March 14, 1939. W. SANDER 2,150,192

SHREDDER

Filed May 29, 1935

Fig. 1.

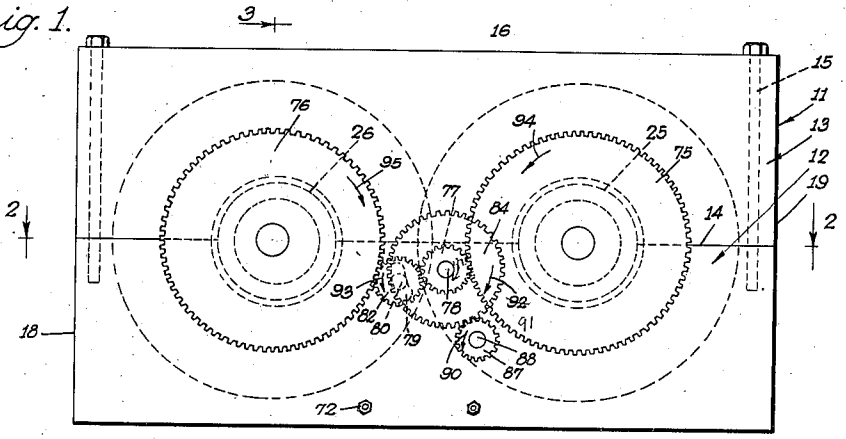


Fig. 2.

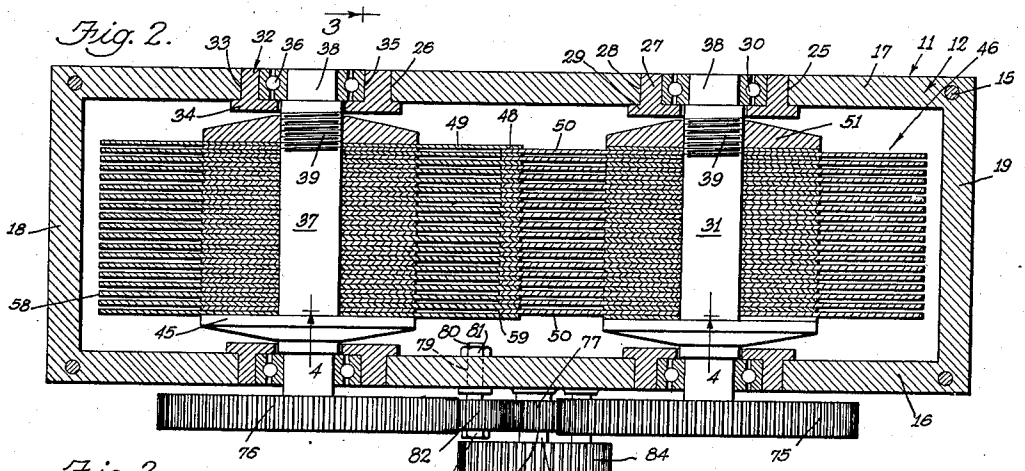


Fig. 3.

