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TRASH CRUSHER

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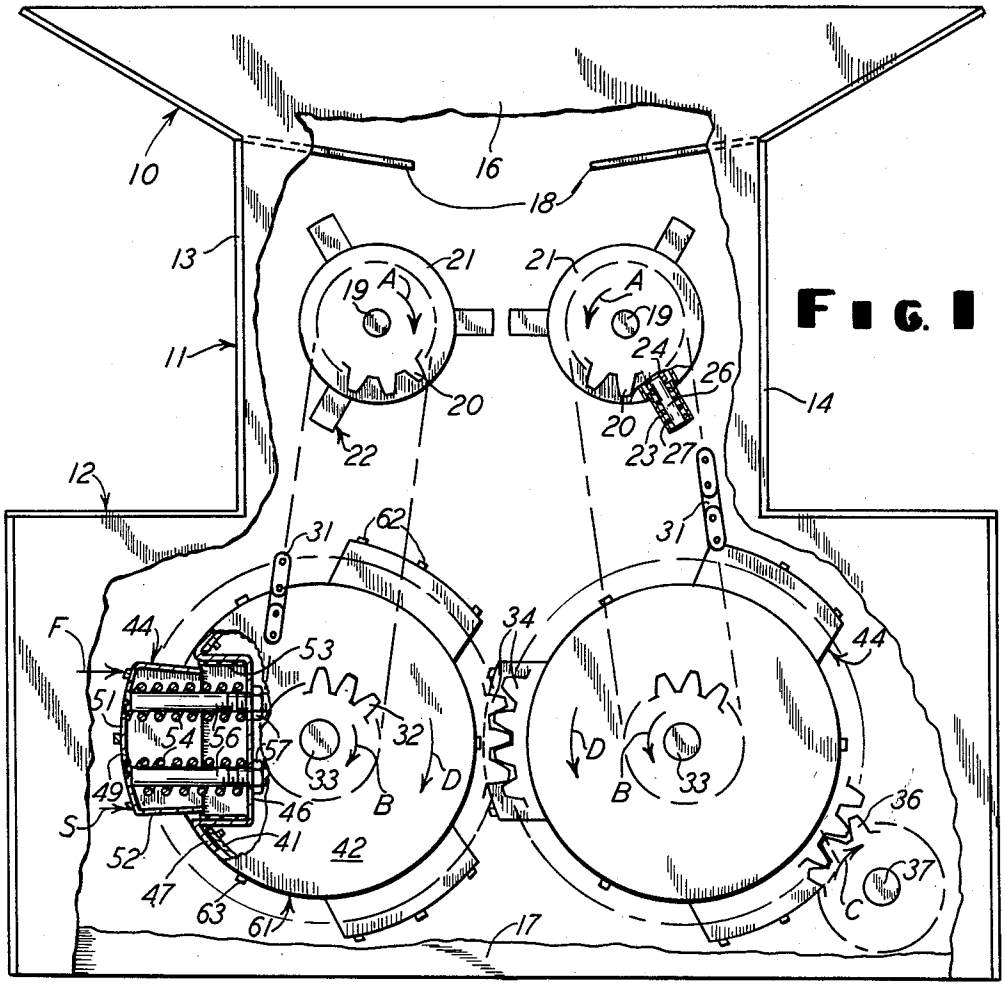


FIG. 1

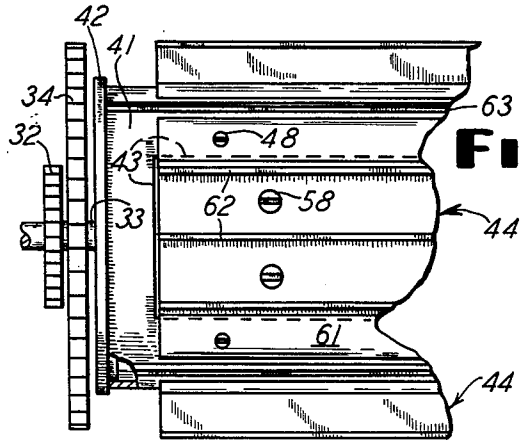


FIG. 2

INVENTOR:
DONALD J. MORGENSON
BY: Arthur J. Hongmann
ATTORNEY

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TRASH CRUSHER

Donald J. Morgenson, Racine, Wis., assignor to Shatter King Mfg. Co., Inc., Racine, Wis., a corporation of Wisconsin

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This invention relates to a trash crusher.

