June 2, 1925. 1,540,483

R. LANG

WOOD GRINDER

Filed March 29, 1924 2 Sheets-Sheet 1

Fig:1.

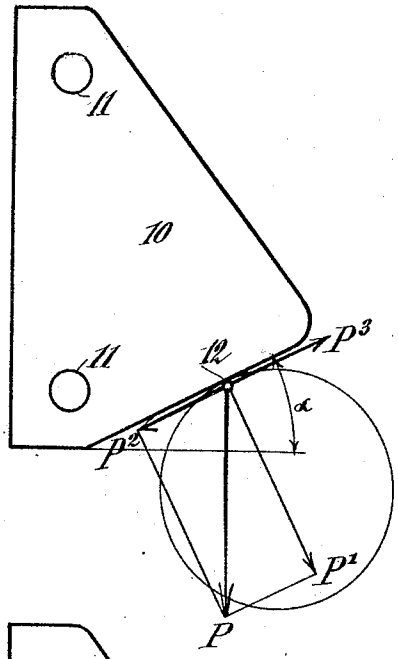
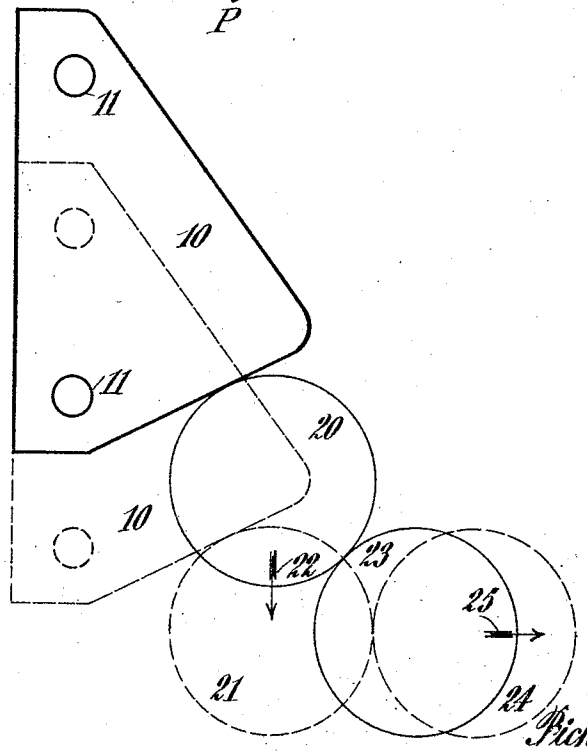


Fig:2.



INVENTOR
Richard Lang
BY C. P. Goepel
ATTORNEY.

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Fig:3.

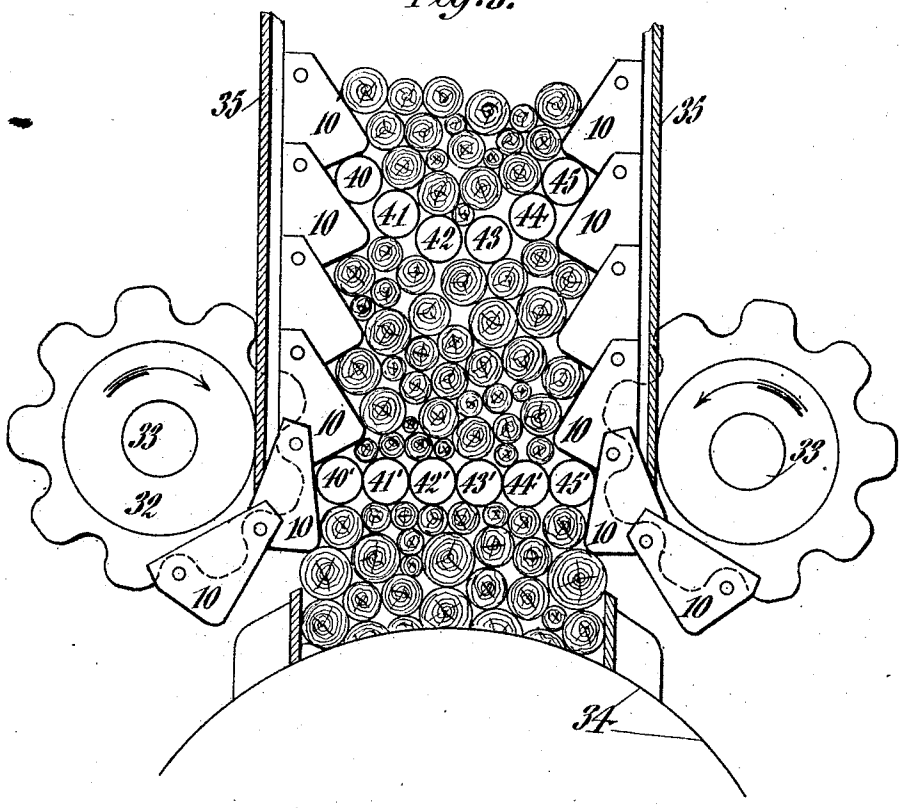


Fig:4.

