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SELF-DRAINING KNIVES AND SCRAPERS FOR SUGAR MILLS

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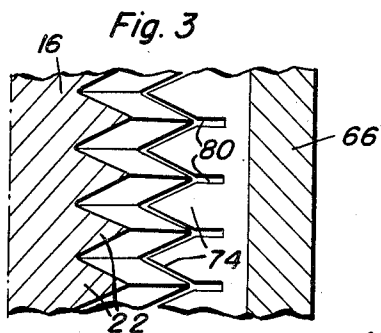


Fig. 3

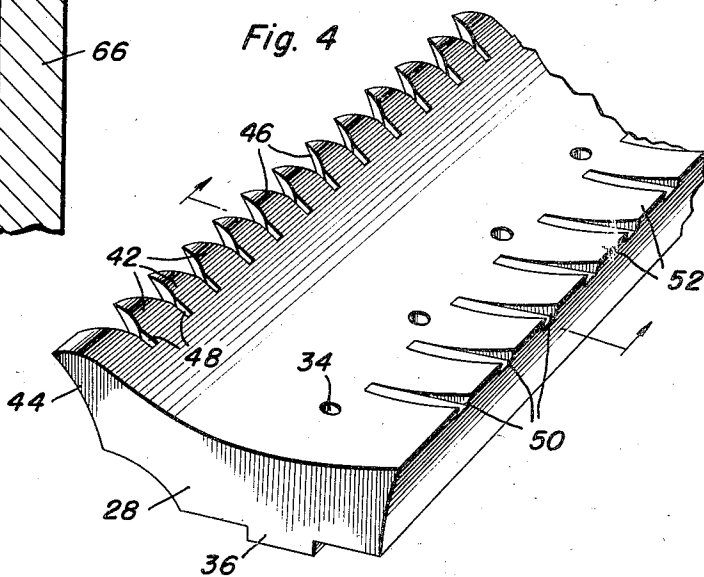


Fig. 4

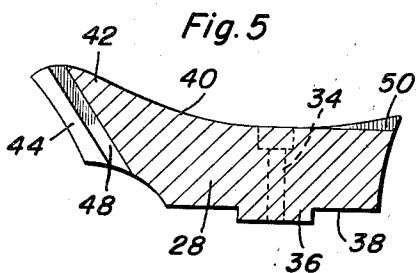


Fig. 5

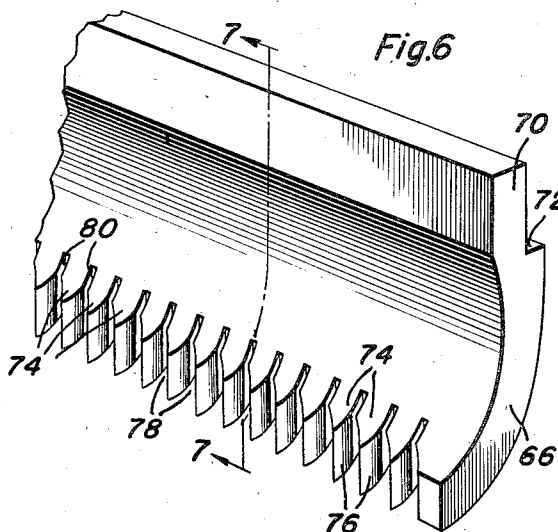


Fig. 6

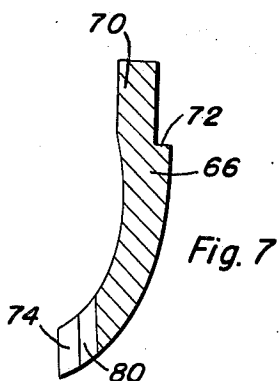


Fig. 7

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1

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SELF-DRAINING KNIVES AND SCRAPERS FOR SUGAR MILLS

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7 Claims. (Cl. 100—174)

This invention comprises novel and useful improvements in self-draining knives and scrapers for sugar mills and generally pertains to an improved turn plate having self-draining knives or teeth together with scrapers having self-draining blades.

