United States Patent [19]

Ferry

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[54] **METHOD OF AND APPARATUS FOR DISINTEGRATING MATERIALS**

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[52] **U.S. Cl.** **241/27,** 56/501, 241/101.7, 241/28, 241/56

[51] **Int. Cl.**.....**A01d 43/00,** B02c 18/00

[58] **Field of Search**.....146/197 L, 182 R, 192, 124, 146/114; 56/500, 501, 504; 241/27, 28

[56] **References Cited**

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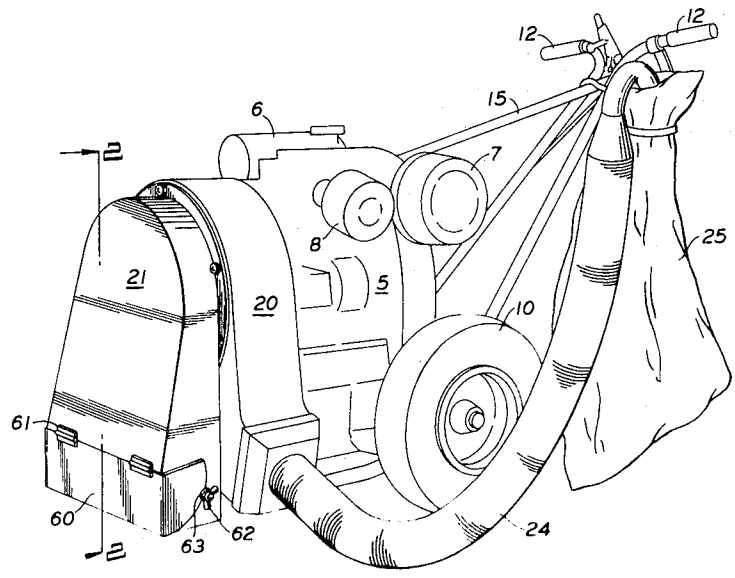
[57] **ABSTRACT**

A disintegrator is composed of (1) a mulch plate with one or more raised diffusers composed of evenly spaced bars rising from the plate with spaces between them, and (2) one or more mulch bars each composed of a bar with teeth projecting from one surface spaced to pass through the spaces between the bars of the diffusers. The mulch bar is positioned to rotate with respect to a fixed location on the mulch plate so that the teeth will pass through the spaces between the bars of the one or more diffusers. The plate may be perforated or imperforate. In the preferred disintegrator, one or more narrow portions of the mulch plate in areas extending substantially radially from said fixed location are fabricated into diffusers. The bars and spaces of each diffuser are arranged substantially circumferentially of said fixed location so that the teeth of the mulch bar pass through them as it is rotated. The spaces between the bars of the diffuser extend through the plate, either as one long opening under the entire diffuser (which is the case when the diffuser is fabricated separately from the plate) or as separate openings (which may be the case when the diffuser is formed from the plate).

The disintegrator is a multi-purpose disintegrator and is well suited for use in an implement such as an outdoor-area cleaner provided with a fan which sucks or blows leaves, twigs, etc. from an area such as a lawn, drive, parking area, etc. against the front face of the disintegrator where the teeth of the one or more mulch bars push them to, and through the spaces in a diffuser where they are disintegrated and go through the opening in the plate without further treatment. The implement is advantageously provided with a bag which catches the disintegrated material. The implement may be operated in any suitable manner. The mulch plate for a disintegrator used for this purpose is generally perforated so that the blower which sucks or blows the leaves through it can blow or suck a relatively uniform quantity of air through the plate at all times.

There are various applications for the disintegrator.