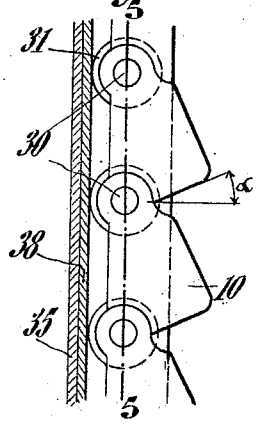
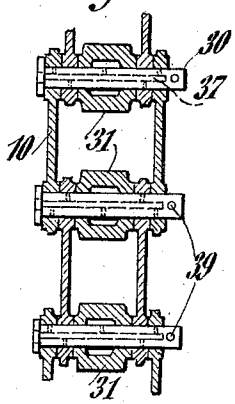


Fig:5.



INVENTOR

Richard Lang

BY C. P. Goepel

ATTORNEY

Patented June 2, 1925. 1,540,483

UNITED STATES PATENT OFFICE.

RICHARD LANG, OF WURTTEMBERG, GERMANY, ASSIGNOR TO AMERICAN VOITH CONTACT COMPANY, INC., OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

WOOD GRINDER.

Application filed March 29, 1924. Serial No. 702,712.

To all whom it may concern:

Be it known that I, RICHARD LANG, a citizen of the Republic of Germany, and a resident of Heidenheim a. d. Brenz, Wurttemberg, Germany, and temporarily residing in the city, county, and State of New York, have discovered certain new and useful Improvements in Wood Grinders, of which the following is a specification.

This invention relates to wood grinders, having for their object the grinding of wood into pulp, used in the manufacture of paper. Particularly the invention has for its object the improvement of the feeding devices of grinders with continuous feed.

In the prior art, the feed of the wood charge against the grind stone is brought about by chains along the sides of the magazine or hopper. When the chains move faster than the charge of wood blocks is ground, there will arise a compacting action which increases the pressure in the interior of the wood column, and thereby the total charge is fed like a solid mass of wood against the grinding stone. This presents certain disadvantageous features known to one skilled in the art.

My present invention utilizes the principle embodied in wedge-shaped link chains, wherein the excess of speed of the feed chains over the speed of the charge brings about a sliding movement between the wedge surfaces of the links of the chains and the adjoining wood blocks whereby these wood blocks are shifted in a lateral direction against the adjoining blocks in the charge, which in their turn transmit this movement to the interior of the charge. Heretofore, however, the angle of the surface of the wedge-shaped links with the horizontal was such that a sliding action took place as the wedge-shaped links moved downwardly through the hopper or magazine. For certain kinds of wood, such sliding action between the charge and the wedge-shaped links failed to give a satisfactory compacting action of the charge against the grindstone.

My invention consists in providing wedge-shaped links of such a structure that a non-sliding grip between the charge and wedge-shaped links is obtained, and preferably this is accomplished by providing the surfaces of the wedge-shaped links with an inclination in respect to the horizontal, equal to or less than the angle of repose.

My invention involves certain other features of novelty and will be hereinafter more fully described, shown in the drawings and finally pointed out in the claims.

In the accompanying drawings,

Figure 1 is a diagrammatic view of an individual link of the wedge chain, in which the lower surface of contact forms an angle equal to or smaller than the angle of repose.

Figure 2 is a diagrammatic view of an individual link, showing its action on a wood charge,

Figure 3 is a central vertical sectional view of a grinder with a continuous feed, having embodied therein, wedge-shaped links in accordance with my invention.

Figure 4 is a partial side view of my improved wedge-like links, showing the manner in which they are mounted and

Figure 5 is a sectional view taken on line 5—5 of Figure 4.

Similar characters of reference indicate corresponding parts throughout the various views.

Referring to the drawings, and more particularly to Figure 1, there is shown a link 10 having shaft openings 11, in which link the lower surface of contact indicated by 12 forms with the horizontal line an angle equal to or smaller than the angle of repose, that is, an angle about less than 26° to 30°. It is well known that the angle of repose for sliding friction between a dry surface of metal and wood, is between 26° and 30°. The angle shown in Figure 1 is about 26°. The downward pressure P of the link 10 is divided, as will be seen from Figure 1, into a component P_1, normal to the surface of contact 12, and a component p_2 parallel to this surface. When sliding occurs, the component p_1 produces a frictional resistance P_3. The condition for sliding is:

P_2 larger than P_3.