The primary purpose of this invention is to provide a knife and scraper construction specifically adapted for use with the crushing and grinding rolls of sugar mills and which will greatly minimize the wear occurring upon the circular knives of the rolls and which will facilitate the drainage of cane juice and bagasse from the cane passing through the rolls.

Yet another object of the invention is to provide a turnplate having integral teeth thereon for cooperating with the lower crushing and grinding rolls together with a scraper blade construction for use with the upper and lower grinding rolls of sugar mill.

These, together with various ancillary features and objects of the invention, which will later become apparent as the following description proceeds, are attained by the present invention, a preferred embodiment which has been illustrated, by way of example only, in view of the accompanying drawings, wherein:

Figure 1 is a fragmentary vertical transverse section through a portion of the conventional form of sugar mill illustrating the association of the upper roller and the lower crushing and grinding rollers together with the turnplate knives and the scraper blades operatively associated therewith;

Figure 2 is a fragmentary horizontal sectional detail view taken substantially upon the plane indicated by the section line 2—2 of Figure 1 and showing the manner in which the turnplate and its knives or teeth are associated with the lower crushing and grinding rollers;

Figure 3 is a horizontal sectional detail view, taken substantially upon the plane indicated by the section line 3—3 of Figure 1 and showing the manner in which the scraper assembly is associated with the upper roller of the mill;

Figure 4 is a fragmentary perspective view of a portion of the turnplate member having two sets of knives or teeth upon its edges for cooperation with the knives of the lower crushing and grinding rollers respectively;

Figure 5 is a transverse sectional detail view taken substantially upon the plane indicated by the section line 5—5 of Figure 4;

Figure 6 is a fragmentary perspective view of a portion of one of the scraper blade assemblies adapted to cooperate with either the upper or lower grinding rollers of the sugar mills; and

Figure 7 is a vertical transverse sectional detail view taken substantially upon the plane indicated by the section line 7—7 of Figure 6.

In the process of producing cane sugar from sugar cane it is customary in the initial stages thereof to pass the sugar cane stalks through a sugar cane mill, whereby the stalks are crushed or broken, are then mashed and

2

finally are ground in order to permit extraction of the sugar cane juice and bagasse therefrom. In such mills, a turnplate is positioned between the usual lower rollers and below the upper roller which cooperates with each of the two lower rollers to assist in guiding the stalks of cane in their passage through the mill. Customarily, this turnplate is fixedly secured in relation to the annular knives of each of these rollers, and while scrapers have been heretofore provided for cleaning the annular knives or the upper and lower grinding rollers, all of these elements have occasioned excessive wear upon the annular knives of the three rollers; and at times have become clogged with the stalks and fiber of the cane and interfered with the extraction of the juice to such an extent that it has frequently become necessary to shut down the mill while the rollers and knives are being cleaned.

It is therefore the primary intent of this invention to provide a construction which will avoid the aforesaid wear upon the knives of the three rollers of the mill; which will facilitate the passage of juice and bagasse from the stalks of cane passing through the rollers; and which will greatly increase the effective life and operation of the rollers and other parts of the sugar mill.

Reference is now made more specifically to the accompanying drawings, wherein like numerals designate similar parts throughout the various views, attention being directed first to Figure 1 wherein it will be seen that stalks of cane indicated at 10 are delivered by a belt conveyor or the like 12 into the sugar cane mill. The latter is of a conventional and known design, including a suitable supporting framework 14 upon which there are journaled three cylindrical rollers. These rollers include an upper roller 16 together with a pair of lower rollers cooperating therewith. These lower rollers consist of a crushing roller 18 and a grinding roller 20. The upper and lower rollers 16 and 18 constituting the crushing rollers of the cane mill are positioned closely adjacent the conveyor 12 whereby the cane stalks delivered thereby will drop down upon the lower roller 18 and be carried thereby between the rollers 16 and 18. The spacing between these rollers is sufficient to crush or sever the cane. Cooperating with the upper roller 16 is the further lower roller 20, which is spaced from the upper roller with a much closer fit than the crushing roller 18 and serves to grind the crushed cane passing the rollers 16 and 18.

