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Brewer

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[45] **Dec. 24, 1974**

[54] **COMBINATION SHREDDER AND AIR-CLASSIFICATION EQUIPMENT**

[75] Inventor: **John C. Brewer,** Salt Lake City, Utah

[73] Assignee: **Garbalizer Corporation of America,** Salt Lake City, Utah

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[52] **U.S. Cl.** **241/79.1,** 209/135, 241/24

[51] **Int. Cl.** **B02c 13/06,** B07b 4/02

[58] **Field of Search** ..... 241/79.1, 5, 24; 209/25, 209/135, 139, 14 L

[56] **References Cited**

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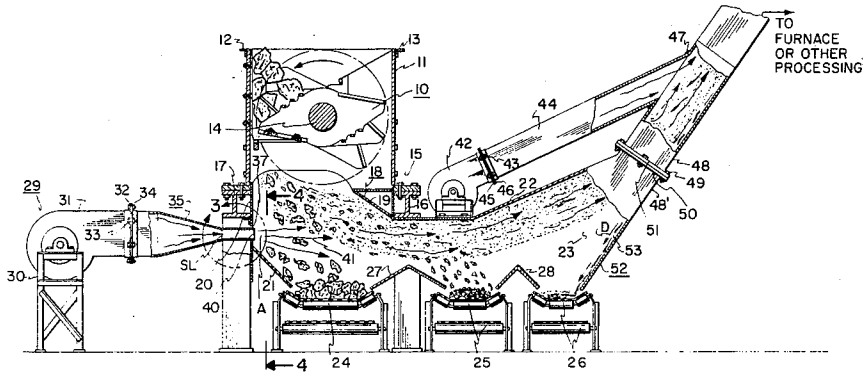
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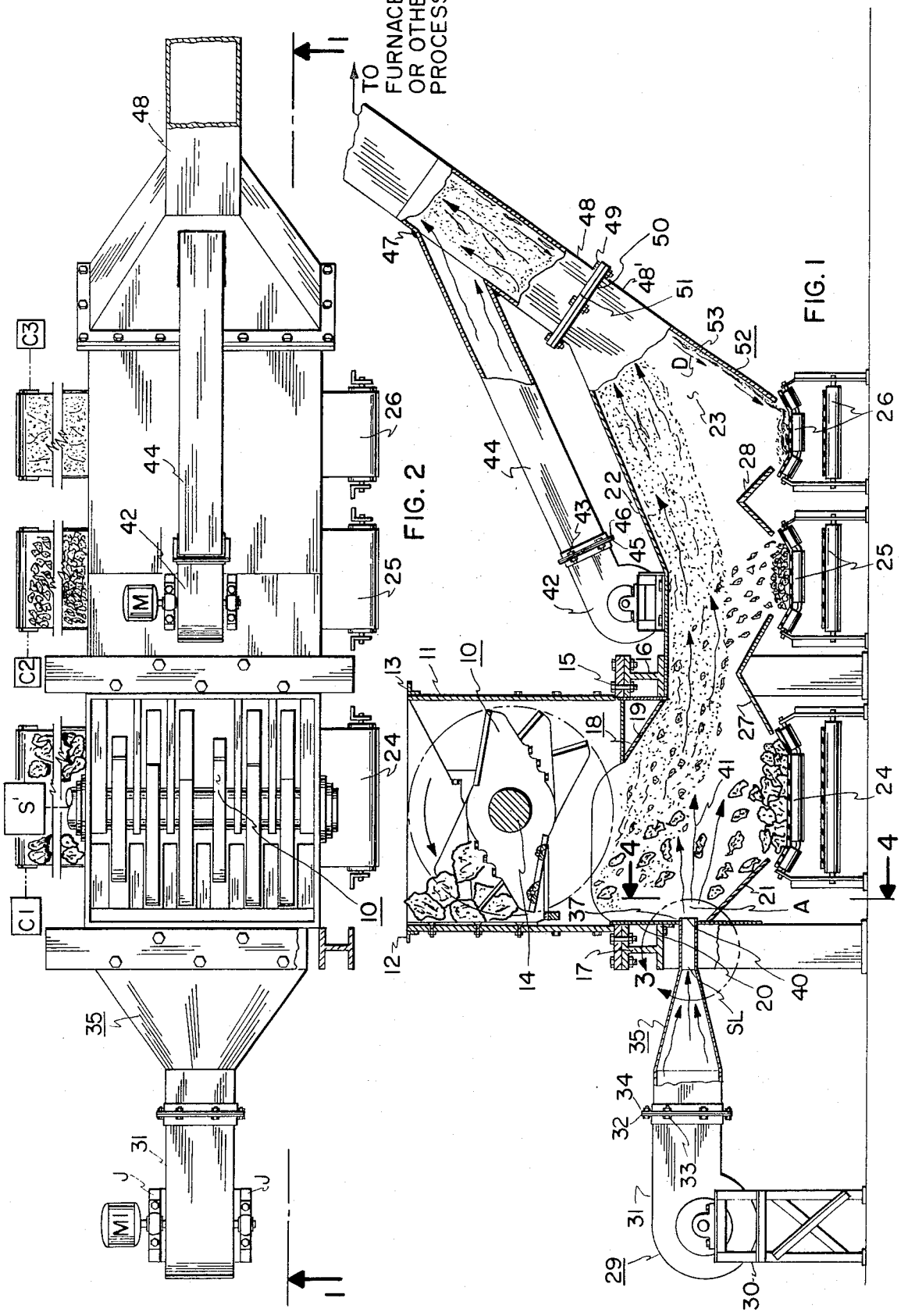
Primary Examiner—Roy Lake
Assistant Examiner—E. F. Desmond