It is an object of this invention to provide a trash crusher which is an improvement on the crushers heretofore known in that the crusher of this invention is effective and efficient in both feeding the trash through the crusher and in crushing the trash. In accomplishing this particular object, it will of course be understood that a trash crusher should perferably have provision for feeding the trash therethrough by gripping the trash and working it through the crusher, or by allowing the trash to fall into a position where it can be crushed. Heretofore, crushers have not had effective means for feeding or guiding the trash therethrough, and this is of particular concern when dealing with trash of varying sizes in the items to be crushed. Accordingly, it is recognized that a crusher must be able to feed the trash through it, and it must be able to handle trash of items of various sizes, and this particular object is the goal of this invention.

Another object of this invention is to provide a trash crusher wherein the trash can be uniformly crushed with uniform pressure, such that one firm article of trash will not prevent the crusher from crushing softer articles which are passing through the crusher at the time that the firm article is passing through. Again in this particular object, the goal is accomplished in the provision of elongated vanes, which are yieldingly urged outwardly on both ends of the vanes, such that the firm article of trash on one end of the vane will compress the vane, but the other end of the vane will not be compressed, and it will therefore force against the articles of trash at that point to crush the trash on the uncompressed vane end. By this means, none of the trash is permitted to fall through the crusher in an uncrushed form, and also all of the trash is uniformly crushed.

Still a further object of this invention is to provide a trash crusher which is adjustable in its crushing pressure so that the operator can actually control and vary the amount of pressure applied to the trash being crushed.

Still a further object of this invention is to provide a trash crusher which is not complicated in its design and thus there is simplicity in manufacture and maintenance of the crusher. Also, in conjunction with this object, the crusher is so designed that the operator can readily remove or disassemble the parts of the crusher for on-the-job servicing or inspection when needed.

Still another object of this invention is to provide a trash crusher which has a means or hopper for receiving bulk trash dumped thereinto, and which has a feeder section for controlling the passage of the bulk trash into a final crusher section. Thus this object accomplishes the purpose and benefit of controlling the passage of the trash into the crusher element, even though all of the trash may be dumped into the machine by the operator at one time.

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Other objects and advantages will become apparent upon reading the following description in light of the accompanying drawings wherein:

FIG. 1 is an end elevational view of a preferred embodiment of a crusher of this invention, and having parts thereof broken away for showing the construction.

FIG. 2 is a front view of a fragment of the crusher shown in FIG. 1, and with a part thereof broken away.

The crusher consists of three basic parts indicated as the hopper 10, the feeder 11, and the crusher element 12. The entire machine consisting of these three sections is defined by the side members 13 and 14, and the end sheets 16 and 17. The end sheets or plates 16 and 17 are of course on opposite ends of the machine, and the trash will fall out of the machine between the two plates 16 and 17. The nearer plate 16 is broken away as shown to provide an interior view of the machine, and it will here be seen that the hopper 10 has two spaced-apart shelves 18 extending inwardly on the hopper to guide the trash downwardly toward the feeder 11 and permit the trash to drop into the feeder. The feeder 11 has two shafts 19 rotatably mounted therein, and two sprockets 20 are mounted on the shaft 19 to rotate therewith. Also two cylinders 21 are mounted on the shafts 19 and rotate with the shafts, and the cylinders have three vanes 22 radially disposed thereon and spaced around the cylinders 21. One vane 22 is shown interiorly, and it will here be noted that the vanes 22 are preferably spring-biased radially outwardly by means of the vane 22 being arranged with a telescopic construction of the outer vane portion 23 and the inner vane portion 24 fixed on the cylinder 21. Thus a guiding pin 26 is disposed in the outer vane portion 23 and a compression coil spring 27 urges the vane portion 23 radially outwardly. It will therefore be understood that the vanes 22 are spring-loaded and can be moved inwardly from their positions shown, and they will of course engage the trash falling through the shelves 18, and thus restrict and regulate the flow of the trash into the crusher section 12. Of course the cylinders 21 are rotated through a means hereinafter described, and the cylinders rotate in the direction of the arrows indicated A, and thus the vanes 22 will control the trash flow and will be pressed radially inwardly on the cylinder 21 when the vanes engage trash which forces inwardly on the vanes 22. In normal and preferred operation, the vanes 22 extend radially outwardly to provide a restriction for the trash disposed thereon so that only a very limited amount of trash can fall past the vanes 22 until of course the vanes rotate away or downwardly with respect to the trash, and then the cylinders 21 provide the restricted opening for the flow of the trash therepast. In this manner, the feeder 11 controls the fall or flow of the trash into the crusher 12.

