

[54] **GARBAGE CLASSIFICATION SYSTEM**
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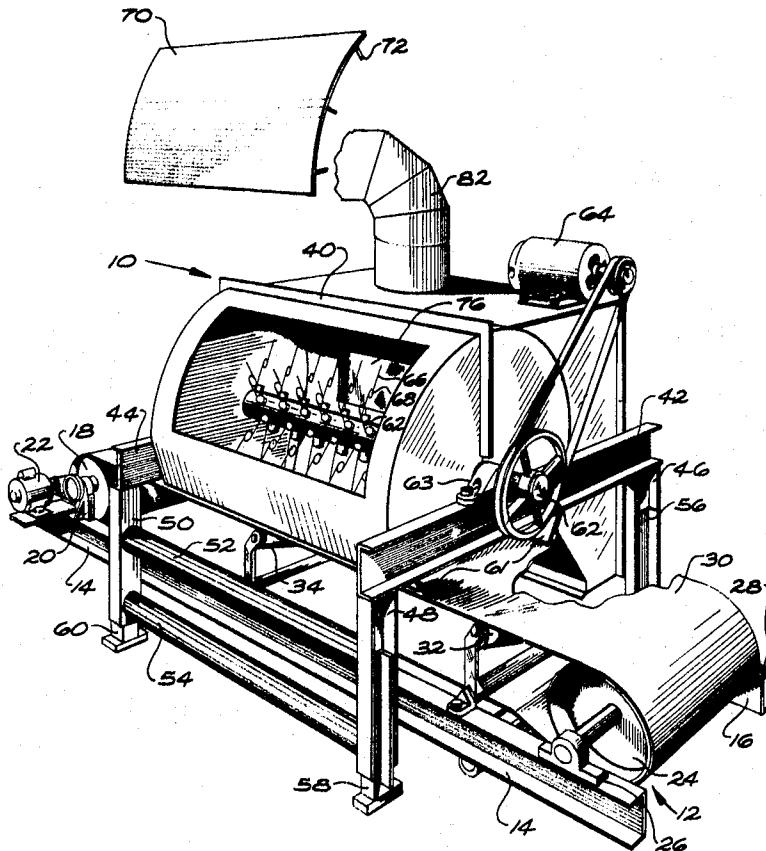
[52] **U.S. Cl.**..... 241/58, 241/73, 241/79.2, 241/195
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 [58] **Field of Search** 241/49, 58, 70, 73, 241/75, 79.2, 135, 138, 195

[57] **ABSTRACT**

A garbage classification system separates lightweight refuse materials from heavier refuse materials as the refuse materials pass by on a conveyor. The lightweight refuse materials are picked up from the conveyor, shredded, and directed to a collection area for removal from the classifier.