13 Claims, 9 Drawing Figures



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SHEET 1 OF 4

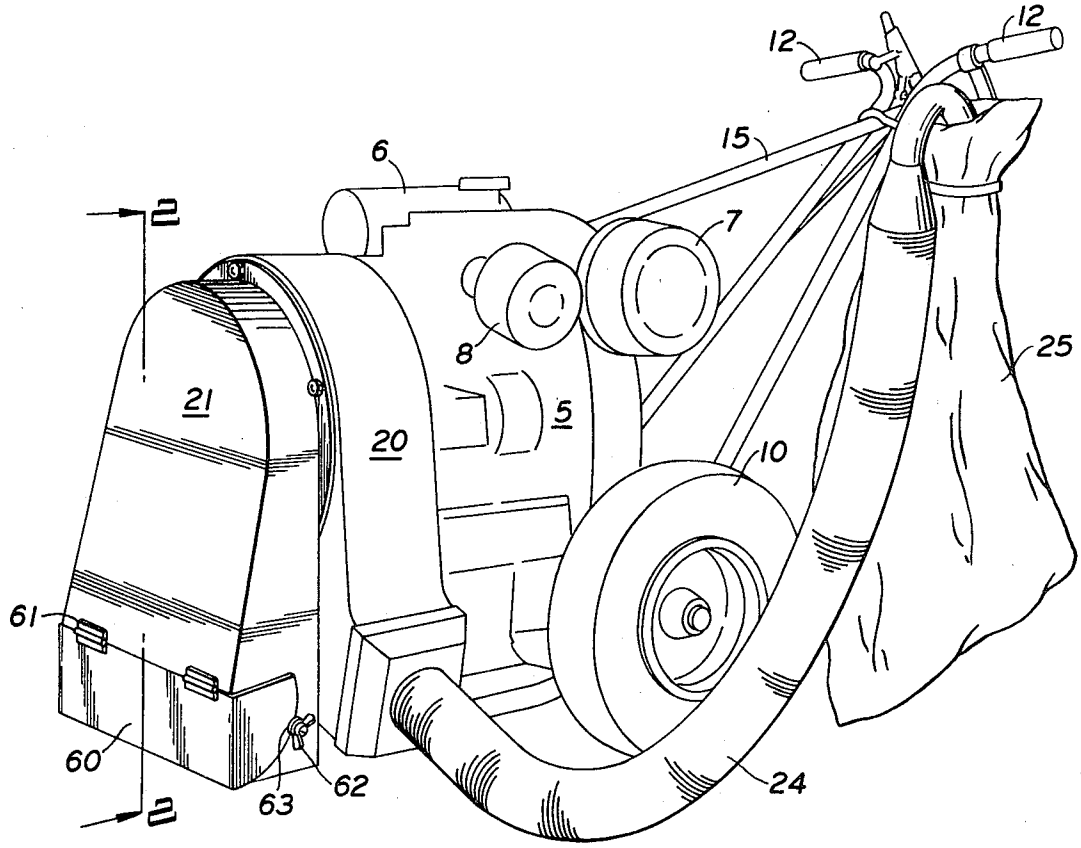


FIG 1