The feeder sprockets 20 are powered by sprocket chains 31 driven by sprockets 32 mounted on the shafts 33 in the crusher 12. The latter are of course rotatably mounted to rotate the sprockets 32 in the direction of the arrows indicated B. The shafts 33 are in turn rotated by gears 34 mounted on the shafts 33, and the one gear 34 is in mesh with and driven by a gear 36 on a shaft 37. The shaft 37 would of course be driven by any suitable source of power or a prime mover, such that the gear 36 rotates in the direction of the arrow indicated C, and the crusher and feeder are rotated in the direction

shown as the arrows indicate including the arrows D, which indicate the direction of rotation of the gears 34.

The crusher 12 consists of the two cylinders 41 which have end plates 42 mounted on the shafts 33 on opposite ends thereof, and of course on opposite ends of the cylinders 41, such that the cylinders are disposed in parallel axial relation and are thus rotated in synchronization with each other so that the trash will of course fall therebetween and be fed between and downwardly from the cylinders 41. The cylinders 41 are preferably hollow, as indicated in the lower portion of FIG. 2, and the cylinders have openings 43 of a rectangular nature extending for virtually the length of the cylinders 41 and being spaced around the circumferences of the cylinders. Vane units generally designated 44 are disposed within the cylinder openings 43, and extend radially beyond the circumference of the cylinders 41. A channel member 46 is disposed within the cylinder opening 41 and has an arcuate flange 47 overlapping the cylinder 41, and screws 48 extend through the flanges 47 and the cylinder 41 to secure the channels 46 to the cylinder. Of course the channels 46 are provided below each of the vanes 44 and extend through substantially the lengths of the two cylinders 41.

The vanes 44 consist of the channel member 49 which has an outer section 51 and side section 52 with the latter telescoping within the inner channel 46. Also, rubber pieces 53 are disposed within the channel 46 to seal between the two telescoping sides of the channels 46 and 49. The channel 49 is yieldingly urged radially outwardly of the cylinders 41 by means of the compression springs 54 extending between the channels 46 and 49 along bolts 56 spaced on the cylinders 41. Nuts 57 are provided at the inner ends of the bolts 56 and the bolt heads 58 are available for adjustment of the bolts 56, and accordingly the pressure of the springs 54 can be adjusted. A significant feature is the location of the bolts 56 at both ends of the vanes 44 such that when one end is compressed by trash, the other end will not necessarily be compressed, depending upon the firmness of the trash at the other end of the vane 44. Still further, it will be understood that if, for instance, only the top of the vane shown sectioned in FIG. 1 is subjected to a force sufficient to compress the upper spring 54, the bottom of the vane 44 and the lower spring 54 will not be compressed and any trash at the lower portion of the vane 44 will also then be crushed with a uniform pressure, since the vane will actually tip both longitudinally of the cylinder 41, and it will tip with respect to the longitudinal axis of the vane 44 so that two-directional tipping is possible to have the vane thus constantly exert a uniform pressure along its length. This can be more completely described by a diagram of a force indicated F at the top of the vane 44, and a smaller force indicated S at the bottom of the vane 44, and it will now be appreciated that the top of the vane 44 will move radially inwardly in the channel 46 while the bottom of the vane 44 will not. Likewise, in FIG. 2, the end section of the vane 44 could have a larger force applied downwardly thereon, while the unshown end may have the smaller force applied theron, and thus the shown end of FIG. 2 with the larger force thereon would press the vane radially inwardly. By this means of at least four springs 54, the vane is free to be disposed in a variety of positions so that it will always exert uniform pressure on the trash passing through the opening between the length of the cylinders 41.

Also, the sides 52 of the vanes 44 are directed inwardly toward each other so that the vane-tilting action described in connection with forces F and S will permit the vane to tilt with the necessary clearance between the channels 46 and 49. In the tilting action mentioned, it will therefore be understood that the bolt 56 in the upper position will serve as a fulcrum point with respect to the force F, and thus the moment arm from F to upper bolt 56 is relatively short and therefore the vane can apply a great pressure in resisting the force F, as the upper spring 54 is located close to the vane upper side 52 for resisting forces in the location of the force F.

