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Wear resistant banding for a mill roll

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ABSTRACT

A sugar mill roll has circumferentially spaced teeth, the tip on each tooth having a recess or "key" to facilitate attachment of a wear resistant weld.

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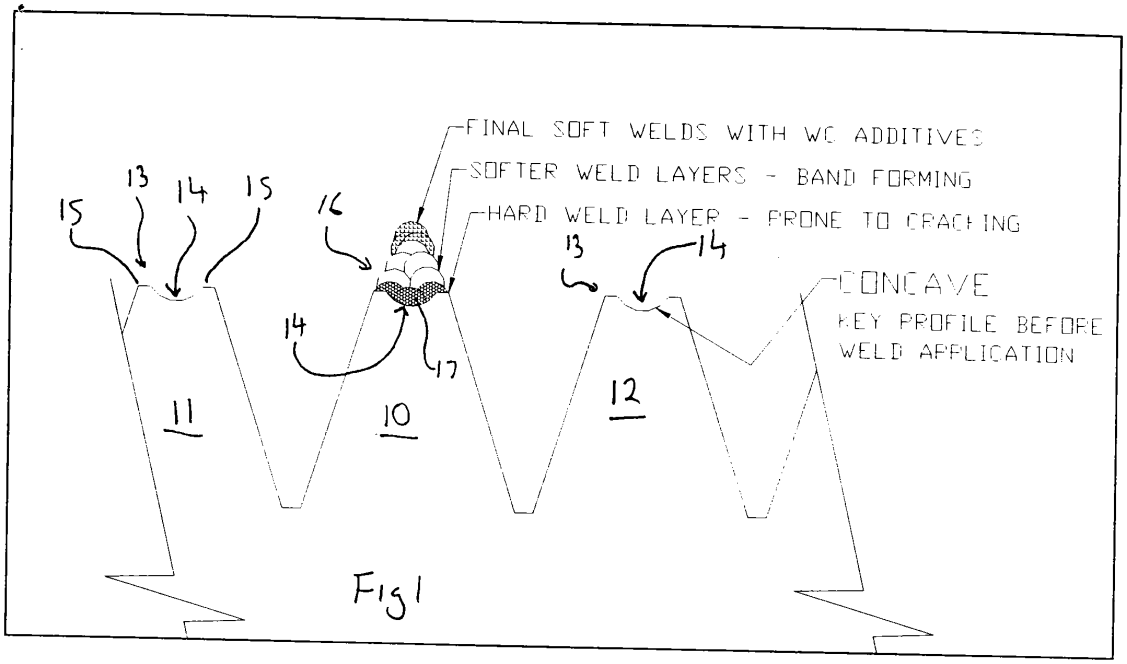

Fig 1

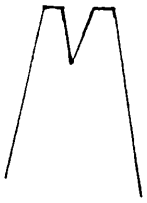

Fig 2

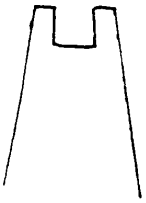

Fig 3

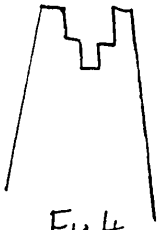

Fig 4

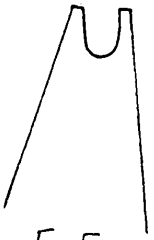

Fig 5

WEAR RESISTANT BANDING FOR A MILL ROLL

FIELD OF THE INVENTION

This invention is directed to improving the life of a mill roll, and is particularly directed to providing the mill roll tooth with a particular profile to facilitate addition of a weld band.

BACKGROUND ART

Mill rolls are used to crush sugar cane to separate the juice from the cane. The rolls can be several metres long and may have a diameter of between 1-2 m. The rolls are provided with circumferentially spaced teeth. The teeth are spaced apart sufficiently to form juice grooves. Such mill rolls are extremely well known.

To prolong the life of a mill roll, it is known to apply a weld over each tooth. The weld can be applied has a discontinuous layer (that is a series of dots or spots), or as a continuous layer. It is known to apply wear resistant particles to the weld layer, these particles typically being tungsten carbide or chromium carbide. It is known to apply multiple layers of weld over the tooth to provide a good thick layer.