To facilitate this crushing, cutting and grinding action, each of the rollers is provided with annular knives indicated at 22 upon the upper roller, at 24 upon the lower crushing roller, and at 26 upon the lower grinding roller.

Disposed below the upper roller 16 and positioned between the pair of lower rollers 18 and 20 is a turnplate 28. This member is removably mounted upon the supporting member 30 carried by or forming a part of the frame 14, being detachably secured thereto as by fastening bolts or the like 32, these bolts extending through the bolt apertures 34, the turnplate structure being more clearly shown in the detail views of Figures 4 and 5.

The turnplate extends along the entire length of the three rollers and upon its bottom surface is provided with a longitudinally extending rib 36 extending below the bottom surface 38 of the turnplate, this rib serving to assist in positioning the turnplate with respect to the lower rollers 18 and 20, and upon the supporting member 30, as will be readily apparent from Figure 1.

The upper surface of the turnplate is concaved in cross-section, as indicated at 40, and is preferably complementary to the periphery or circumference of the upper roller 16 and is equidistantly spaced from the same over the entire area of the surface 40. The clearance between

the surface 40 and the lower portion of the circumference of the upper roller 16 is preferably such as has been found to be most efficient for handling of the sugar cane stalks in the sugar mill.

Upon that edge of the turnplate 28 which is adjacent to the lower crushing roller 18, the turnplate is provided with a plurality of teeth or knives 42 which are tapered so as to be interdigitated with and to fit between the annular knives 24 of the lower crushing roller 18. As will be best apparent from Figures 4 and 5, the lower surface of the turnplate is provided with a rearwardly sloping surface 44 underlying each of the teeth 42. As will be readily apparent from Figures 4 and 5, this sloping under-surface provides V-shaped teeth which fit closely between the adjacent annular knives 24 of the lower crushing roller 18 to provide a close clearance therebetween. Thus, although the turnplate teeth closely approach the knives, they do not mechanically touch the same thereby avoiding wear upon the turnplate and the knives.

Extending between each of the teeth 42 is a V-shaped groove 46 formed upon that edge of the turnplate to receive the V-shaped annular knives. From the inward portion of these grooves there is provided an inwardly extending slot or channel 48 which slopes downwardly through the turnplate from its upper to its lower surface as will be best apparent from Figure 5. Thus, the cane juice and the bagasse extracted from the cane stalks by the upper and lower crushing rollers 16 and 18 may collect in and pass through the grooves and channels to the underside of the turnplate and be collected for further processing. However, the crushed and cut stalks of cane cannot pass between the teeth and the knives and therefore pass across the upper surface of the turnplate to the upper and lower grinding rollers 16 and 20.

The other longitudinal edge of the turnplate 28 is provided with a plurality of drainage channels 50 which lie between a second set of teeth 52 which cooperate with the annular knives 26 of the lower grinding roller 20. As will be apparent from Figure 4, the outer ends of the channels 50 communicate with the space between the knives 26 to further discharge juice and bagasse between the turnplate and the lower grinding roller.

As so far described, it will now be apparent that the turnplate avoids direct mechanical contact with the two lower crushing and grinding rollers, but is in sufficiently close interdigitated relationship with the annular knives as to prevent passage of stalks of cane therebetween, while permitting free flow of juice and bagasse therethrough. At the same time, upper surface of the turnplate passes the cane stalks on the crushing roller to the grinding roller.

A much closer spacing of the teeth of the upper roller and the grinding roller serve to finally comminute and grind the stalks to complete the extraction of juice and bagasse from the same.

