to flat 30 with fastener 20. The replacement of the belt 16 is a simple operation which may be performed with a minimum of labor. Furthermore, the cost of the belt is minimal in comparison to the cost of a new knurled roller.

Although a specific disclosure of the instant invention has been shown and described in detail above, it is readily apparent that those skilled in the art may make various modifications and changes in a roller construction without departing from the spirit and scope of the present invention. It is to be expressly understood that the instant invention is limited only by the appended claims.

What is claimed is:

1. A roller for use in driving sheet material to be folded in a folding machine comprising: an elongated cylindrical body having a longitudinal axis; said cylindrical body having a cylindrical outer surface; an axle connected to the body for rotatably supporting said body for rotating the body about its longitudinal axis; means releasably securing the belt to the axle connected to the body for rotatably supporting said body for rotating the body about its longitudinal axis;
an elongated strip friction belt removably mounted on said surface; said friction belt including a first fabric web, a second fabric web over the first fabric web, a rubber body having a portion extending through the first and second fabric webs, a third fabric web above the second fabric web, said rubber body having a second portion extending through the third fabric web and extending above the third fabric web, and said rubber body having a friction surface formed thereon above the third fabric web; said friction belt being helically wound on the outer surface of the cylindrical body at an angle to the longitudinal axis with adjacent edges of the belt abutting each other; said helically wound friction belt being wound at an angle of approximately 80° to the longitudinal axis of the elongated cylindrical body; said friction surface being drivingly engageable with sheet material to be folded in the folding machine; said friction surface having a plurality of straight gripper edges formed integral therewith; each of said gripper edges having tapered sides to form a sharp edge forming an angle of less than 90° between the sides; and means releasably securing the belt to the cylindrical body.

3. A roller for use in driving sheet material to be folded in a folding machine comprising; an elongated cylindrical body having a longitudinal axis; said cylindrical body having a cylindrical outer surface; an axle connected to the body for rotatably supporting said body for rotating the body about its longitudinal axis; an elongated strip friction belt removably mounted on said surface; said friction belt being helically wound on the outer surface of the cylindrical body at an angle to the longitudinal axis with adjacent edges of the belt abutting each other; said friction belt having a friction surface for driving engagement with sheet material to be folded in the folding machine; said friction surface having a plurality of straight gripper edges formed integral therewith, each of said gripper edges having tapered sides to form a sharp edge forming an angle of less than 90° between the sides; the helically wound friction belt is wound at an angle of approximately 80° to the longitudinal axis of the elongated cylindrical body; said friction belt including a first fabric web, a second fabric web over the first fabric web, a rubber body having a portion extending through the first and second fabric webs, a third fabric web above the second fabric web, said rubber body having a second portion extending through the third fabric web and extending above the third fabric web, said rubber body having the friction surface formed thereon above the third fabric web, said gripper edges arranged in parallel pairs with an indentation between each of the edges in each pair, each of said indentations being semicircular in cross-section, and a second indentation, deeper than the first-mentioned indentation being positioned on each of the four sides of the pairs of gripper edges; and means releasably securing the belt to the cylindrical body.

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