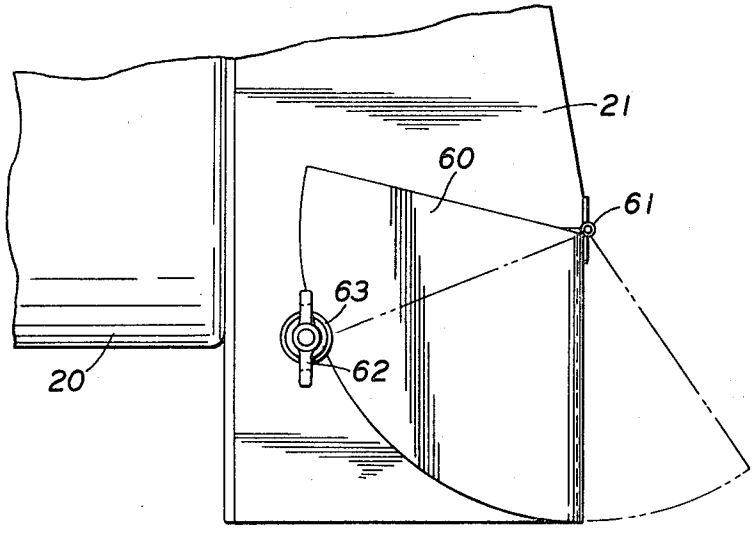


FIG 3

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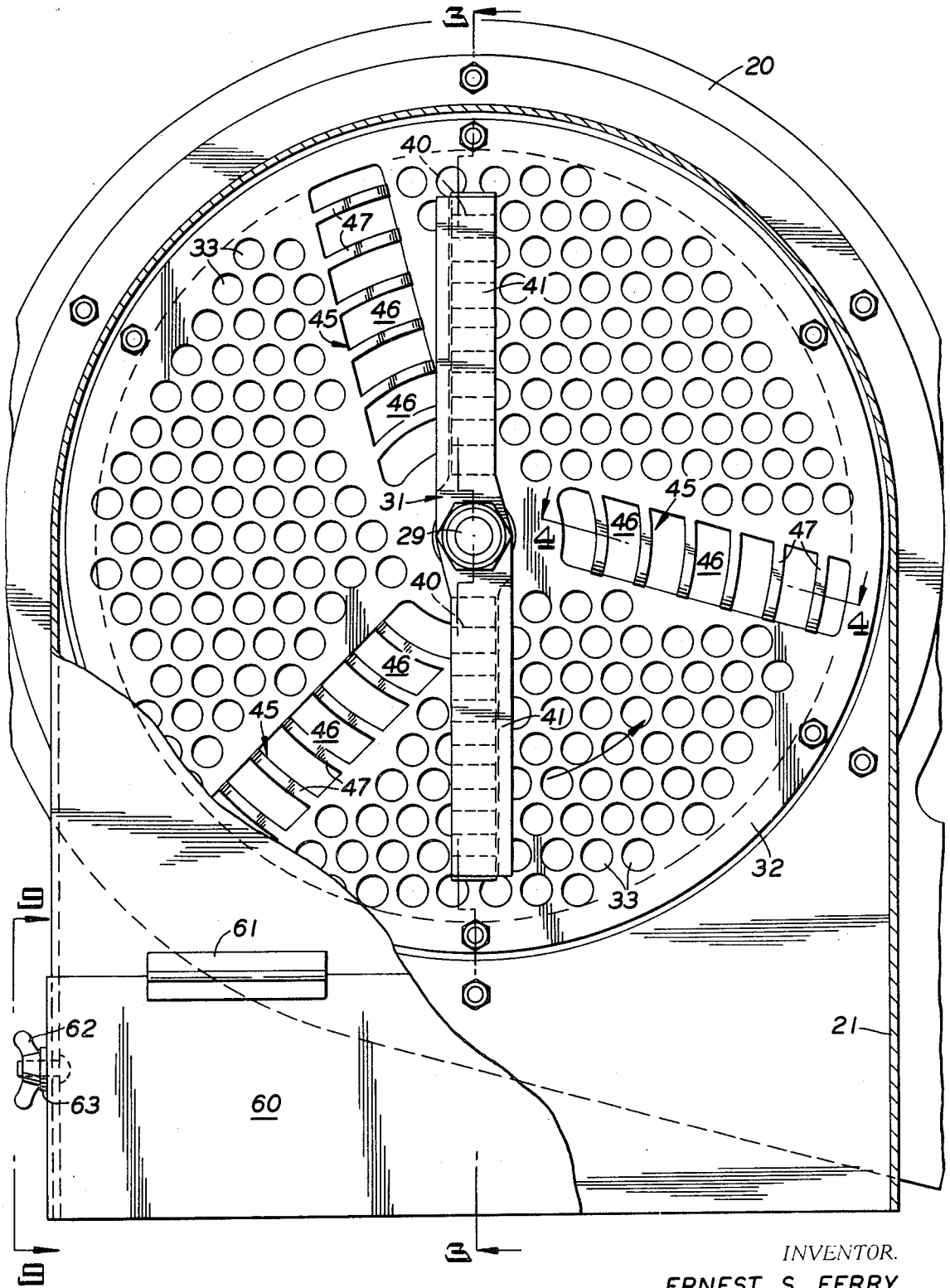


