ROLLERS ARE BUILT OF SEPARATE ROLLS RADILY SEPARABLE FROM DRIVE HUBS

The present invention is especially useful in connection with elliptical roller devices, similar to that of Erickson Patent 2,973,093, which have become popular as combined screeners and feeders. These devices feed rock or the like to a crusher and at the same time classify or separate from the over-sized material to be crushed the smaller material which does not need crushing. The accompanying description is offered for public dissemination in the event patent protection is granted.

The elliptical rollers of the above-mentioned devices preferably are provided with outstanding ribs. Most of the wear of the rollers is along these ribs and it has been old to build them up with welding metal and to use ribs in the form of replaceable wear caps which could be welded together in place. However, the operation necessary to restore such rollers by any of these methods necessarily consumes considerable time, and the need for shutting down a feeding or classifying operation during such restoration has been very objectionable.

According to the present invention, an assembly is provided which makes the rollers very readily removed. Although a number of welders could then work on separate rollers to restore them in minimum time, the wrought iron removed will usually be immediately replaced by spare rollers which are either new or have been previously restored. The removed rollers can then be sent to the shop and restored in whatever may be the most convenient and efficient manner.

The quick removal is accomplished by keying each roller to a driving hub, at one end thereof, so that a keying means extending along a single diametral line in the radially disposed mating faces so that when freed, the roller can be simply lifted out. The freeing is accomplished by the simple expedient of drawing out a central dowel shaft extending through the roller, through the driving hub and through a bearing hub at the opposite end of the roller. Of course, the inner faces of the roller and the bearing hub must also permit simple lifting of the roller, and preferably they have a key similar to the driving key arrangement and in the same diametral plane. The roller can then be turned end for end in the event of uneven wear.

Preferably the entire surface of the roller is covered by the removable wear caps forming the ribs, this being another feature of the present invention. For ease of handling and for replacing only the ones required by wear, each rib is preferably formed separately from the other ribs and has two halves readily welded together around the roller. The roller surface is preferably shaped to interlock with the halves thus welded together so as to hold the wear elements, or wear caps, as they are commonly called, in the correct longitudinal position along the roller without the necessity of welding to the roller. The simple eXception being that each hub or wear cap are preferably sized with an internal circumference minutely smaller than the external circumference in order that they may be freely interlocked with the surface of the roller while being welded together. Although they are then readily removed by burning out the weldings, they function during operation as integral parts of the roller.

Any danger that a wear cap would be inadvertently assembled so loose as to slip off is prevented by providing end rings on the rollers. These end rings may be part of the key arrangements previously mentioned, or may be rings provided for antijam purposes. In any event, they may have a diameter smaller than the larger diameter of the ellipse of the roller, but larger than its smaller diameter, so that only in the latter direction do they form retaining shoulders for the wear caps. Unless a circular construction is desired in this area for other reasons, the rollers may merely be provided at each end with lugs extending outwardly in the correct positions for forming the retaining shoulders in question.

It has been found most convenient to provide wear caps which not only fit the ends but form caps meeting with one another between the ribs. By providing the two parts of each wear cap with externally beveled portions along these caps where the two parts of one cap meet, diametrically opposed welding grooves are provided. These grooves are readily accessible for welding and provide sufficient welding strength. Inasmuch as the two halves do not come together the welding applied to these grooves will also tack weld the wear cap to the roller, further ensuring rigidity of the construction in operation so that there will be no wear between the parts.

Further objects and advantages will become apparent from the following description taken in conjunction with the drawings in which:

FIGURES 1A and 1B are vertical sections illustrating two ends respectively of an embodiment of the invention;

FIGURES 2 is a partial section as viewed at line 2—2 of FIG. 1A;

FIGURE 3 is a partial section as viewed at line 3—3 of FIG. 2; and

FIGURE 4 is an elevational view of the two parts that are employed to form one of the wear caps of the present invention.

Although the following disclosure offered for public dissemination is detailed to ensure adequacy and aid understanding, this is not intended to prejudice that purpose of a patent which is to cover any new inventive concept therein no matter how others may later disguise it by variations in form or additions or further improvements.

