CRUSHER FOR RECONDITIONING SACKED MATERIAL

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My invention relates to devices for crushing or re-pulverizing sacked material such as sugar or the like which has partially hardened or become lumpy. When sacked sugar, or like material has been placed in a damp atmosphere or has been stored for a considerable length of time, it partially hardens becoming lumpy and it is necessary to thoroughly break up the lumps in order to recondition it for commercial use.

The present method of reconditioning such material while in sacks is to manually drop the sack several times on a hard base and sometimes further pound the same with hammers or the like which is a slow operation, injures the sack, and is necessarily unsatisfactory, inefficient and uneconomical; and the principal object of the present invention is to devise a simple and efficient device which will thoroughly recondition sacked material without harming the sacks.

My invention consists principally in a crushe device comprising a framework, a pair of oppositely disposed vertical crushe rolls of cylindrical shape mounted therein, and two pairs of oppositely disposed horizontal crushe rolls mounted in said framework, one of said pairs of horizontal rolls being of cylindrical shape and the other of longitudinally concave shape. My invention also consists in the parts, combinations and arrangements of parts hereinafter described and claimed.

In the accompanying drawings which form part of this specification and wherein like reference numerals refer to like parts wherever they occur:

Fig. 1 is a plan view of a crushing device embodying my invention;

Fig. 2 is a right hand side view of the device shown in Fig. 1; and

Fig. 3 is a left hand side view of said device. As illustrated in the drawings, my device in general comprises a framework 1, a pair of oppositely disposed vertical cylindrical rolls 2 mounted in the forepart of said framework, a pair of oppositely disposed horizontal cylindrical rolls 3 mounted in the middle part of said framework, and a pair of oppositely disposed horizontal concave rolls 4 mounted in the rear part of said framework. A sack of sugar or the like to be crushed and reconditioned by my device, is delivered by suitable means to the vertical rolls 2 and in the forepart of the framework, and the middle horizontal rolls 3 are located and adapted to receive the sack as it passes from between the vertical rolls, whereas the rear concave rolls 4 are adapted to receive said sack as it emerges from between the middle horizontal rolls and preferably, the first two pairs of rolls are corrugated to insure proper feeding action and help knead the sack. It is obvious, that by using the above combination of rolls, all portions of the sack of material are thoroughly engaged and crushed, as the vertical cylindrical rolls 2 crush the side portions of said sack, the middle horizontal cylindrical rolls 3 crush the top and bottom portions of said sack and the concave rolls crush the edge portions of said sack left untouched by the other rolls.

While any suitable type of framework may be used in which to mount the various rolls, I have shown a rectangular-shaped framework 1 comprising bottom longitudinal side members 5 and transverse end members 6 supporting upright members 7 at each corner, said upright members supporting top longitudinal side members 8 and transverse end members 9. In order to strengthen the framework 1, and to provide bases for mounting various portions of the roll driving means thereon, two suitable upright members 10 are secured to the top and bottom longitudinal side members intermediate the ends of the frame, and intermediate transverse top and bottom members 11 are secured to the ends of said upright members 10. Preferably the framework as a whole is mounted on four suitable ball bearing swivel truck castors 12, each of which is mounted on the bottom longitudinal side members 5 near an end thereof, so that the device as a whole is portable and can be moved to any desired location in the warehouse or building in which it is being used.

Each of the vertical rolls 2 is mounted in a yoke-shaped bracket 13 comprising top and bottom branches 14 extending integrally from a large cylindrical sleeve 15 which is mounted for rotation on a vertical shaft 16 and said shaft 16 is mounted in vertical bearings 17 extending from the forward corner upright member 7. Each vertical roll 2 is rigidly mounted on a shaft 18 which is mounted in bearings 19 provided in enlarged circular end portions of the branches 14 of the yoke-shaped bracket. Preferably, in order to insure smooth operation of the rolls, suitable anti-friction bearings 20 are interposed between the bottom of the vertical roll hubs 2 and the circular end portions of the bottom branches 14; and also suitable anti-friction bearings 21 are interposed between the bottom of the rotatable cylindrical sleeves 15 and the bottom bearings 17.