It is also been found that only several vanes 44, and preferably three thereof, are most efficient in both guiding and crushing the trash passing therethrough. Thus it will be noted that the vanes 44 extend around the cylinders 41 for a certain portion thereof which is only slightly less than the circumferential portion extending between the vanes 44 on the cylinders 41. Still further, it will of course be observed that the cylinders 41 with the vanes 44 are synchronized for rotation so that the vanes 44 will mesh with the intervening cylinder portions designated generally 61 in FIG. 1. In this manner, the crusher is much like two spur gears in mesh with the projecting vanes 44 extending into the intervening or intermediate portions of the adjacent cylinder 41, as shown in FIG. 1. Thus the trash will be pulled down or guided between the cylinders 41 by means of the vane sides 52, at least in part, but because of the angularity to the sides 52, presenting a rectangular vane shape axially of the cylinders, and because of the location of the springs 54, the vanes 44 will be able to handle the trash and carry it between the cylinders 41 to where the vanes 44 and the opposite cylinder portion 61 can crush the trash. To further assist in gripping and leading the trash down into the crusher, angularly shaped means comprising projections or vanes 62 are provided on the vanes 44 to extend through the length thereof, and also projections or vanes 63 are provided on the cylinder portion 61 to extend through the length thereof. These vanes 62 and 63 of course will provide treads or grips for engaging the trash, and leading it downwardly in the crusher.

Therefore it will be noted that the vanes 44 are well spaced-apart on the cylinders 41 and project a substantial distance from the cylinders 41 so that trash can of course enter between the vanes and the cylinders 41 in sufficient quantity to have the crusher work rapidly and efficiently, and also the vane 44 can be adequately spring-biased to provide the uniform crushing effect along the length of the vanes 44, and to resist lateral forces on the vanes 44.

While a specific embodiment of this invention has been shown and described, it should be obvious that certain changes could be made therein and the invention therefore should be determined only by the scope of the appended claims.

What is claimed it:

1. A trash crusher comprising a pair of cylinders disposed in parallel and spaced-apart relation, vanes extending along the lengths of each of said cylinders and having a width extending around predetermined portions of the circumference of each of said cylinders and being spaced therearound, angularly shaped means on the radially outer surfaces of each of said vanes for pulling trash to a position between said cylinders, yielding means operatively interposed between said cylinders and said vanes for yieldingly urging said vanes radially outwardly on said cylinders, each of said cylinders including a cylinder portion in the space intermediate every two of said vanes and being of a circumferential length substantially equal to said width of each of said vanes, and means for rotating said cylinders in synchronization to have each of said vanes on the respective said cylinders meet with a respective said cylinder portion for crushing trash between each of said vanes and each of said cylinders.

2. A trash crusher comprising a pair of cylinders disposed in parallel and spaced-apart relation and having openings therein spaced around said cylinders and extending along the lengths thereof, vanes snugly telescopically disposed in said openings of each of said cylinders throughout the lengths of said openings and

extending radially beyond said cylinders and being movable into said openings, said vanes being rectangularly shaped axially of said cylinders, separate yielding means operatively interposed between said cylinders and each of the rectangular corners of said vanes for separately yieldingly urging said corners of said vanes radially outwardly on said cylinders, each of said cylinders including a cylinder portion in the space intermediate every two of said vanes and being of a circumferential length substantially equal to the width of each of said vanes, and means for rotating said cylinders in synchronization to have each of said vanes on the respective said cylinders meet with a respective said cylinder portion for crushing trash between each of said vanes and each of said cylinders.

3. A trash crushing machine comprising a hopper with an open top and having a restricted lower opening smaller than said top for passing trash therethrough, a pair of rotating members disposed below said hopper in a position to receive the trash passed through said hopper and for passing trash through said members, a pair of cylinders disposed in parallel and spaced-apart relation below said rotating members for receiving the trash passed by the latter, drive means connected between said members and said cylinders for transmitting rotary motion therebetween, said cylinders having openings therein spaced around said cylinders and extending along the lengths thereof, vanes snugly telescopically disposed in said openings of each of said cylinders and extending radially beyond said cylinders and being movable into said openings and being rectangular in radial projection, yielding means operatively interposed between said cylinders and said vanes and adapted and disposed to force outwardly on the corners of said vanes for yieldingly urging said vanes radially outwardly on said cylinders, each of said cylinders including a cylinder portion in the space intermediate every two of said vanes and being of a circumferential length substantially equal to the width of each of said vanes, and means for rotating said cylinders in synchronization to have each of said vanes on the respective said cylinders meet with a respective said cylinder portion for crushing trash between each of said vanes and each of said cylinders.

4. A trash crusher comprising a pair of cylinders rotatably disposed in spaced-apart rolling relation, vanes extending radially outwardly along the lengths of said cylinders and around a predetermined amount of the circumference of each of said cylinders and being circumferentially spaced apart thereon, separate yielding means operatively interposed between said cylinders and each of the opposite ends of said vanes for independently yieldingly urging said ends of said vanes radially outwardly on said cylinders, said cylinders including surfaces intermediate said vanes and being of a size slightly greater than the radially projected size of said vanes, said vanes extending in an overlapping relation between said cylinders, and means operatively connected to said cylinders for rotating said cylinders in synchronization for meshing said vanes on the respective said cylinders with said surfaces on the opposite one of said cylinders for crushing trash between each of said vanes and each of said surfaces.