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9 Claims, 4 Drawing Figures



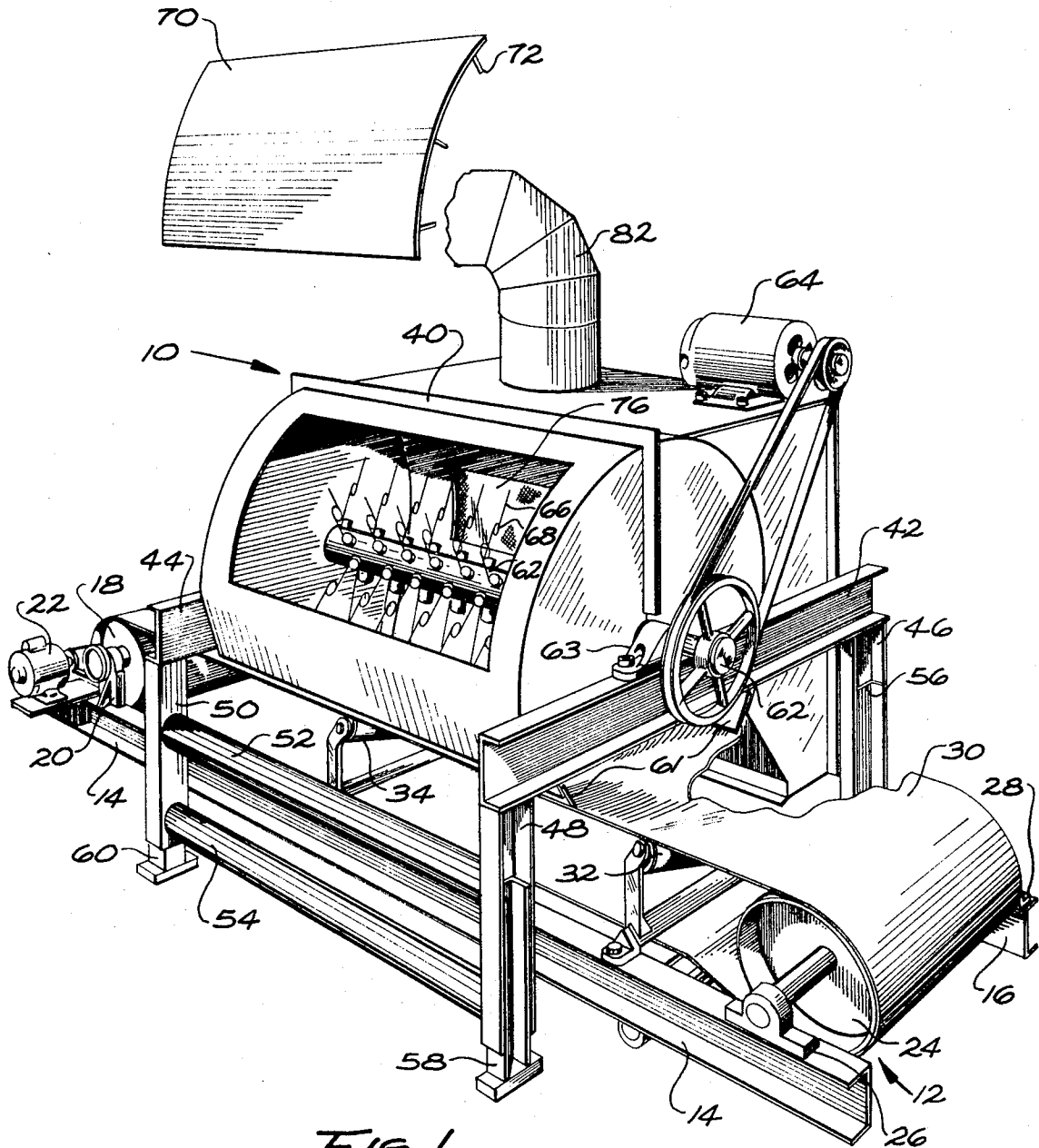


FIG. 1.