In order to maintain the annular knives of the upper roller 16 and the lower grinding roller 20 free of fibers or particles of the cane stalks, which might interfere with their efficient functioning in the grinding operation, there are provided upper and lower scraper members. The latter consists of elongated beams 54 and 56 which may form a part of or be fixedly secured to the supporting frame 14, and which are respectively provided with longitudinally spaced sockets 58 and 60 which by means of fastening bolts 62 and 64, removably secure a pair of scraper members 66 and 68 therein. Since these members are of identical construction, the description of one will suffice for that of the other, and accordingly the member 66 has been illustrated in Figures 3, 6 and 7.

The member 66 extends substantially the entire length of the rollers 16 and 20 and is provided with an up-standing longitudinal rib 70 which is seated in the socket 58 with the shoulder 72 abutting against the ends of the beam 54 to be removably retained in the beam. The member 66 is arcuately shaped transversely of the machine, as will be readily apparent from Figure 7, and at its opposite edge from the rib 70, is provided with a

plurality of blades 74. These blades are provided with V-shaped tooth surfaces 76 on their ends, which are interdigitated with the adjacent annular teeth of the associated roller. As in the case of the teeth on the turnplate, the blades 74 with the surface 76 are closely spaced relative to the annular knives 22 and 26 of the rollers 16 and 20 to provide a close working fit but avoid actual mechanical contact therewith. Thus, any material carried by the knives will be scraped therefrom, but the wear of a direct physical contact between these members will be avoided.

Between each of the scrapers 74 there is provided a groove 78 to provide the above-mentioned clearance with the annular knives, and each of these grooves communicates with a rearwardly extending channel 80 which extends entirely through the member 66. The channels provide means for draining the cane juice and bagasse which might stick to the annular knives and prevent the same from clogging the scraper blades.

From the foregoing, it will be apparent that provision has been made for discharging juice and bagasse from between the rollers and for maintaining the upper and lower grinding rollers and their annular knives in a clean condition, while avoiding the detrimental wear occasioned by direct mechanical contact of these elements. At the same time, the construction is one which will permit of ready inspection and replacement or servicing, although greatly increasing the period of useful operation of the sugar mill without servicing.

Since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the appended claims.

Having described the invention, what is claimed as new is:

1. In a sugar cane mill having an upper roller operatively associated with a lower crushing roller and a lower grinding roller, each of said rollers having annular knives thereon, and a turnplate disposed between said lower rollers, said turnplate having a first set of teeth interdigitated with the knives of the lower crushing roller and a second set of teeth cooperating with the knives of the grinding roller, said first set of teeth having grooves therebetween receiving the knives of the lower crushing roller and providing a clearance therefor, said turnplate having a channel therethrough communicating with each groove for passing juice and bagasse therethrough, said second set of teeth having grooves therebetween discharging into the space between the knives of the lower grinding roller for passing juice and bagasse therethrough, said turnplate having a concave upper surface equidistant from the upper roller, said last named grooves extending tangentially towards said second set of teeth.

2. In a sugar cane mill having an upper roller operatively associated with a lower crushing roller and a lower grinding roller, each of said rollers having annular knives thereon, a turnplate disposed between said lower rollers, said turnplate having a first set of teeth interdigitated with the knives of the lower crushing roller and a second set of teeth cooperating with the knives of the grinding roller, said first set of teeth having grooves therebetween receiving the knives of the lower crushing roller and providing a clearance therefor, said turnplate having a channel therethrough communicating with each groove for passing juice and bagasse therethrough, said second set of teeth having grooves therebetween discharging into the space between the knives of the lower grinding roller for passing juice and bagasse therethrough, said turnplate having a concave upper surface, said last named grooves extending tangentially from the central portion of said upper surface and sidewise towards said second set of teeth, and a scraper comprising a member extending the length of one

5

of said rollers and positioned closely against thereto, said member having a plurality of blades interdigitated with the knives of said roller, said member having grooves between said blades receiving said knives in closely spaced relation, said grooves having channels communicating therewith and extending through said member.