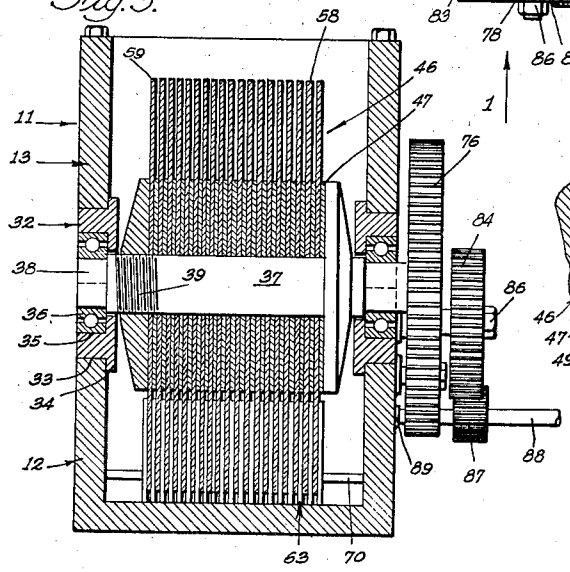
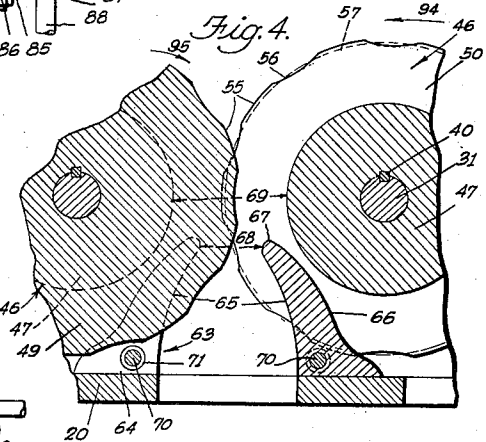


Fig. 4.



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Patented Mar. 14, 1939 2,150,192

UNITED STATES PATENT OFFICE

2,150,192

SHREDDER

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Application May 29, 1935, Serial No. 24,075

7 Claims. (Cl. 146—122)

My invention relates to a shredder of the intersecting disk type, adapted to cut shreds in material, in which the shreds have parallel edges, the shreds being comparatively narrow.

An object and feature of my invention is the construction of a rotary type of shredder having intersecting shredding disks in which the periphery of the disks are of such a type that they automatically feed the material through the shredding knives without requiring a positive pressure on the material to force it through the knives.

A further feature of my invention is having an assembly of knives in the form of disks, the disks each having peripheral surfaces, sections of which form segments of cylinders and in which the edges of the two sets of disks overlap in order that the cutting or shredding is done by the corners of two adjacent disk surfaces, this being in contradistinction to shredders which have disks with cutting edges bevelled to form a knife-like edge. In my invention the edges may be considered as blunt and the cutting being done by the interengagement of the flat surfaces of adjacent disks.

A further detail feature of my invention is in constructing the peripheral blunt edges of the disks with complementary convex and concaved sections on the opposing disks, these being arranged to be in alignment when overlapped, preferably in the same horizontal plane; the material being fed downwardly by gravity and by the pull of the cutters so that the complementary convex and concave sections of the opposing disks of the shredder will cause a feeding of the material to be shredded.

A particular use of my invention is in shredding orange peels for which purpose the pulp has preferably been removed from oranges cut through their center and thus each half of the orange forms a hollow or hemispherical shell. A feature therefore of my invention is that the shredder forms long shreds from these shells of orange peel, thus adapting the shreds for use in making marmalade or similar products.

A further feature of my invention resides in the relative adjustment of the shafts carrying the sets of shredding disks so that the spacing apart of the two shafts and therefore the overlap of the disks may be varied. This accommodates the reduction of the diameter of the disks by grinding to sharpen such disks and also to give them a greater overlap when desired in a shredding operation.

A further feature of my invention resides in a gear drive whereby a secondary driving pinion may be used to mesh with the adjustable driven gear of an assemblage of shredding disks.

A further detail feature resides in employing spacers between each adjacent pair of disks on each shaft, these spacers forming a limit to the space between the blades through which the shreds may pass. In connection with these spacers and the disks I employ fixed clearing or scraping fingers which positively remove the shredded material from the disks used in making the shredding cuts.

My invention is illustrated in the accompanying drawing, in which,

Fig. 1 is a side elevation taken in the direction of the arrow 1 of Fig. 2.

Fig. 2 is a horizontal section on the line 2—2 of Fig. 1 in the direction of the arrows.

Fig. 3 is a vertical section on the line 3—3 of Fig. 1, taken in the direction of the arrows.

Fig. 4 is a vertical longitudinal section on the line 4—4 of Fig. 2 in the direction of the arrows.