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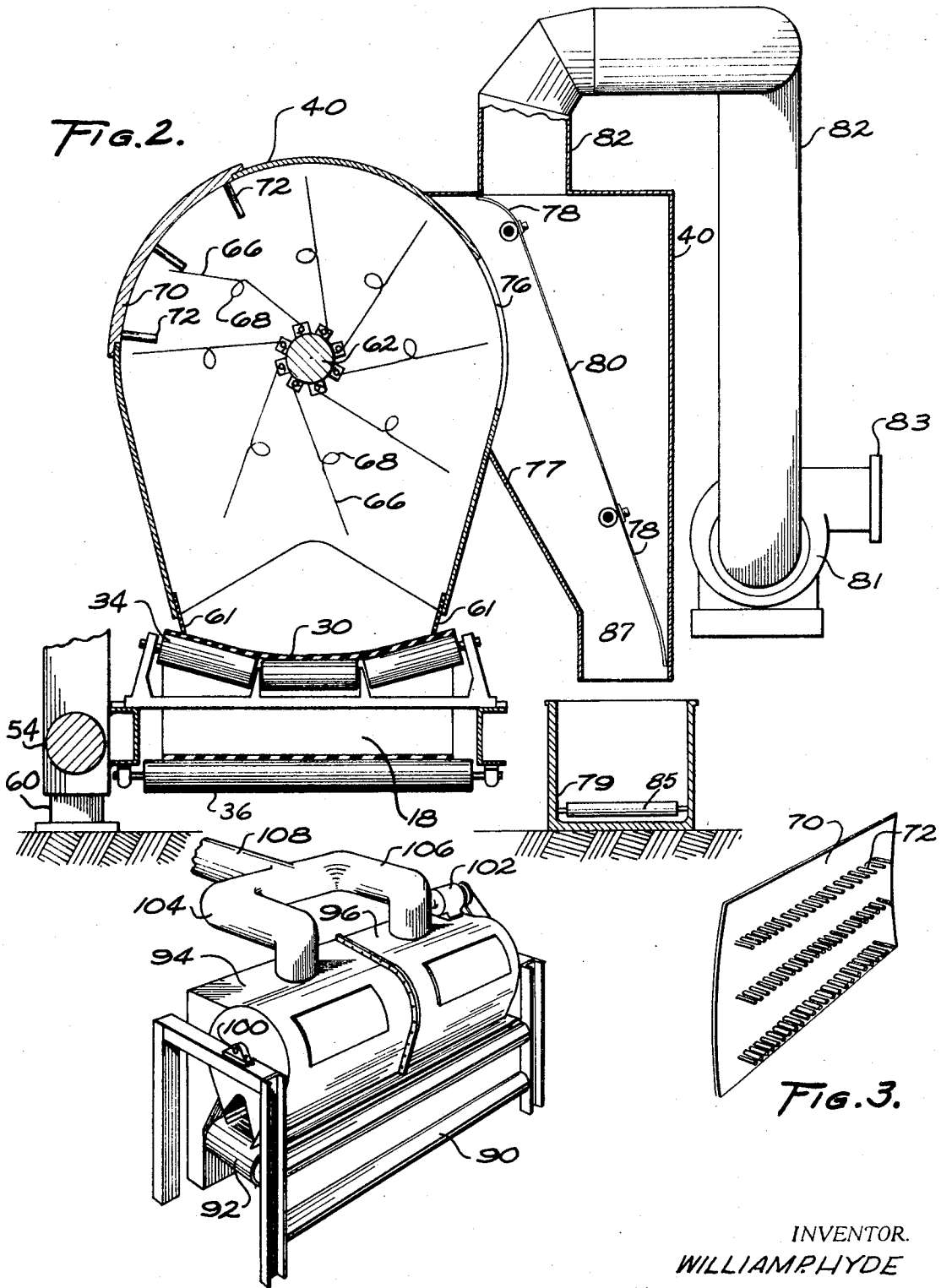


FIG. 2.

FIG. 3.

FIG. 4.

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GARBAGE CLASSIFICATION SYSTEM

BACKGROUND OF THE INVENTION

This invention relates to a garbage classification system for separating lightweight refuse materials from heavyweight refuse materials. More particularly the invention relates to a garbage classification system which is of relatively simple construction and fully automated once the refuse materials have been deposited on a conveyor leading into the system.

In recent years considerable attention and economic effort has been directed toward the efficient disposal of refuse materials in a manner which will not harm the environment. One of the problems with prior art waste disposal systems is their almost universal attempt to subject the myriad forms of refuse to the same sort of treatment in order to break same down into a disposable form, such as ash, etc.

The present invention recognizes that all forms of refuse are not subject to the same type of "break-down" process and provides a system of classifying and separating refuse materials according to their weight. In this manner heavy objects of metal and stone, etc., are separated from lightweight paper and plastic objects so that they can be subjected to different disposal procedures.