With $P_1 = P \, x \cos \alpha$

$P_2 = P \, x \sin \alpha$

$P_3 = fo \, x \, P \, x \cos \alpha$

where *fo.* is the coefficient of sliding friction.

It follows that $P \, x \sin \alpha$ larger than $fo. \, x \, P \, x \cos \alpha$

It results therefrom: tan α larger than

fo. $fo = \tan f$, where f the angle of friction, lies between 26° and 30°, as aforesaid.

All wedges, with a surface to the horizontal having an angle greater than the angle of repose, produce a sliding action between said surface and the wood block, until the maximum compacting effect on the charge of wood blocks which can be obtained with the selected angle of the wedge, is accomplished.

To overcome this sliding action and still obtain a compacting action, my improved wedge surface inclination to the horizontal has an angle of contact equal to or smaller than the angle of repose. For certain wood conditions it is of advantage that no sliding between links and wood blocks should take place. No sliding action between link and wood block will occur if the angle, which the surface of contact forms with the horizontal, is equal to or smaller than the angle of repose.

In Figure 2 is shown a link of such design. It is the object of this invention to use links with an angle between surface of contact and horizontal, from O° up to the angle of repose. Such links can no longer be called sliding wedge links, because they produce a non-sliding grip between the links and the wood blocks. When the link 10 moves downward into dotted line position, as shown in Figure 2, the wood block 20 follows the arrow 22 in a stoneward direction and comes into the position 21, at the same time pushing the wood blocks 23 in the direction of the arrow 25, laterally into the position 24. It will readily be seen that with such links a similar final compacting action on the mass of wood blocks will be obtained, as with a link of the sliding wedge shape type, the difference, however, being that with a sliding wedge the wood block will move down diagonally inward, whereas with a non-sliding wedge, a vertical downward movement of the block is made possible, and simultaneously the other blocks will be pushed inwardly by downward moving block 20. A direct downward pressure is seen to first result followed by a laterally inward pressure, and hence, a more advantageous effect is obtained for certain kinds of wood.

In Figure 3, the application of a chain with links that produce a non-sliding engagement with the logs is shown in a grinder with continuous feed, having a hopper or magazine. In this figure, the chain links 10 are supported on the shafts 30, having rollers 31, which pass over sprockets 32 on shafts 33, which drive the chains. The grind stone 34 is below the hopper or magazine 35. A series of adjoining wood blocks in the upper part of the hopper or magazine is indicated by 40, 41, 42, 43, 44, 45. While some other contact of these maye be shown in the drawings, there is not necessarily contact. In practice, a space may exist between them. The hopper 35 serves as a receptacle for the wood blocks and supports the guide strips on which the chain links move. The feed chains are moved with an excess of speed to that with which the wood is ground on the stone.

As will be seen from Figure 3, the charge in the hopper or magazine has a series of wood pieces or blocks subjected to a simultaneous direct downward and laterally inward pressure, whereby the blocks subjected to such pressure take the position of a catenary, for instance, as shown in Figure 3, by 40 to 45, though not necessarily in contact. As this series of blocks, for example, move stoneward, they become compressed in the manner as shown in the series designated 40′, 41′, 42′, 43′, 44′ and 45′. In other words, this catenary pressure distribution gradually takes a distribution of a more or less straight line substantially transversely to the movement of the charge in the hopper or magazine as it moves against the stone. It will be noted that as the wood block 40, for instance, moves, it first moves directly downward, that is, in a vertical direction, then tilts and gives to the adjacent wood block an inward movement. The wood blocks 40 and 45 tilt, as stated, in the nature of a swivel action because they are not fixedly held by the links, though held in a non-sliding grip. The blocks while held in a non-sliding grip are free to move in respect to the links though remaining in contact therewith, while substantially maintaining their initial contactual position.

In Figure 4, a design of the chain in somewhat larger scale than in Figure 3 is shown. The link wedges 10 are carried on rollers 31 by means of shaft 30, held in place by pins 39. The rollers 31 project beyond the inside edges of the links, so that when pressure is applied to the links, the rollers instead of the inner faces of the links will move on the guide strips 38 of the hopper 35, thereby avoiding all sliding friction between the links and the guide strips. The shafts 30 are bored out with passages 37, and filled with lubricating material which, through small holes emanating from the bore and ending on the surface of the pins, lubricates both roller 31 and links 10.