[57] **ABSTRACT**

A combination shredder and air classification system wherein the cutting and automatic pre-separation by the shredder of waste materials being processed is introduced into an airstream serving as an air classifier such that pieces of shredded material of different weights will descend into respective conveyor systems. The airstream produced results in an entrainment of the light materials that are carried by such airstream into and through a discharge housing to be routed to a furnace or to other processing. Supplemental airstream generating means is provided and is directed into the primary airstream, so as to aid in the continued transport of entrained materials.

3 Claims, 4 Drawing Figures




TO FURNACE OR OTHER PROCESSING
FIG. 1
FIG. 2

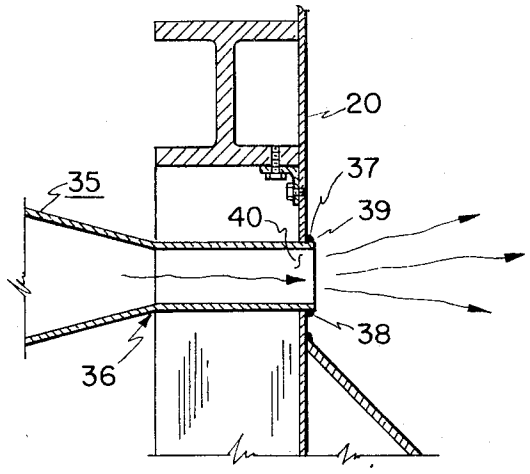


FIG. 3

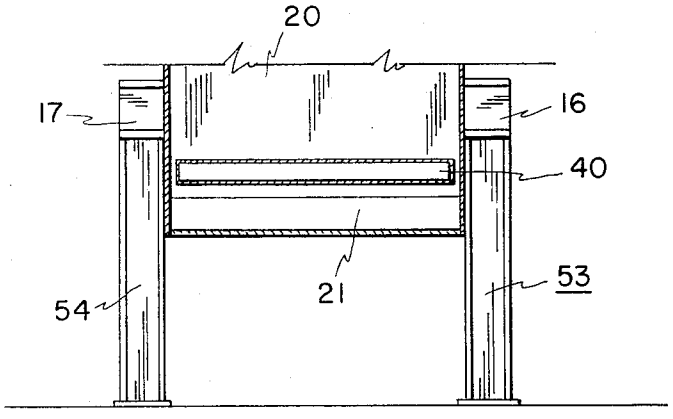


FIG. 4

COMBINATION SHREDDER AND AIR-CLASSIFICATION EQUIPMENT

The present invention relates to municipal and other waste handling equipment and, more particularly, provides a shredding mechanism and an air classification system operating therebelow, this together with other structure utilized for advantageous purposes which shall be hereinafter described.

In the past certain structures have been used for separating, in the sense of classifying pieces of material of various characteristic weights. In certain prior systems endless conveyor means are used to dump, en masse, materials into some sort of air classifying apparatus. The materials descend in bulk as an almost solid mass, as a consequence of which the air classifying function is extremely difficult to perform. In the present invention, a shredder mechanism is used for three purposes. In the first place, the same acts as a feed for a transversely oriented air classification system; secondly, the shredder cuts or shreds incoming materials such as garbage, wood, automobile parts, plastics and other components of municipal waste materials, so that small pieces are produced.

Thirdly, and most important, the shredder, by its nature, is such that the cutting or shredding function automatically accompllishes or effects a prior preseparation of the shredded material pieces so that material pieces are already separated prior to their entrance into the airstream of the air classification system. This preconditioning of the shredded material, namely the separation of cut pieces, vastly increases the efficiency of the air separation system in the invention. The latter is used to separate shredded pieces of various things such that the same will be deposited upon separate, respective conveyor systems, for example.

Auxiliary blower means is provided so as to introduce an airstream beyond the last conveyor of the system. This is for the purpose of creating an updraft, as well as to add to the total volume of air moved and the particulate entrainment capability of the airstream as the same conducts light materials, such as paper and other cellulosic materials, to a furnace or for other processing. The updraft housing or chute is provided with a slanted side such that light metals, for example light aluminum strips, tinfoil and the like may slide downward to a last conveyor utilized in the system.

Accordingly, a principal object of the present invention is to provide a combination shredder and air classification system.

An additional object is to provide as a waste materials handling system, the combination of a shredding mechanism having, essentially underneath the same, an air classification system in the form of an airstream that is directed transversely through the descending preseparated materials of the shredding mechanism.

A further object of the invention is to provide a combination shredder and air classification system therebeneath, and this in combination with a series of conveyors or materials' collecting devices such that a classification as to characteristic weight of materials is effected.

A further object is to provide a combination shredder and air classification system wherein a supplemental airstream is provided to supplement primary air flow, this so as to create a suction effect, such as to draw incoming materials rapidly upward as they are transported to a furnace or to another process.

The features of the present invention which are believed to be novel are set forth with particularity in the appended claims. The present invention, both as to its organization and manner of operation, together with further objects and advantages thereof, may best be understood by reference to the following description, taken in connection with the accompanying drawings in which:

FIG. **1** is a side elevation, partially shown in section view, of a shredder and air classification system constructed in accordance with the principles of the present invention, and is taken along line **1—1** in FIG. **2.**

FIG. **2** is a plan view of the structure of FIG. **1.**

FIG. **3** is an enlarged detail taken along the arcuate line at **3** in FIG. **1.**

FIG. **4** is an enlarged elevation, partially sectioned, and taken along line **4—4** in FIG. **1.**