FIG 2

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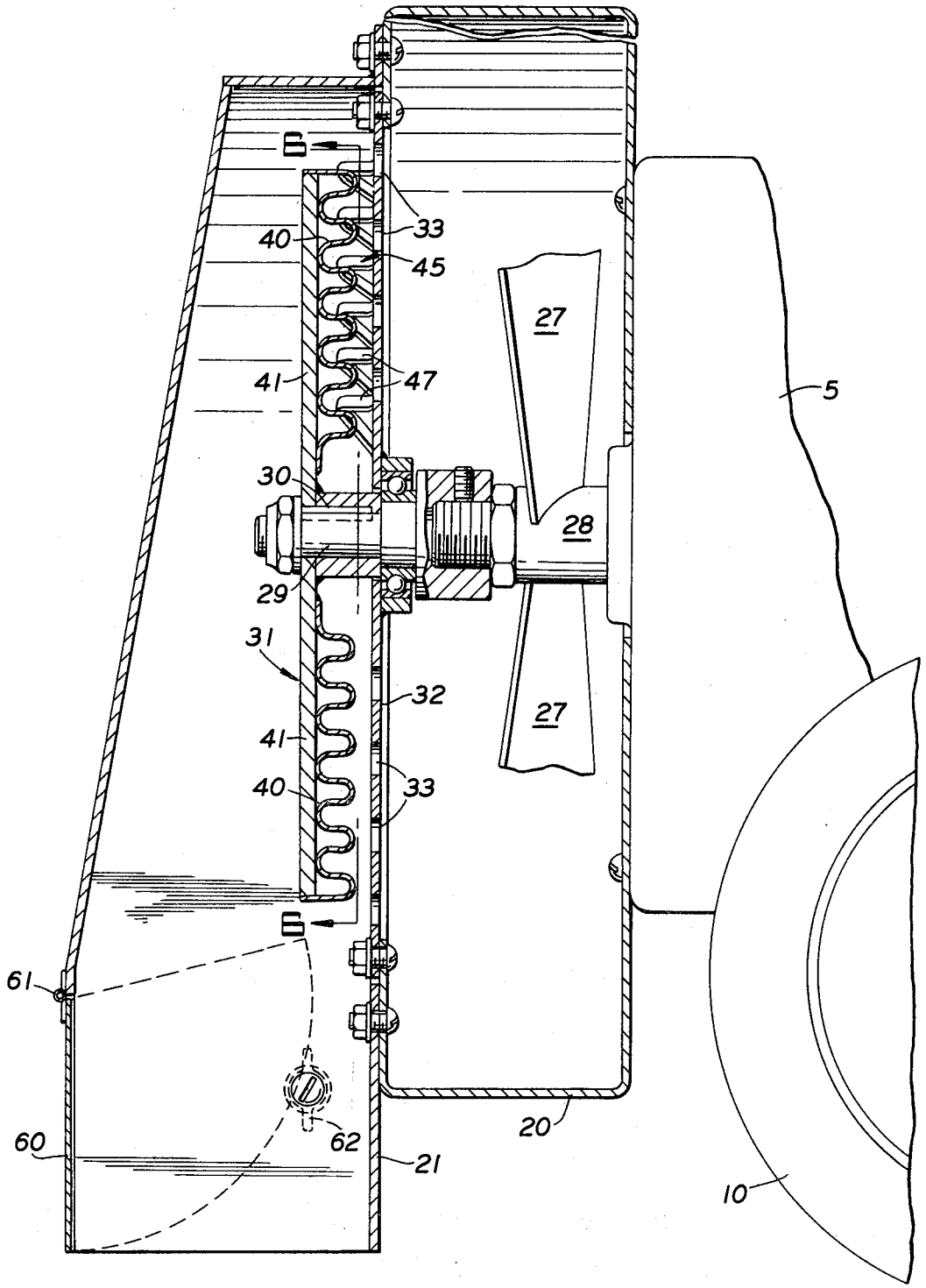


Fig 3

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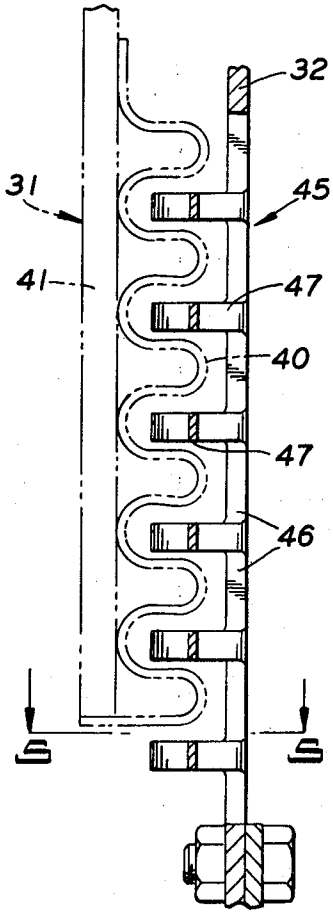