5. A trash crusher comprising a pair of cylinders rotatably disposed in spaced-apart relation, vanes extending radially outwardly along the lengths of said cylinders and around a predetermined amount of the circumference of each of said cylinders and being circumferentially spaced apart thereon, compression spring and bolt means connecting said vanes to said cylinders and being operatively interposed therebetween and disposed at the opposite ends of said vanes for independently yieldingly urging said ends of said vanes radially outwardly on said cylinders, said means being arranged to be threadedly adjustable from the exterior of said vanes, said cylinders including surfaces intermediate said vanes and being of a size slightly greater than the radially projected size of said vanes, said vanes extending in an overlapping relation between opposite ones of said cylinders, and drive means interconnected for rotating said cylinders in synchronization for meshing said vanes on the respective said cylinders with said surfaces on the opposite one of said cylinders for crushing trash between each of said vanes and each of said surfaces.

6. A trash crusher comprising a pair of hollow rollers rotatably mounted in spaced-apart relation and including an exterior surface, said rollers having openings extending through said surfaces in spaced locations thereabout, vanes disposed in said openings and overlapping said surfaces to be supported radially inwardly on said rollers and extending radially outwardly thereof along the length of each of said rollers and the combined width of said vanes on each of said rollers being slightly less than one-half of the periphery of each of said rollers, said two rollers being disposed and said vanes extending to have said vanes overlap each other on opposite ones of said rollers in a gear-meshing nature when said rollers are rotated, yielding means operatively interposed between said rollers and said vanes for yieldingly urging said vanes radially outwardly on said rollers, said rollers including surfaces intermediate said vanes, and drive means interconnected between said rollers for rotating said rollers in synchronization and with said vanes on the respective said rollers disposed to face said surfaces for crushing trash between each of said vanes and each of said surfaces.

7. A trash crusher comprising a pair of cylinders rotatably disposed in spaced-apart relation, vanes extending radially outwardly along the lengths of said cylinders and around a predetermined amount of the circumference of each of said cylinders and being circumferentially spaced apart thereon, fastening means connected between said vanes and said cylinders for releasably securing said vanes to said cylinders, spring means operatively interposed between said cylinders and said vanes for yieldingly urging said vanes radially outwardly on said cylinders, said cylinders including surfaces intermediate said vanes and being of a size slightly greater than the radially projected size of said vanes, said vanes extending in an overlapping relation between said cylinders, and means for rotating said cylinders in synchronization for meshing said vanes on the respective said cylinders with said surfaces on the opposite one of said cylinders for crushing trash between each of said vanes and each of said surfaces.

8. A trash crusher comprising a pair of cylinders rotatably mounted in spaced-apart relation, vanes extending radially outwardly on said cylinders along the length of each of said cylinders and the combined width of said vanes on each of said cylinders being slightly less than one-half of the circumference of each of said cylinders, said vanes being spaced apart on said cylinders, said two cylinders being disposed and said vanes extending to have said vanes overlap each other on opposite ones of said cylinders in a gear-meshing nature when said cylinders are rotated, yielding means operatively interposed between said cylinders and said vanes for yieldingly urging said vanes radially outwardly on said cylinders, said cylinders including surfaces intermediate said vanes, projections on the radially outer surfaces of at least one of said vanes and said surfaces for gripping trash, and means for rotating said cylinders in synchronization and with said vanes on the respective said cylinders disposed to face said surfaces for crushing trash between each of said vanes and each of said surfaces.

9. A trash crusher comprising a pair of cylinders rotatably mounted in spaced-apart relation, three vanes extending radially outwardly on said cylinders along the length of each of said cylinders and the combined width of said three vanes being slightly less than one-half of the circumference of each of said cylinders, said three vanes being equally spaced on each of said cylinders, said

two cylinders being disposed and said vanes extending to have said vanes overlap each other on opposite ones of said cylinders in a gear-meshing nature when said cylinders are rotated, yielding means operatively interposed between said cylinders and said vanes for yieldingly urging said vanes radially outwardly on said cylinders, said cylinders including three surfaces intermediate said three vanes, and means for rotating said cylinders in synchronization and with said vanes on the respective said cylinders disposed to face said surfaces for crushing trash between each of said vanes and each of said surfaces.

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WALTER A. SCHEEL, *Primary Examiner.*