In my invention I employ a box or housing 11 which has a lower section 12 and an upper section 13 connected by a horizontal joint 14 and secured together by the vertical bolts 15. The box has opposite sides 16 and 17 and opposite ends 18 and 19 and is thus hollow with a pair of supporting slats 20 at the bottom for the cleaning fingers hereinunder described.

In the sides 16 and 17 there are formed two circular openings 25 in alignment and two eccentric openings 26 in alignment. In the circular opening a cylindrical bearing 27 is inserted; this bearing having an outer cylindrical periphery 28 and an inner flange 29. Anti-friction bearings 30 are used in the bushing and in these bearings is mounted a shredder blade shaft 31. The other or eccentric bearing 32 has an eccentric periphery 33 fitting in the eccentric opening 26. This likewise has a flange 34 and mounted in the internal cylindrical surface 35 is an anti-friction bearing 36 in which is mounted the second shredder disk shaft 37. The shafts 31 and 37 are illustrated as having reduced ends 38 fitted in the inner race of the anti-friction bearings. Each shaft has a threaded section 39 and each is provided with a key and keyway 40.

The mounting of the shredding disks is as follows: Fixed heads 45 are secured to each of the shafts 31 and 37 and on each of these shafts there is an assembly of shredding disks 46. These disks are spaced apart by cylindrical spacing washers 47, each washer being cylindrical on its periphery and of the thickness of the opposing shredding disk. The shafts 31 and 37 are mounted

the proper distance apart so that there is an overlap 48 of the individual disks 49 and 50 of the opposed assemblies. The disks and also preferably the spacer washers are provided with keyways to accommodate the key securing the disks on the shafts from non-rotation. In order to clamp the disks tightly together, clamping heads 51 are threaded on the threaded portions 39 of each of the shafts 31 and 37. On account of having the box 11 formed in upper and lower parts, manifestly each part has either the semi-cylindrical opening to form the full opening 25 or the semi-eccentric opening to form the full opening 26. The long diameters of the eccentric opening 26 and thus of the eccentric bushing 32 is on the horizontal joint line 14 and thus is in the same plane with the axes of the shafts 31 and 37.

An important feature of my invention in regard to the super-feeding of the material to be shredded, consists in providing each of the disks with a periphery having adjacent convex portions 55 and adjacent thereto concave sections 56. These are so arranged that the convex portion, for instance, 55 on one set of disks overlaps and is in alignment with the concave section 56 of the opposing set of disks when these are in the horizontal plane through the shafts as illustrated in Fig. 4. As these are arranged in an alternate manner on the two assemblies of shredding disks, it will be seen that there are a set of convex projections on one set of disks which register with and overlap the concave depressions on the other assembly. These slight extensions and depressions beyond the pitch circle 57 cause the superfeed of the material such as orange peels through the machine.

As will be noted by reference to Figs. 2 and 3, the peripheral edge 58 of each of the disks forms either the small section of a cylinder at the projections 55 and squared surfaces with the slight concave curves 56. Thus the disks may be considered as having cutting corners indicated at 59 where they overlap.

In order to clear the shredded materials from the cutting disks I employ clearing fingers 63. These are supported on the slats 20, each finger preferably having a flat base 64, a concave edge 65, a convex edge 66; both these edges meeting in a curved point 67. Thus the two points of the fingers are spaced by the measurement 68 which is less than the distance 69 between the spacing washers 47 mounted on each of the shafts between the adjacent disks on each shaft. In order to clamp the fingers in position I employ a tie rod 70 for each set of fingers, the tie rod passing through the sides 16 and 17 and each of the fingers is spaced apart by a spacing washer 71 on the tie rods. These tie rods have heads and nuts 72 on their opposite ends. The drive connection consists of two large driven gears 75 and 76, each being keyed or otherwise secured to the shafts 31 and 37. The gear 75 meshes with a driving pinion 77 which is mounted on a stub shaft 78, such stub shaft being secured in a fixed position on the side 16 of the box. This side is provided with an arcuate slot 79 through which extends a movable stub shaft 80 this being clamped by a nut 81 which clamps against the inside surface of the side 16. A second driving pinion 82 is mounted on this movable stub shaft 80 and meshes with the main driving pinion 77 and is held in place by the nut 83 on the stub shaft 80. This pinion gear 82 also meshes with the large driving gear 76. A speed reduction is through the medium of the gear 84 which rotates on the stub shaft 78 and is connected to the gear 77 by a sleeve 85. The gears 77 and 84 may if desired be made integral and such assembly held in place by the nut 86 on the stub shaft 78. The gear 84 meshes with a driving pinion 87 which is mounted on a driving shaft 88, one end of which is journaled at 89 in the side 16 of the box. The other end may be suitably journaled and connected to a source of power.