FIG 4

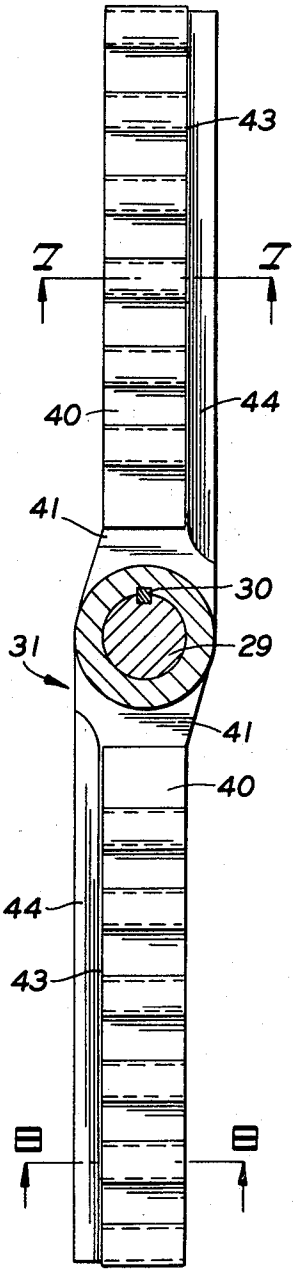


FIG 6

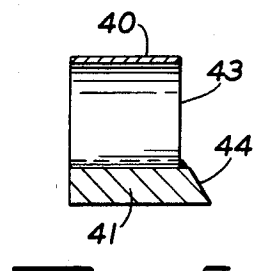


FIG 7

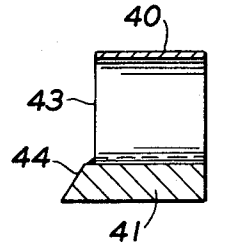


FIG 8

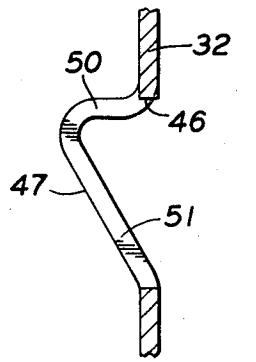


FIG 5

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METHOD OF AND APPARATUS FOR DISINTEGRATING MATERIALS

This invention relates to a multi-purpose disintegrator and an implement such as an outdoor-area cleaner that includes the disintegrator; and it includes the method of disintegrating fibrous material, wet or dry, particularly cellulose-type materials including grass, twigs, sticks, leaves, stalks, paper, etc.; and in the outdoor-area cleaner it blows away leaves, twigs, etc. from a lawn, driveway or parking area, etc., or sucks them up through the disintegrator. The disintegrated leaves, twigs, etc. are advantageously caught in a bag but may be disposed of in any suitable manner.

There are various devices on the market for disintegrating leaves, etc. in an implement which includes means for bagging the disintegrated product. Attention is called to Shaw U.S. Pat. No. 3,049,857 which includes a disintegrating or comminuting device attached to a screen plate, but that device merely disintegrates or comminutes the leaves, etc. which are on the screen plate and continuously operates on them until they are disintegrated to a size which permits their passage through the openings in the screen plate.

The implement of the invention is described more particularly as applied to an outdoor-area cleaner in which leaves, twigs, etc. are sucked or blown through the disintegrator, but it is to be understood that the disintegrator has many other applications. It can be used for the disintegration of both wet and dry materials. It can be used for cleaning outside areas such as driveways, parking areas, lawns, etc. by blowing only. This is done by starting from a clean area, usually an edge, and using the air velocity from the outlet end of the implement. In this instance, the implement is used as a blower only: the debris which is removed does not go through the disintegrator, and is blown to any desired location. Alternatively, debris collected at a curb, wall which may be a foundation, a tree, garden plot, etc. may be sucked up into and through the disintegrator. To save raking, lawn clippings may be scattered by blowing or they may be sucked up and bagged. If sucked up into the disintegrator they are finely ground and may be scattered over the lawn by the implement as mulch, or blown off of the lawn to another area or they may be bagged and disposed of in any desired manner. All of these operations and many others can be carried out by this one implement without accessories or attachments (other than a bag, when desired). Thus, the one implement is capable of blowing only, or the suction may be used.