It is obvious from the foregoing description, that since the branches 14 of the yoke-shaped brackets 13 are free to rotate about their supporting ver-
tactical shafts 16, the vertical rolls 2 are capable of swinging horizontally, and hence the distance between the two vertical rolls may be varied. A spring 22 is secured to each of the top bracket 5 branches 14, which spring 22 yieldably resists separation of the rolls 2 but will allow them to separate in case an extremely hardened sack passes between said rolls.

Each pair of horizontally disposed rolls are mounted in a similar manner, each of the bottom rolls 3 and 4 being rigidly mounted on transverse shafts 23 supported in bearings 24 extending from the bottom longitudinal side members 5. Each of the top horizontal rolls is rigidly mounted on top transverse shafts 25, the ends of which shafts are rotatably mounted in the free ends of arms 26 extending from auxiliary top transverse shafts 27 which are supported near each end in brackets 28 extending downwardly from the top longitudinal side members 8. Said arms 26 are rotatably mounted on the shafts 27 and hence the top rolls 3 and 4 are capable of swinging toward or away from their cooperating bottom rolls and in order to locate and hold the top rolls directly above the lower rolls, diagonal supporting rods 29 are bent and inserted in holes provided in the rotatably mounted arms 26, and extend to the rear intermediate and end transverse members, the rods 29 supporting the middle portion of the intermediate rear top transverse member 11, and the rods holding the top concave roll being secured to the end transverse member 9. The rods 29 are not rigidly secured to the transverse members but fit loosely extend through openings provided therein, and springs 30 extending between the end portions of said rods 29 are secured to nuts 31 on the ends of said rods and to the transverse members, whereby the top horizontal rolls can give by rising upwardly in case an overly hardened sack is being crushed between the rolls thereby preventing injury to the sack.

The lower transverse shaft 23 on which the lower middle horizontal cylindrical roll 3 is mounted is operatively connected at one end to a suitable gear speed reducer 32 which is driven by a motor 33 of any suitable type mounted on the framework. The other end of said shaft 23 is provided with a bevel gear 34 which meshes with a second bevel gear 35 mounted on a longitudinal shaft 36 which is operatively connected to the various other rolls to drive the same and which is supported at its two ends and near the center by bearings 37 extending from the side longitudinal member 5. Said longitudinal shaft 36 is provided at its forward end with a bevel gear 38 which intermeshes with a second bevel gear 39 mounted near the bottom of the vertical shaft 10 on which the cylindrical yoke-shaped bracket 9 there is rotatably mounted at that side of the framework.

The top of said shaft 16 is provided with a sprocket wheel 40 which drives a sprocket chain 41 which in turn drives another sprocket wheel 42 mounted on the top of the vertical roll shaft 18. The vertical roll shaft 18 on the other side of the framework is also provided at its top with a sprocket wheel 43 driven by a sprocket chain 44 which in turn is driven by a sprocket wheel 45 mounted at the top of the vertical bracket shaft 16 on that side of the framework.

In order to drive the rolls simultaneously from the main longitudinal shaft 26, a transverse shaft 46 mounted in bearings 47 extending from the bottom longitudinal side members 5 is provided with bevel gears 48 on each end which intermesh with bevel gears 49 provided on the bottom of each vertical shaft 16.

Each of the two top horizontal rolls is driven by means of sprocket chains 50 engaging sprocket wheels 51 provided at one end of the shafts 26 on which they are mounted, and sprocket gears 52 mounted on the top transverse shafts 27. Said shafts 27 are provided with bevel gears 53 at one end, said bevel gears 53 intermeshing with bevel gears 54 provided on the top of vertical shafts 55 which are mounted in bearings 56 secured to the side upright members 10, said shafts 55 having bevel gears 57 provided on their bottom which intermesh with bevel gears 58 mounted on the main longitudinal shaft 36.