By this construction the pinion 87 rotates in the direction of the arrow 90, the gear 84 in the direction of the arrow 91, the gear 77 rotates in the direction of the arrow 92, the gear 82 in the direction of the arrow 93, which drive causes the gears 75 and 76 and hence the knives mounted on the shafts 31 and 37 to rotate in a counter-direction of the arrows 94 and 95 respectively.

The manner of operation and functioning of my shredder is substantially as follows: It will be understood by the above described gear drive, that the shafts 31 and 37 rotate at the same speed and as the shredding disks of both sets are of the same pitch diameter, that is, the diameters at the pitch line 57 are the same, it follows that the opposed sets of disks have the same peripheral speed. Therefore when the assembly of disks on the shaft 31 and the shaft 37 are properly assembled, the row of humps indicated at 55 on one set of shredder disks come into registry in their overlap with the depressions 56 in the complementary set of disks; thus causing the disks to positively feed the material such as orange peels, without requiring any positive pressure forcing the material through the shredders. The material being shredded is confined between the disks by the spacing washers or rings 47 and therefore as the material is cut it cannot spread horizontally to a great extent. Therefore the fingers 63 scrape all of the shredded material from between the disks, preventing it from packing and filling up the space between such disks. The disks may be considered as having a dull peripheral edge indicated at 58 and the cutting or shredding being done by the right angular or sharpened corners 59. When the machine is first set up the eccentric bushing 32 may be so installed that the shafts 31 and 37 are the maximum distance apart. Should the disks be reground and thus their pitched diameter decreased, or it is desired to give a greater overlap, the bolts 15 are loosened, thus unclamping the eccentric bushing 32, which pair of bushings may be rotated by hand in order to slightly decrease the spacing of the shafts 31 and 37. Prior to this change, however, the gear 82 mounted on the stub shaft 80 must be shifted and this can be done as the stub shaft is mounted in the slot 79. Such slot is arcuate and has as its center the axis of the stub shaft 78.

In rotating the two eccentric bushings 32, unless these are completely reversed, the axis of the shaft 37 will be shifted either slightly above or slightly below the horizontal plane through the axis of the shaft 31, but even with this shift the disks can be brought into proper registry to get the desired aligned overlap of the humps and depressions 55 and 56 before the gear 82 is brought into mesh with the gears 77 and 76. When the bushings 32 are set at the desired position, the bolts 15 then clamp the upper and lower sections of the housing tightly together and retain the bushings 32 in their adjusted position.

Various changes may be made in the details of construction without departing from the spirit or scope of the invention as defined by the appended claims.

I claim:

1. A shredder comprising in combination a pair of parallel shafts, each shaft having a set of shredding disks secured thereto, the disks of each set having parallel side faces and having a peripheral edge formed of convex projections and contiguous concave depressions relative to the pitch circle of each disk, the projections and depressions of each set of disks being in longitudinal alignment, means to rotate the shafts to rotate the pitch circles of the disk at the same peripheral speed, the said disks overlapping, whereby the projections on one set align with the depressions on the complementary set in the plane of the two shafts, whereby the complementary projections and depressions operate to feed material through the shredding disks.