There are also various uses for the disintegrator when not incorporated in an area cleaner or similar device. Thus, a disintegrator which is integral with the plate from which it is fabricated, if on the top of the plate, may be used for the disintegration of corn stalks, etc. A disintegrator for this purpose will normally be of larger construction than one designed primarily for cutting leaves, etc. when run over a lawn, etc. It may be incorporated in a vehicle such as shown, but of larger construction.

The disintegrator of this invention is composed of two elements, namely, (1) a mulch plate with one or more diffusers, each composed of spaced ribs rising from the plate with spaces of either the same or different widths between each two ribs, and (2) one or more mulch bars each composed of a bar with teeth projecting from one surface spaced to pass between the ribs of the diffusers.

Below each of the diffusers is one long opening or a series of openings in the mulch plate. If the diffusers are fabricated from the plate, there is usually one long opening in the plate from which the diffuser is fabricated by cutting away the metal between each two ribs. Alternatively, the diffuser may be fabricated from the mulch plate by raising each rib separately and thus forming a separate opening under each rib. The latter construction is usually less desirable than providing a longer opening in the mulch plate because the metal which is left between the ribs will collect the cuttings and create a clogging effect, thus impeding the free flow of the disintegrated material through the mulch plate.

If the diffuser is separately fabricated and then fastened to the plate, there will usually be a single opening in the plate under substantially the whole of the diffuser, but a series of openings may be used. In case several openings are used, each opening will be so large that any mulch which passes between the bars will pass directly through the openings without further treatment.

The one or more mulch bars are rotatably positioned about a fixed point on the plate, and the teeth of the one or more mulch bars pass through the spaces between the bars of the one or more diffusers. Each mulch bar may rotate about a separate fixed point, but usually all of the mulch bars, if there are more than one, are fabricated as a unit to rotate about a single fixed point.

The face of the mulch plate on which the one or more diffusers are located is referred to herein as the front face to distinguish it from the back face.

In an area cleaner, leaves and twigs, etc. are sucked up from the area (in the usual manner) by a blower, and they are sucked or blown against the front face of the mulch plate.

In an area cleaner, the mulch plate will usually be in a vertical plane, although this is not necessary because the plate may be slanted or horizontal, and if the plate is not vertical the diffusers may be on either the upper or lower surface of the plate.

The teeth of the mulch bar may be made from a metal strip having a sinuous cross section. The front edge may be a cutting edge, but this is not necessary. Alternatively, the teeth may be individually formed and fastened to the mulch bar. Usually only one such tooth passes through the space between two ribs of the diffuser, but two or more teeth may pass between each two ribs.

In an area cleaner, it is advantageous to perforate the mulch plate to provide for passage of a sufficient substantially constant volume of air at all times to provide for a substantially uniform operation of the blower.

The mulch bar is advantageously pivoted at the middle, but this is not necessary because any number of bars may extend radially from a single pivot mounting.

The blower which blows or sucks the material through the disintegrator may be operated by an electric motor or a gasoline engine, or it may be driven mechanically by a suitable connection with the wheels on which the area cleaner moves.

Usually, the leaves, twigs, etc. are sucked through the cutter, so that the material passing through the blower has first been disintegrated.

The disintegrated leaves, twigs, etc. may be blown out of the area cleaner onto the lawn to serve as a mulch which feeds the lawn. They may be blown directly into a bin which will be emptied periodically. Preferably, they are caught in a bag which is emptied periodically. The bag is usually connected directly to the blower housing outlet. The outer end may be supported from the handles of the implement.

The disintegrator is illustrated in the drawings as a component of an area cleaner, but it is to be understood that it has many other uses. In the drawings:

FIG. 1 is a view in perspective of an area cleaner;

FIG. 2 is a section, partly broken away, and showing the mulch plate and mulch bar of the disintegrator on the line 2—2 of FIG. 1;

FIG. 3 is a section on the line 3—3 of FIG. 2;

FIG. 4 is an enlarged section on the line 4—4 of FIG. 2;

FIG. 5 is a section on the line 5—5 of FIG. 4;

FIG. 6 is a plan view of the mulch bar on line 6—6 of FIG. 3;

FIG. 7 is a section on the line 7—7 of FIG. 6;

FIG. 8 is a section on the line 8—8 of FIG. 6; and

FIG. 9 is an enlarged side view on line 9—9 of FIG. 2 of the lower end of the disintegrator housing.