This, and the claims at the end thereof are intended as the chief aid toward this purpose; as it is these that meet the requirement of pointing out the parts, improvements, or combinations in which the inventive concepts are found.

The drawings illustrate one of the rolls, generally 10, employed in a combined screen and feeder for rock or the like. As is more fully described in Patent 2,973,093 such machine employs a plurality of generally elliptical rolls interconnected to each other and to a suitable power means for rotating the rolls. The connection between the rolls, such as a driving chain, is such that adjacent rolls have the major axis of their elliptical cross section 90° out of phase with each other. The rolls 10 are rotatably mounted in the side members of a frame generally 11. Frame 11 has a smooth surface 12 which define a hopper or upwardly projecting side retaining walls to maintain a deep load on the bed of rollers 10.

Each of the rollers 10 includes a body 14 cast with an opening 15 therein. At each end are end walls 16 into which are fitted sleeves 17 to support the roller snugly on a dowel shaft 18.

As best seen in FIG. 2, body 14 is elliptical in shape and thus described as having a relatively small minor axis and a relatively large major axis. End walls 16 define flange disks 19 at their ends, these being best seen in FIG. 3 as flanges to which the numerals 19 are applied. Flange
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A keyway 20 extends through flange disk 19 parallel to the major axis. About the exterior of body 14 are a plurality of wear caps 22 defined by two segments 22A and 22B (Figs. 2 and 4). All of the intermediate wear caps 22 are identical and have a rib 23 at each side of which are cufifs 24. However, the end wear caps 25 have only one cufif 24 at one side and two rib 23. To aid in axially positioning the wear caps on body 14, the body has a plurality of tapping, best seen in Fig. 3. Thus, the ellipses at lines 26 are slightly larger than the ellipses at lines 27 with the body tapering between these two lines. Wear caps 22 and 25 are similarly tapered so that when the wear caps are snugly fitted about the body and welded together, the tappers will interlock or resist axial displacement of the wear caps along the body. In addition, flange disks 19 about the end wear caps 25 as best seen in Fig. 3 to hold the wear caps against serious axial displacement with complete safety.

The two segments 22A and 22B of the wear caps are assembled in situ about the body, and temporarily clamped in place. Preferably, the wear caps are not identical to half-ellipses so as to be clamped firmly to the body 14 and not seated on each other before doing so. Cuffs 24 have beveled portions 28 at each end thereof (Fig. 4). When two segments, 22A and 22B, are fitted in place about the body, beveled portions 28 form a "Y" shaped scarf or welding groove. The two segments are thus welded together along the adjacent ends of the cuffs 24, forming welds 29. Preferably, this is performed by arc welding. Because of the scars, the weld will be sufficiently deep to at least tack weld the wear caps to body 14. This holds the wear caps against minor displacement on the body which would cause wear or fretting corrosion. Such tack welds will not prevent the reconditioning of the rolls. After a roll has been used and disassembled from the machine for rehabilitation (as hereinafter described), the wear caps can be cut and any tack welds which remain can be broken loose as by means of a chisel.

At one end roll 10 is supported by a driving hub 31 and at the other, by a driven or idle hub 32 (Figs. 1A and 1B respectively). Hub 31 is rotatably mounted in a bearing assembly 33 which includes bearing rollers 34. Similarly, hub 32 is rotatably mounted in a bearing assembly 35 which includes bearing rollers 36. The bearing assemblies are constructed and arranged to hold the hubs against axial displacement with respect to frame 11 and to be self-aligning. The bearing assemblies include grease seals 37—40. They are provided suitable conduits through which grease may be introduced into the roller bearings from grease fittings 41 and 42 respectively. Bearing housings 43 and 45 of the parts therein are interchangeable between the two sides.