To ensure that the weld is properly attached to the mill tooth, it is typical for the tooth to be machined to form a flat tip or land portion having a width of between 5-10 mm. It is also known to machine the mill tooth into a stepped profile, or a stepped pyramid profile. This provides the tooth with a number of separate land portions to accommodate the weld.

These features are known and have been known since at least 1994.

A difficulty with conventional techniques to apply weld over the tooth is to ensure that the weld is properly keyed or attached to the tooth. Various techniques are used to ensure a good adhesion of the weld to the tooth. These techniques include use of an initial buttering layer of stainless steel. However, this increases the complexity in applying a weld.

It is also advantageous to provide a weld band about the periphery of each tooth. A weld band is a continuous bead of weld which part fuses and shrink fits to the roll by virtue of the natural contraction of the weld

material. The bead can comprise several layers of weld.

OBJECT OF THE INVENTION

The present invention is directed to a technique to allow weld to be applied over the tooth of a mill roll and which need not require a buttering layer of stainless steel, but still provides good attachment of the weld to the tooth. This can be achieved by providing a key or recess in the tooth in which the weld can be applied.

In one form, the invention resides in a mill roll having a plurality of circumferentially spaced teeth, at least some of the teeth being provided with a recess which can accommodate at least part of a weld layer.

The recess is typically formed in a land portion which is usually machined off the top of each tooth. The land portion is typically flat, and a recess can be formed in the flat land portion. This may be achieved sequentially by initially machining a flat land portion and then machining or otherwise forming the recess. Alternatively, the recess may be formed in a single step process.

The recess is typically continuous and extending along the entire tooth. However, it is envisaged that the recess may comprise discontinuous portions. The shape size and configuration of the recess may vary providing that it can accommodate at least part of a weld. The recess may comprise a concave portion. The concave portion may extend into the otherwise flat land portion. The concave portion may terminate at a position spaced inwardly from each side of the tooth such that a small flat portion is still present on each side of the tooth. This flat portion may be between 1-3 mm wide. The recess may comprise a triangular recess, a square or rectangular recess, a U shaped recess, a stepped recess, and the like. The recess may have an open upper end which is sufficiently wide to accommodate at least part of a weld layer. The open upper end may have a width of between 3-10 mm. The depth of the recess may vary to suit. A typical depth may be between 3-10 mm. The recess can be seen as a "key" to key in at least one layer of weld.

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments of the invention will be described with reference to

the following drawings in which:

Figure 1. Illustrates part of a mill roll showing three teeth each having a concave key portion and where one tooth is provided with a plurality of layers of weld.

Figures 2-5. Illustrate some other types of recesses.

BEST MODE

Referring to the drawings and initially to Figure 1, there is illustrated part of a mill roll having three spaced apart circumferentially spaced teeth 10-12. A typical mill roll may have between 100-300 such teeth. Each tooth has a generally triangular cross-section. The top of each tooth has been machined off to form a flat portion 13. The flat portion typically has a width of between 5-10 mm. A recess 14 is formed (typically by machining) into the flat portion. In Figure 1, the recess is concave . Recess 14 has edges which terminate inwardly from the edges of flat land portion 13 such that small land portions 15 are still present on each side of the recess. The recess has a depth of between 3-8 mm depending on the size of the tooth. The recess is machined around the entire circumference of each tooth.

In Figure 1, the recess (or key profile) is illustrated as being concave, but this can vary with the type of weld being applied. Several layers of weld 16 are applied in a least partially overlapping arrangement to form a weld deposit. The first or primary layer of weld 17 typically draws carbon from the iron mill roll. This will make this layer harder and render the layer more prone to cracking. However, the subsequent layers of weld become progressively softer and will form a continuous band around the tooth that is required for reliability. The uppermost or final layers of weld applied to the band can contain various hard components (eg tungsten carbide) that will assist with preserving the toughness and causes of the weld band without causing the weld band to fracture.

The plurality of layers of weld together form a welded ring that part fuses and shrink fits to the roll by virtue of the natural contraction of the weld material.

Figures 2-5 illustrate a selection of other key profile shapes. It is

envisaged that the profile shape illustrated in Figure 1, Figure 2 and Figure 5 will be most suitable.