The disintegrator is preferably designed to be fastened to an opening in the housing of the motor that drives the fan in an area cleaner of a particular make, but it may be designed to be adjusted to fit several such openings.

In the drawing, the housing 5 is for a gasoline motor fed from the gas tank 6. Air is supplied through the intake 7, and 8 is a muffler. The whole implement is supported on wheels 10 and it is guided by the handlebars 12 and operated in a usual manner through levers, etc. which pass through the conduit 15. It is understood that the implement shown is merely illustrative, and the invention is in no way limited thereto.

The fan is within the housing 20 and the disintegrator is located within the housing 21. The disintegrated leaves, etc. are blown through the hose 24 into the bag 25. These are merely illustrative of equipment that may be used.

As best shown in FIG. 3, the fan in the housing 20 includes blades 27 attached to the shaft 28 which is operated by the motor within the housing 5. An extension 29 of this shaft is fastened by the key 30 to the mulch bar 31. This is a double bar, and an enlarged view of one-half of the bar is shown in FIG. 4.

The fan housing 20 is separated from the disintegrator housing 21 by the plate 32 which includes many perforations 33. A plan view is shown in FIG. 2.

There are two blades 40 attached to the mulch bar 41 which serve as teeth. Each of the blades is a narrow, sinuous steel ribbon, preferably sharpened along one edge 43. The two halves of the mulch bar 41 are fastened to the shaft 29, and each forward edge 44 of the bar 41 may be square or it may be serrated or concave or convex or ground to a sharp edge. Thus it may sever debris, sticks, twigs, etc. that are caught in passing through the holes in the mulch plate.

As best shown in FIG. 2, diffusers 45 extend almost radially from the shaft 29. These are integral with the plate 32 and are formed by cutting openings 46 from the plate (which are larger than openings 33), and raising a rib 47 between each two such openings. The ribs are positioned circumferentially with respect to the shaft 29. The opening 46 need not be the same size. Generally they will be somewhat less than one inch across and about 1½ inches long. The narrow ribs 47 may be only one-quarter to one-half inch wide. These dimensions are merely suggestive. Although in FIG. 2 there are three disintegrators, there may be only one or two, or there may be more than three. Each looped portion of the blade 40 passes between two ribs 47 of the plate. Thus, each blade, as it is rotated over the perforated plate, carries with it constantly renewed portions of leaves, twigs, etc. to be pulverized, and as the blades pass between the ribs 47 of the plate, the leaves, twigs, etc. are disintegrated to a size that will go through the openings 46, and the blade forces them through these openings.

The ribs 47 are raised and, as shown in FIG. 5, the ribs are advantageously shaped with a forward portion 50 which is substantially vertical, and a reclining rear portion 51. The portion 50 may, for example, be about one-half to three-quarter inch long. Thus each blade, moving in the direction of the arrow in FIG. 2, as it enters between the ribs 47, first passes between the raised portions 50 which retard the passage of that part of the leaves or other material being disintegrated which abuts the ribs 47, and the leaves, etc. are disintegrated by the blades as they pass between the ribs 47. As this material is disintegrated, the blade forces it through openings 46, and it is sucked through the openings in the diffusers by the blower which blows it out of the housing 20 outlet. Hose may be used, or bag attached directly to exhaust outlet of housing.

The ribs 47 may be part of a separate small plate or diffuser formed over an elongated opening in the plate 32. This separate small plate is located so that the spaces between Any ribs 47 are located circumferentially about the shaft 29. Alternatively, there may be several smaller openings under each diffuser, but such openings are larger than the openings 33 in the plate. They are so large that they do not interfere with disintegrated material that passes between the ribs 47. An material passed between the ribs 47 by the blades, passes freely through the plate.

Thus, there is an outstanding difference between the cutter of Shaw U.S. Pat. No. 3,049,857 and the disintegrator shown here. Any part of the material which is chopped up by the cutter of Shaw, which is not sufficiently small to pass through the openings in the perforated plate, remains on the plate until it is further cut to a size to pass through the perforations. Twigs, etc. may accumulate and remain on the plate for a sufficient time to annoyingly retard the passage of other disintegrated material through the perforations. In applicant's diffuser, the teeth, in passing between the ribs 47 of the plate, cut the larger materials or align them in the direction in which the teeth rotate and they pass through the spaces 46 between the ribs 47 to the other side of the plate. Thus the disintegration of leaves or any other material being treated is not limited to producing particles small enough to pass through the

openings 33 in the plate over which the bar rotates, but in applicant's device these openings 33 merely provide for the passage of sufficient air to provide a relatively uniform flow of the air through the implement at all times.