2. A shredder as claimed in claim 1, spacers on each shaft for each set of disks, spacing the disks of one set the same distance apart as the disks of the other set, the peripheral edges of the disks of each set being blunt and the shredding being caused by the corners formed by the peripheral edge and the side faces of the contacting disks.

3. A shredder as claimed in claim 1, spacers on each shaft for each set of disks, spacing the disks of one set the same distance apart as the disks of the other set, the peripheral edges of the disks of each set being blunt and the shredding being caused by the corners formed by the peripheral edge and the side faces of the contacting disks, a structure having an opening positioned below the plane of the shafts, a set of clearing fingers, each finger being of the same thickness as a contiguous spacing disk and set to extend between the pitch circle of the shredding disk of each assembly and the periphery of the contiguous spacing disk, there being a space between the upper ends of the fingers of each set for the discharge of shredded material.

4. A shredder comprising in combination a pair of parallel shafts, each shaft having a set of shredding discs secured thereto, the discs each having parallel side faces and having a blunt peripheral edge at right angles to the side face of such disc, spacing elements on the shafts spacing the discs of each set apart whereby the discs of the two sets overlap, a fixed structure having an opening, fingers secured to said structure on opposite sides of the opening, the fingers being two sets and fitting between the discs of the two sets and having tip ends located between the pitch circle and the periphery of the spacing elements whereby the opposed sets of fingers are operative to guide material shredded through said opening and to prevent material packing between the fingers and the spacing elements and the discs contiguous thereto, the peripheral edge of each disc being formed with convex projections concentric with the axis of the disc and contiguous concave depressions relative to the pitch circle of each disc, the projections and depressions of each set of discs being in longitudinal alignment, means to rotate the shafts whereby the pitch circles of each set of discs move at the same peripheral speed, the overlap of the discs being arranged whereby the projections on one set of discs align with the depressions on the complementary set in the plane through the two shafts.

5. A shredder comprising in combination a pair of parallel shafts, each shaft having a set of shredding discs secured thereto, the discs of each set having parallel side faces and a blunt peripheral edge at right angles to the side faces, the peripheral edge of each disc having projections beyond and depressions within the pitch circle of such disc, the said projections having an outer surface substantially concentric with the center of its disc and thus being convex, the depressions being concave and of substantially similar shape to the projections but reversed, such projections and depressions being of substantially the same length considered peripherally of the disc, the projections and depressions of each set of discs being in longitudinal alignment, means to rotate the shafts to rotate the pitch circles of the disc at the same peripheral speed, the said discs overlapping whereby the projection on one set aligns with the depressions on the complementary set in the plane through the two shafts and whereby the complementary projections and depressions operate to feed material through the sets of shredding discs.

6. In a shredder, the combination of a housing, a first shaft journaled in the housing, a second shaft journaled in a pair of eccentric bushings, the said bushings being mounted in the housing, whereby on rotation of the pair of bushings the spacing of the shafts may be varied, a gear drive to the first shaft and a displaceable gear forming a drive to the second shaft, each shaft having a set of shredding disks secured thereto, each set of disks overlapping, the degree of overlap being changeable by adjusting the eccentric bushings.

7. In a shredder, the combination of a housing having a first shaft journaled therein with a driving gear on said shaft, a pair of eccentric bushings mounted in the housing, a second shaft journaled in said bushings, a second gear on the second shaft, a gear drive to the first gear, a shiftable gear meshing with said gear drive and with the second gear, the gear ratios being such that the shafts rotate at the same speed, each shaft having a fixed head and an adjustable clamping head, a set of disks mounted on each shaft and clamped between the two heads on each shaft, the disks having parallel side faces and a blunt peripheral edge, means to space the disks of each set apart, whereby the disks overlap with the faces of the disks of the two sets contacting at their overlap, the adjustment of the said bushing being adapted to vary the overlap of the disks of each set.

WALTER SANDER.