By profiling the tooth to have a key portion or a recess, a buttering layer of stainless steel may not be required which saves on the cost in preparing a hardened roll. By having the weld at least partially physically keyed into the roll tooth, the weld has good attachment to the roll and should provide the roll with a long life.

It should be appreciated that various other changes and modifications may be made to the embodiment described without departing from the spirit and scope of the invention.

CLAIMS:

1. A mill roll having a plurality of circumferentially spaced teeth, at least some of the teeth being provided with a recess that can accommodate at least part of a weld layer.

2. The mill roll of claim 1 comprising a sugar mill roll and wherein the recess is in a land portion that is formed on the top of each tooth.

3. The mill roll of claim 1 or claim 2, wherein the recess has a depth of between 3-10mm and a open mouth which has a width of between 3-10mm, the width of the recess being less than the width of the land portion.

4. The mill roll as claimed in any one of the preceding claims, wherein the recess has a configuration selected from the group consisting on a concave recess, a triangular recess, a square or rectangular recess, a U shaped recess, and a stepped recess.

5. A mill roll substantially as hereinbefore described with reference to the drawings.

Dated this 26th day of March 2002

Bundaberg Foundry Engineers Ltd

By their Patent Attorneys

CULLEN & CO.

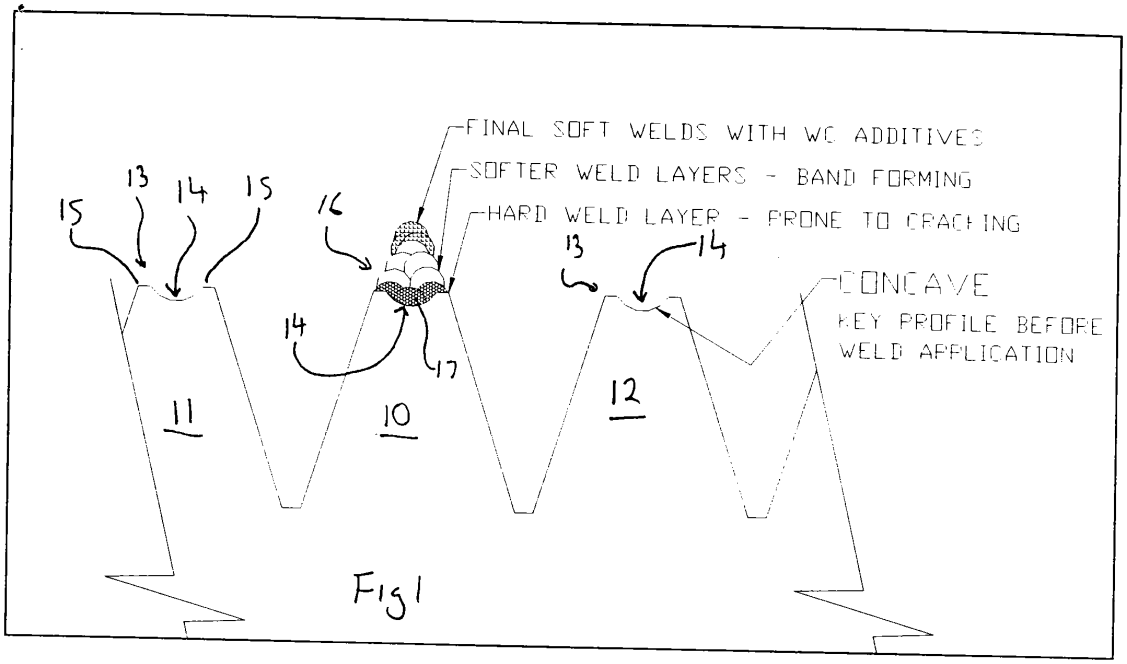

Fig 1

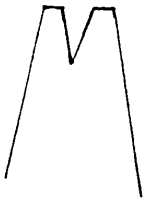

Fig 2

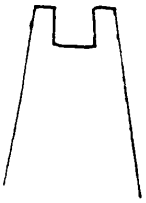

Fig 3

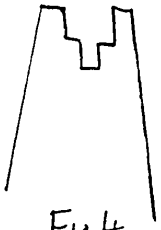

Fig 4

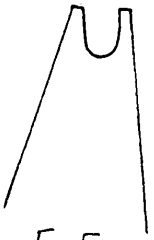

Fig 5