Of course, if the plate is in back of the fan, the air will be blown through the plate instead of being sucked through it. In an area cleaner the plate is advantageously placed in front of the fan; otherwise leaves, twigs, etc. before disintegration will be brought into contact with the fan and may interfere with its operation.

The disintegrator is located within the housing 21. As shown in FIG. 9, this housing is open at the bottom. It is provided with a door 60 mounted on hinge 61 which may be swung up and fastened at any angle by the nut 62 which tightens the washer 63 against it. Any means for controlling the position of the door 60 may be utilized. No such door is necessary if there is an adequate area for the leaves, twigs, etc. to be sucked up into the housing without a door. The bottom end of the intake may flare out or it may be of any desired shape with or without movable parts.

The exhaust from the housing 20 is shown as being passed through the base 24 into the bag 25. This is merely suggestive of preferred equipment that may be used.

The disintegrator may be used alone for the disintegration of materials other than leaves and twigs. It may be used with a blower or a suction device and, as illustrated, it is advantageously used with a fan which sucks the air and disintegrated material through it, or the material may pass through the fan before being disintegrated. The bagger is optional.

When the disintegrator is used separately from the housing and means for moving it, the plate over which it is mounted may, for example, be horizontally mounted with the cutter on its upper surface and it may be used without other equipment by merely feeding into it the material to be cut. In such a situation the plate need not be perforated. Alternatively, the disintegrator may be incorporated in more or less complicated equipment for accomplishing any one of a variety of cutting operations.

The diffuser need not be a unit in one location but may be divided into several pieces mounted at different distances radially from the center about which the mulch bar rotates.

I claim:

1. A disintegrator which comprises a generally flat plate, a series of spaced teeth mounted to rotate about a fixed location and close to the plate, an area of the plate extending generally radially from said fixed location which area is formed of inclined ribs raised above one surface of the plate with spaces between the ribs, all located circumferentially with respect to said fixed location, with the teeth spaced to pass between the ribs when the blades are rotated; there being one or more openings in the plate between said spaced ribs which are large enough to pass without interference all material disintegrated by the teeth passing between the spaced ribs.

2. The disintegrator of claim 1 in which the ribs are integral with the plate.

3. The disintegrator of claim 1 in which the ribs are in an element fastened to the plate.

4. The disintegrator of claim 1 in which the teeth are a sinuous steel strip with a cutting edge.

5. An outdoor-area cleaner which may be moved over a surface, a disintegrator of claim 1 located therein in a housing which has an opening at the surface, a blower for sucking leaves, twigs, etc. from the surface and sucking or blowing them through the disintegrator, and an exhaust from the blower.

6. The cleaner of claim 5 in which the plate is perforated with additional openings smaller than the aforesaid openings to provide for the passage of a larger volume of air than is accommodated by the aforesaid openings.

7. The cleaner of claim 6 in which the blower is situated to suck the leaves, twigs, etc. through the disintegrator.

8. The cleaner of claim 7 which includes a bag for collecting solid matter at the blower exhaust.

9. The process of disintegrating material which comprises supplying the material to a plate having ribs raised from one surface thereof with spaces between the ribs arranged circumferentially with respect to a fixed location on the plate, there being material-discharge openings between said ribs rotating a bar about said location with a series of teeth thereon spaced to pass between said ribs, and thereby moving constantly renewed portions of the material over the plate and forcing them between the ribs and thereby disintegrating the material and passing it through said openings in the plate.

10. The process of claim 9 in which the material is sucked against the plate by a blower and there are small openings in the plate to allow passage of sufficient air therethrough to provide for passage of a substantially constant volume of air through the plate.

11. The process of claim 9 in which the material after passing through the openings is bagged.

12. The process of claim 10 in which leaves, twigs, etc. are sucked from a relatively flat surface through the disintegrator.

13. The disintegrator of claim 1 in which openings smaller than said one or more openings are distributed throughout the area of the plate.

* * * * *