In FIGS. **1** and **2** shredder **10,** which may be a standard, gravity-feed, materials' severing or reducing unit, preferably comprises one of the inventor's own shredder designs as shown in the inventor's U.S. patents, e.g., U.S. Pat. Nos. 3,708,127 and 3,578,252, fully incorporated herein by reference. Thus, shredder **10** may include a series of mutually revolving blades mounted on shaft **14** and coacting with mutually spaced cutter bars. Flanges **13** and **14** accommodate hopper attachment. The shredder **10** may be of any desired form as above explained and in one form may include a single revolving shaft **14** which is suitably driven by external means. Shredder support structure **15** is likewise illustrated, the same including I-beams **16** and **17** as indicated. Below the shredder is chute structure **18** having respective chute walls **19** and **20,** plus chute material guide **21.** Housing **22** is contiguous with chute side **19** and forms an upper boundary for a materials conduction passageway **23.** Below such passageway is disposed a series of endless conveyors **24, 25** and **26,** the same being provided with interconveyor material guide dividers **27** and **28.** These dividers, as seen, are for the purpose of precluding the dropping of materials between the endless conveyors and additionally, for guiding droppings onto the respective conveyors as illustrated.

Blower **29** may be of the squirrel cage, or other variety, as desired, and is supported on support stand **30** and is bolted or otherwise secured thereto. Blower **29** includes an outer airstream housing **31,** having flange **32** which is bolted by means **33** to flange **34** of shroud **35.** With reference to FIGS. **1–4** it is seen that shroud **35** changes the circular or square cross section of housing **31** to an essentially horizontally elongate cross section proximate the arrow **36** in FIG. **3.** Thus, there can be a gradual horizontal elongation and a gradual vertical taper such that horizontally slotted apperture **37** of wall **20** is accommodated. In this regard welds **38** and **39** are designed to weld the shroud **35** into position. See FIG. **3.** With the shroud in place there will be provided a material classification, airstream slot **40** provides a blast or rapid stream of air leading in the direction shown by the arrows **41.** Blower **42** is bolted by bolt means **43** to airstream housing **44** by virtue of the inclusion of respective flanges **45** and **46.** Housing **44** is welded or otherwise secured at **47** to materials-carrying airstream housing **48.** The latter is bolted by bolt means **49** to flange **50** at the former's flange **51.**

Housing **52** includes a wall **53** serving as an inclined slide plate, in effect, for returning materials back to endless conveyor **26.** Blower **42** will be driven by motor M. And blower **29** will likewise be driven by a motor incorporated therein, and shown specifically in FIG. **2** at M1. The shredder **10** and conveyors **24–26** are driven by motors S′, C1–C3, respectively. Appropriate journal mounts, as for example that J in FIG. **2,** will be provided each of the blowers. I-beams **53** and **54** serve as columns to support the shredder's structure. The support structure further includes I-beams **16** and **17** as before mentioned.

In operation, material fed into the input of the shredder above numeral **10** in FIG. **1** will descend into the shredder to be shredded or cut in pieces of various sizes and of various weights, this depending upon the several types of materials introduced in the shredder which can include glass, cans, garbage, dirt, wood, rubber, plastics and other debris. Once the material passes through the shredder, then the same descends in a slightly separated-piece state, so as to enter the airstream area at area A. This airstream is provided, of course, by the rapidly revolving blower **29.** At this point it should be noted that the blower housing and the horizontal slot exuding the airstream will be designed such that there will be no back pressure build up immediately posterior the slot. This is to say, the cross sectional area of the slot at SL will be at least as great as the cross sectional area of blower housing **31.**

Thus, what is presented at A and to the left of A in FIG. **1** is an air classifying means by which the heavier materials will drop downward upon endless conveyor **24,** whereas progressively lighter materials will be carried by the airstream to the right in the direction of conveyors **25** and **26.** Thus, materials of intermediate weight and size will descend upon conveyor **25,** whereas those of still lighter weight will descend onto conveyor **26.** In this regard, it may be anticipated that endless conveyor **24** will receive materials such as ferrous metals, heavy non-ferrous metal pieces, pieces of automobile tires, overstuffed furniture pieces, and the like. Endless conveyor **25,** in contrast, will receive material such as smaller pieces of some non-ferrous metals, wet garbage, wood products, and cotton from overstuffed furniture. Still lighter materials will be received directly from the airstream as in the case of arrow C. The majority of the remaining materials, however, will include small bits of textiles, papers, and other combustibles, which are carried by the airstream upward into housing **48.** Carried with such cellulosic products will be small pieces of aluminum and tinfoil, for example, but which latter materials will fall downward in the direction of arrow D, after hitting walls **48** and **48′,** so that these also will be carried by endless conveyor **26** for processing. The remaining materials which will essentially be all combustibles will be conveyed upward, both by virtue of the blower **29,** but more specifically by virtue of the supplemental airstream at **44** as provided by blower **42,** so the rapid air draft upward will direct the entrained papers, textiles and so forth upward to a furnace for firing, or to another process.