3. In a sugar cane mill having an upper roller operatively associated with a lower crushing roller and a lower grinding roller, each of said rollers having annular knives thereon, a turnplate disposed between said lower rollers, said turnplate having a first set of teeth interdigitated with the knives of the lower crushing roller and a second set of teeth cooperating with the knives of the grinding roller, said first set of teeth having grooves therebetween receiving the knives of the lower crushing roller and providing a clearance therefor, said turnplate having a channel therethrough communicating with each groove for passing juice and bagasse therethrough, said second set of teeth having grooves therebetween discharging into the space between the knives of the lower grinding roller for passing juice and bagasse therethrough, and scrapers for said upper roller and said lower grinding roller, each scraper comprising a member extending the length of its associated roller and positioned closely adjacent thereto, each member having a plurality of blades interdigitated with the knives of its associated roller, said members having grooves between said blades receiving the knives of the associated rollers in closely spaced relation, said grooves having channels communicating therewith and extending through said members.

4. In a sugar cane mill having an upper roller operatively associated with a lower crushing roller and a lower grinding roller, each of said rollers having annular knives thereon, and a turnplate disposed between said lower rollers, said turnplate having a first set of teeth interdigitated with the knives of the lower crushing roller and a second set of teeth cooperating with the knives of the grinding roller, said first set of teeth having grooves therebetween receiving the knives of the lower crushing roller and providing a clearance therefor, said turnplate having a channel therethrough communicating with each groove for passing juice and bagasse therethrough, said second set of teeth having grooves therebetween discharging into the space between the knives of the lower grinding roller for passing juice and bagasse therethrough, said turnplate having its upper surface concave and equidistant from the upper roller.

5. In a sugar cane mill having an upper roller cooperatively associated with a lower crushing roller and a lower grinding roller, each of said rollers having annular knives thereon, a turnplate disposed between said lower rollers,

6

said turnplate having its upper surface concave and equidistant from the upper roller, the front edge of said turnplate being disposed in close proximity to the crushing roller and the rear edge of said turnplate being disposed in close proximity to the grinding roller, a first set of teeth formed on the front edge of said turnplate interdigitated with the knives of the lower crushing roller and having grooves therebetween to provide a clearance between the roller and turnplate teeth, said turnplate having a slot therethrough communicating with each groove for passing juice and bagasse therethrough, and teeth formed on the rear edge of said turnplate, the upper surface of said turnplate being provided with rearwardly extending grooves increasing in depth from the central portion of the turnplate to the rear edge of the turnplate and opening between the rear edge teeth to facilitate juice drainage from the rearward edge of said turnplate.

6. As a new article of manufacture, a turnplate having front and rear edges, said turnplate having a concave upper surface, teeth formed on the front edge of said turnplate, said turnplate having V-shaped grooves between said teeth and slots opening into the apices of said grooves, teeth formed on the rear edge of said turnplate, the upper surface of said turnplate having drain channels formed therein and opening between the teeth formed on the turnplate rear edge.

7. As a new article of manufacture, a turnplate having front and rear edges, said turnplate having a concave upper surface, teeth formed on the front edge of said turnplate, said turnplate having V-shaped grooves between said teeth and slots opening into the apices of said grooves, teeth formed on the rear edge of said turnplate, the upper surface of said turnplate having drain channels formed therein and opening between the teeth formed on the turnplate rear edge, said channels extending tangentially rearward from the central portion of the turnplate.

References Cited in the file of this patent

UNITED STATES PATENTS

1,343,059	Miller	June 8, 1920
1,456,430	Fisher	May 22, 1923
1,759,896	Farrel	May 27, 1930
1,933,766	Scharnberg	Nov. 7, 1933
2,151,405	Hurter et al.	Mar. 21, 1939
2,314,074	Capay	Mar. 16, 1943
2,417,210	Menzl	Mar. 11, 1947
2,607,288	Munson	Aug. 19, 1952

FOREIGN PATENTS

197,563	Great Britain	May 17, 1923
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