The rear end lower horizontal concave roll 4 is driven by means of a bevel gear 59 provided on the end of the shaft 23 on which said roll 4 is mounted, said gear 59 intermeshing with another bevel gear 60 provided on the rear end of the main longitudinal drive shaft 36.

While any suitable means may be used for delivering sacks to my device, I prefer to use an endless conveyor 61 of the pusher bar type adapted to deliver articles between the two vertical rolls, the carriage 62 of said conveyor traveling from the end of a suitable horizontal bracket 63 extending from the forward end of the rectangular framework 1, to about the middle horizontal rolls and passing just below the bottom of the vertical rolls. Said conveyor 61 comprises sprocket wheels 65 mounted on a shaft 64 provided on the forward end of said bracket 61, sprocket wheels 66a mounted on a shaft 65 extending between the upright members 10, and sprocket chains 66 provided with pusher bars 66a traveling around said sprocket wheels. Preferably, the conveyor is operatively connected to the roll driving means through an endless chain 61 mounted around a sprocket wheel 68 on the 115 shaft 65 and sprocket wheel 69 on the lower middle roll transverse shaft 23.

Preferably, in order to properly guide and carry sacks from the middle rolls to the rear ones, a bed of transverse dead conveyor rollers 70 is suitably mounted and arranged by a motor 71 of any suitable type secured to the framework between said rolls and sacks emerging from between the two end concave rolls are received on a suitable table 71 adapted to receive the same, and any suitable means such as an inclined ramp 72 may be used to feed conditioned sacks from said table 71, said sacks being pushed down said ramp by following sacks.

Obviously, as numerous changes may be made in the construction illustrated without departing from the spirit of my invention, I do not wish to be limited to the precise construction shown and described.

What I claim is:

1. A crusher device comprising a framework through which a sack of material is adapted to travel, a pair of vertical cylindrical rolls mounted in said framework placed opposite each other at the sides of the line of travel of said sack adapted to crush the sides of said sack, a pair of horizontal concave rolls mounted in said framework placed opposite each other above and below the line of travel of said sack adapted to crush the top and bottom portions of said sack, and a pair of horizontal concave rolls mounted in said framework placed opposite each other above and below the line of travel of said sack adapted to crush the side edge portions of said sack.

2. A machine for reconditioning sugar or like material hardened in sacks which comprises...
framework, a pair of spaced apart vertically disposed crusher rolls rotatably mounted on said framework, a pair of horizontally disposed rolls rotatably mounted on said framework so as to exert crushing pressure on a sack between them, a pair of concave rolls rotatably mounted on said framework so as to exert pressure on a sack radially of their concave surfaces, and means for feeding sacks to said first, second and third pairs of rolls in succession whereby the cross sectional shape of the contents of the sack tends to change towards a circle.

3. A machine for reconditioning sugar or like material hardened in sacks which comprises a framework, a pair of vertically disposed crusher rolls mounted on said framework for rotation and transverse bodily movement relatively to each other, means for yieldably forcing said rolls toward each other and thereby exerting crushing force against the narrow sides of a hardened sack, a pair of concave rolls mounted on said framework for rotation and transverse bodily movement relatively to each other so as to exert pressure on a sack radially of their concave surfaces, and means for feeding sacks of hardened material to said first and second mentioned pairs of rolls in succession whereby the cross sectional shape of the contents of the sack tends to change towards a circle.

4. A machine for reconditioning sugar or like material hardened in sacks which comprises a framework, a pair of vertically disposed crusher rolls mounted on said framework for rotation and for transverse bodily movement relatively to each other, means for yieldably forcing said rolls toward each other and thereby exerting crushing force against the narrow sides of a hardened sack, a pair of horizontally disposed rolls mounted on said framework for rotation and for transverse bodily movement relatively to each other so as to exert crushing pressure on a sack between them, a pair of concave rolls mounted on said framework for rotation and for transverse bodily movement relatively to each other so as to exert pressure on a sack radially of the concave surfaces of said last mentioned rolls, and means for feeding sacks to said first, second and third pairs of rolls in succession whereby the cross sectional shape of the contents of the sack tends to change towards a circle.

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