FIGS. **3** and **4** are simply enlargements of the slot portion of the structure approximate letter A in FIG. **1** to illustrate that a horizontal, vertically thin stream of air is provided to effect air classification approximate letter A. Thereafter, the air, and particularly the air supplied by blower **42,** supplies a materials transport airstream up housing **48** to effect a natural conveyance of such materials as are contained thereat.

It is most important to note that the slot **40** provides, in effect, a partition or wall of air through which materials must enter and heavy materials of which must pass. Thus, air classification is achieved directly beneath the shredding mechanism at **10** in FIG. **1,** whereas, after air classification as above described, the remaining materials are transported out of housing **48.**

The present invention thus presents a system wherein air classification is used right at that point where pieces of materials are already pre-separated by the shredding action. This greatly increases the efficiency of the air classifying in the present invention, since the materials coming into the airstream are already separated. It remains therefore, once the droppings into several endless conveyors have occured, for the remaining material to be carried upward into housing **48.**

It is to be noted that where the conveyors **24–26** and dividers **27, 28** are so constructed that upwardly directed air circulation therethrough is permitted, then such circulation will assist in materials' entrainment and, hence, in the separation achieved.

While particular embodiments of the present invention have been shown and described, it will be obvious to those skilled in the art that changes and modifications may be made without departing from this invention at its broader aspects and, therefore, the aim in the appended claims is to cover all such modifications as fall within the true spirit and scope of the present invention.

I claim:

1. In combination, revolving blade means for shredding materials including metals in pieces; means disposed immediately and essentially vertically beneath said shredding means for directly receiving and air-classifying said pieces, including metals, into a plurality of groups progressively spaced from said air-classifying means, which groups are of essentially differing characteristic weights, the progressively lighter of said groups being progressively farthest removed from said air-classifying means, said air-classifying means including means for producing a vertically thin, horizontally elongate stream of classifying air, and means proximate said air-classifying means for separately receiving said groups, wherein said separately receiving means comprises plural, parallel, endless belt-type conveyors having respective, corresponding, opposite side edge margins, and wherein said combination includes upwardly convex divider means overlapping corresponding side edge margins of said conveyors.

2. In combination, means for shredding materials in pieces; means disposed beneath said shredding means for air-classifying said pieces into plural groups of essentially differing characteristic weights, and means proximate said air-classifying means for separately receiving said groups, wherein such combination includes an updraft exhaust conduit positioned at a location remote from said air-classifying means and constructed to receive light-weight materials as do not fall directly onto said separately receiving means, and wherein said combination includes a supplemental blower, and secondary air-stream conduit means coupled to said supplemental blower and upwardly branching into said updraft exhaust conduit for increasing air volume through-put thereat.

3. In combination, gravity-feed shredder means for receiving and shredding in pieces a shredder throughput of a heterogenious mixture of materials; means for blowing a stream of air into and through said materials immediately underneath said shredder means while said materials are just dropping through said shredder means in pre-separated form for essentially air-classifying such cut materials into, plural, essentially differing groups, and means disposed downstream from said blowing means for separately collecting said groups, and wherein said combination includes means for injecting a supplemental airstream into air-entrained materials passing said separately collecting means, and housing means constraining said entrained materials and air to passage for further processing.

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