The hub of the sprocket assembly 45 is mounted on the end of hub 31 with the two being interlocked against rotation with respect to each other by means of a keyway 46. A washer 47 seats against the outer face of sprocket assembly 45. A bolt 48 extends through washer 47 and the adjacent portion of hub 31 and is threaded into the adjacent hub 32 of dowel shaft 18. At the other end of dowel shaft 18 a lock ring 49 abuts collar 50 of bearing assembly 35 and may be held in place by capping into a groove 51 in dowel shaft 18. A key 52 is affixed to dowel shaft 18 by means of screws 53. Key 52 slides in a keyway 54 in hub 32. At the end of hub 31 which faces roll 10 is a radially aligned slot 57. Two keys 58 are fitted in slot 57 and held in place by screws 59. As best seen in Fig. 3, keys 58 are received in keyway 20 at the end of the rolls. Similarly, hub 32 has a slot 60 in which are keys 61 held in place by screws 62. Keys 61 are received in a keyway 20 at the corresponding end of the roll. Each end of roll 10 is identical whereby the rolls may be removed and reversed end for end if desired to compensate for uneven wear. Otherwise, no care is necessary when inserting the rollers to choose either end-for-end position.

In normal operation, chains 65 engage the sprockets on sprocket assembly 45 to interconnect the various rollers with each other and with the source of power. Hold-down guides 66 are used where the chains run in a straight line. After the wear caps on a roll have been worn to an extent such that it is desired to repair or replace them, the entire roll can easily be removed from the machine for this purpose. To this end bolt 48 is removed to free dowel shaft 18. Dowel shaft 18 can then be moved toward the opposite end (to the right of the roll in Fig. 1A and 1B). Threaded socket 66 in the end of dowel shaft 18 is provided for a puller screw. Upon the removal of the dowel shaft, roll 10, if turned with its keys 58 and 61 vertical, is free to move vertically and it is then lifted out. Depending upon the circumstances, usually a new or newly rebuilt roll is immediately substituted. In any event, the roll to be replaced is aligned so that keyways 20 fit about keys 58 and 61 in hubs 31 and 32 respectively. The replacement roll then is lowered into place until its axial opening is roughly aligned with the axial openings in the hubs 31 and 32. Dowel shaft is then inserted from the end to which it was removed. Taper 68 on its threaded ending end completes the alignment of parts. The dowel shaft is turned so that key 52 is aligned to enter keyway 54 in hub 32. When the dowel shaft is in place, bolt 48 is threaded into the shaft and tightened to pull the assembly tight and to lock the shaft in place. The roll now is all secured as a unit. Keys 58 and 61 at the ends of the roll lock the roll to hubs 31 and 32 against relative rotation while dowel shaft 18 maintains the axial alignment of the three parts. Key 46 ensures that hub 31, and hence the roll assembly, will rotate with sprocket assembly 45. Key 52 ensures that dowel shaft 18 will rotate with hub 32, and thus, with roll 10, hub 31 and sprocket assembly 45. The entire rotating assembly is thus locked tight, functioning as a rigid or integral construction and preventing any fretting corrosion.

The replacements are made with a minimum of "down" time. The removed rollers may be substituted for the shop for leisurely rebuilding in the most efficient manner. This may mean burning the wear caps loose and applying replacement wear caps as described. If they do not need replacement, or if the roller has no replaceable wear caps, the worn areas can be restored by building up with welding.

The removal of the rolls makes replacement of the wear caps of this invention quite easy. The wear cap features have advantages with other rolls, too, however. For example, they fully protect the roller body from any possible shallowness of the wear caps and roller body ensure proper axial positioning while still leaving the roller body of substantially full strength, with all metal contributing to the strength. The interfitting ellipses ensure, at the same time, proper angular positioning of the wear caps on the body. A very small amount of welding in a relatively protected position is all that is needed.

We claim:

1. In an apparatus of the class described having a plurality of rollers rotatably mounted on a frame, the improvement comprising: a driving hub journalled on said frame; a driven hub journalled on said frame; a roller extending between said hubs; dowel shaft means extending axially through said hubs and said roller and releasably affixed in place, and when released axially removable from said roller to permit said roller to be removed from between said hubs while the body remains in the operating position; said driving hub and the adjacent end of the roller having a radially positioned keyway on one and an interlocking key on the other to operatively interconnect the two while permitting the removal of the roller after the shaft has been removed.