It is to be understood that, without departing from the spirit of my invention, the surfaces of contact of the wedge-like non-sliding links may be other than as shown by straight lines as in Figures 1 and 4. They may also be curved, so as to suit the shape of the wood blocks, the essential point being that the mean profile of the contact surface of the wedge, where it comes into contact with the wood blocks, has

throughout an angle equal to or smaller than the angle of repose, which will allow of a non-sliding grip of the wedges or links on the wood blocks.

My invention when applied to grinders with continuous feeds, for example, has the advantage of giving a very efficient operation. The angle of impact of the wedges or links may be varied to some extent within the limits indicated, and thus the grinder may be peculiarly adapted to particular kinds of woods. Suitable calculations of one skilled in the art may readily enable this adaptation to be made. Particular constructions may also be made, in which the surfaces are suitably adjustable to different kinds of woods.

My invention is not limited to the details of construction shown in figures, since suitable changes may be made without departing from the spirit of the invention as defined in the appended claims.

I claim as new:

1. A wood grinder of the continuous working type, comprising a grinding element, a magazine above the same, and an endless feed chain at opposing sides of the magazine, for positively feeding a charge of wood blocks against the grinding element, said feed chains consisting of wedge like links each having its lower charge-pressing surface of contact inclined against the horizontal under a fixed angle not greater than the known angle of repose between wood and metal, for providing a non-sliding gripping engagement between the said surface of contact and the surface of the wood blocks.

2. A wood grinder of the continuous working type, comprising a grinding element, a magazine above the same, an endless feed chain at opposing sides of the magazine for positively feeding a charge of wood blocks against the grinding element, said feed chains consisting of wedge like links each having its lower charge-pressing surface of contact inclined against the horizontal under an angle not greater than the angle of repose between wood and metal, for providing a non-sliding gripping engagement between the said surface and the surface of the wood blocks of the charge, and means for moving the feed chains in excess of the speed with which the wood blocks are ground on the grind stone.

3. In a wood grinder, a feed chain formed on a plurality of links, members thereon, each having a charge-pressing surface of contact with the horizontal at an angle not greater than the angle of repose between wood and metal, whereby said members are adapted for a non-sliding gripping engagement with the surface of the wood blocks, rollers, supporting the links and of such diameter as to project beyond the inner edges of the links, and shafts for the rollers, said shafts being bored for taking a lubricant.

4. In a woodgrinder, charge-engaging means having its charge-pressing surface forming an angle not substantially greater than a fixed angle of 30 degrees to the horizontal.

5. In a woodgrinder, charge-engaging means having its charge-pressing surface forming an angle not substantially greater than a fixed angle of 30 degrees with the horizontal, and means for adjusting said angle to adapt it to various kinds of wood to be ground.

6. In a wood-grinder, charge-feeding means, having members immovably fixed thereto, the lower charge-pressing surface of the members adapted to non-slidingly and grippingly engage the logs of the charge under an angular relationship between said lower charge-pressing surface to the horizontal not greater than the angle of repose between wood and metal.

7. The method of grinding wood, which consists in subjecting the marginal wood of a charge to be ground independently and separately from each other, to a simultaneous direct downward and lateral inward pressure under direct contact with the feeding means engaging the surface of the blocks only without the aforesaid marginal wood laterally changing its position with respect to the walls of the magazine from the upper portion thereof to the grindstone, for compacting the charge as it is fed to the grindstone, whereby the said marginal wood blocks transmit their direct pressure to blocks in a substantially catenary alignment, and change said catenary alignment to a substantially transverse straight line alignment as the charge approaches the grindstone.

8. The method of grinding wood, which consists in subjecting the lateral marginal blocks of the charge of wood to be ground independently and separately to a direct stoneward movement along the walls of the magazine without the lateral marginal blocks changing their initial distance from the walls of the magazine during their movement from the upper part of the magazine to the grindstone, and without lateral inward movement in respect to the walls of the magazine, while under continuous engagement with the surface only of the wedge blocks.

9. In a wood grinder, a feed chain formed of a plurality of links, members thereon, extending throughout the depth of the magazine with a charge pressing surface of exactly or approximately the whole length of the wood blocks and forming in the cross section an angle with the horizontal not greater than the angle of repose between

wood and metal, whereby said members are adapted for non-sliding gripping engagement with the surface of the wood blocks.

10. In a wood grinder, a plurality of endless feed chains on opposing sides of the magazine and each formed of a plurality of links, members connecting corresponding links of the chains and extending throughout the depth of the magazine with a charge pressing surface of exactly or approximately the whole length of the wood blocks and forming in the cross section an angle with the horizontal not greater than the angle of repose between wood and metal, whereby said members are adapted for non-sliding gripping engagement with the surface of the wood blocks.

In testimony that I claim the foregoing as my invention and have signed my name hereto.

RICHARD LANG.