2. In an apparatus of the class described having a plurality of rollers rotatably mounted on a frame, the im
provement comprising: a driving hub journaled on said frame; a driven hub journaled on said frame; a roller extending between said hubs; dowel shaft means extending axially through said hubs and said roller and releasably affixed in place, and when released axially removable from said roller to permit said roller to be removed from between said hubs while the hubs remain in the operating positions; said hubs and the adjacent ends of the rollers having a radially positioned keyway on one and an interlocking key on the other to operatively interconnect the two while permitting the removal of the roller after the shaft has been removed.

3. In an apparatus of the class described having a plurality of rollers rotatably mounted on a frame, the improvement comprising: each roller being mounted between a driving hub and a driven hub with each hub and the adjacent portion of the roller defining a pair of adjacent ends; a dowel shaft extending axially through the roller and into the two hubs and being axially moveable with respect to the three; means to releasably restrain said shaft against axial movement; an anti-friction bearing means rotatably mounting the driving hub on said frame and restraining the driving hub against axial movement; an anti-friction bearing means rotatably mounting the driven hub on said frame and restraining the driven hub against axial movement; a radially positioned keyway on one end of each pair of adjacent ends; a key on the other end of each pair of adjacent ends and received in the respective keyway to permit said roller to each hub against relative rotational movement between the hub and the roller while permitting radial movement of the roller when the shaft is removed and while the hubs remain in their operating positions; and means connecting said shaft to one of said hubs to cause said shaft to rotate therewith.

4. A roller body having a dowel passage along its longitudinal axis, having an elliptical cross section, having ends lying generally in radial planes perpendicular to the axis but having on each end a key formation with surfaces on the sides of the formation perpendicular to a common plane and at predetermined disposition with respect to the major axis of the elliptical cross section, to permit sliding said roller transversely into and out from between correspondingly keyed hubs.

5. A roller body having a dowel passage along its longitudinal axis, having an elliptical cross section, having ends lying generally in radial planes perpendicular to the axis but having on each end a key formation with surfaces on the sides of the formation perpendicular to a common plane and at predetermined disposition with respect to the major axis of the elliptical cross section, to permit sliding said roller transversely into and out from between correspondingly keyed hubs.

6. A roller body having a dowel passage along its longitudinal axis, having an elliptical cross section, having ends lying generally in radial planes perpendicular to the axis but having on each end a key formation with surfaces on the sides of the formation perpendicular to a common plane and at predetermined disposition with respect to the major axis of the elliptical cross section, to permit sliding said roller transversely into and out from between correspondingly keyed hubs.

7. A roller body having a dowel passage along its longitudinal axis, having an elliptical cross section, having ends lying generally in radial planes perpendicular to the axis but having on at least one end a key formation with surfaces on the sides of the formation perpendicular to a common plane and at predetermined disposition with respect to the major axis of the elliptical cross section, to permit sliding said roller transversely into and out from between correspondingly keyed hubs.

8. In an apparatus of the class described having a plurality of rollers rotatably mounted on a frame, the improvement comprising: each roller being mounted between a driving hub and a driven hub with each hub and the adjacent portion of the roller defining a pair of adjacent ends; a dowel shaft extending axially through the roller and into the two hubs and being axially moveable with respect to the three; means to releasably restrain said shaft against axial movement; an anti-friction bearing means rotatably mounting the driving hub on said frame and restraining the driving hub against axial movement; an anti-friction bearing means rotatably mounting the driven hub on said frame and restraining the driven hub against axial movement; a radially positioned keyway on one end of each pair of adjacent ends; a key on the other end of each pair of adjacent ends and received in the respective keyway to connect the roller to each hub against relative rotational movement between the hub and the roller by means of surfaces all perpendicular to a common plane to permit radial movement of the roller when the shaft is removed and while the hubs remain in their operating positions; and means connecting said shaft to one of said hubs to cause said shaft to rotate therewith.

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