Further objects and advantages of the present invention will be apparent from the following description and claims and are illustrated in the accompanying drawings which, by way of illustration, show preferred embodiments of the present invention and the principles thereof and what are now considered to be the best modes contemplated for applying these principles. Other embodiments of the invention embodying the same or equivalent principles may be used and structural changes may be made as desired by those skilled in the art without departing from the present invention and the purview of the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an overall view illustrating a preferred embodiment of the invention.

FIG. 2 is a cross-sectional view of the embodiment shown in FIG. 1.

FIG. 3 is a detailed view of one of the elements of the classifier shown in the embodiment of FIG. 1.

FIG. 4 is an overall view of a modified embodiment of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to FIG. 1 there is shown at 10 a single stage garbage classification system. The overall system comprises a conventional conveyor means, such as a belt conveyor shown generally at 12.

The belt conveyor 12 comprises a pair of laterally spaced channel frame members 14 and 16 which extend lengthwise through the system. A driver roller 18 is suitably journaled in a conventional manner on roller supports, one of which is shown at 20, at a first end of the system. The driver roller 18 is driven by any suitable motor means, such as shown at 22.

At a second end of the system an idler roller 24 is similarly mounted and journaled in roller supports 26 and 28 which supports are attached to the frame members 14 and 16 in any suitable manner, such as by bolt means or welding. A flexible endless conveyor belt 30

is entrained around the driven roller 18 and the idler roller 24. A plurality of supporting rollers are also mounted along the length of the frame members as shown at 32 and 34. In addition, idler roll 36 (FIG. 2) puts tension on the conveyor belt 30.

The conveyor belt 30 can of course be driven in either direction and also the refuse materials to be processed through the system may be placed on either end of the belt. However, for purposes of this discussion, we will assume that the refuse materials are initially placed upon the conveyor belt 30 at the end wherein the motor driven roller 18 is located. That is, the materials will pass through the system from left to right as shown in FIG. 1.

As also shown in FIG. 1, the classifier system 10 comprises an enclosed housing 40. The housing 40 is attached in any suitable manner to a pair of laterally extending frame members 42 and 44. Frame members 42 and 44 are, in turn, suitably attached to vertically adjustable channel members, located at the four corners of the system, and three of which are shown at 46, 48 and 50. The two channel members on each side of the system, such as 48 and 50, are joined to each other by support struts 52 and 54 to lend stability to the frame structure. Each channel member 46, 48 and 50 is vertically slidable about four fixed post elements, three of which are shown at 56, 58 and 60. Suitable bolt members, not shown, may be passed through holes formed in the slidable channel members and the fixed post members to adjust the height of the classifier housing 40 with respect to the belt conveyor 30. It should also be noted that relatively stiff gasket members 61 are situated inside housing 40 and press down upon the conveyor 30 to ensure that refuse on the conveyor will be trapped within the housing 40.

Turning now to FIG. 2 in conjunction with FIG. 1 there is shown a main rotor 62 which extends lengthwise throughout the classifier housing 40. The rotor 62 is journaled in a conventional manner in the frame members 42 and 44, as shown at 63, and is driven by suitable motor means 64 located on top of the housing 40.

Located on the rotor 62 and interior of the housing 40 are a plurality of radially outwardly extending stiff wire element 66. The wire elements 66 project directly into the path of, and at a predetermined height above, incoming refuse material which has been placed upon the conveyor 30. Consequently, upon rotation of the rotor 62, the wire elements 66 sweep the lighter weight refuse materials upwardly in a clockwise direction as best shown in FIG. 2. Although the wire elements 66 may be straight, it has been found preferable to form a coil 68 therein. The coil 68 tends to allow the wire elements to bend easily and thus prolong the effective life of the wire elements 66 while also reducing maintenance costs. The wire elements are mounted on the shaft 62 in such a manner as to form a double helix along the length of said shaft. When material passes through from left to right, as shown in FIG. 1, the helix formed by the wire elements will propel lightweight materials from right to left, as shown in FIG. 1, thus tending to keep said lightweight materials in housing 40 until they can be exhausted through the air chamber.

The housing 40 is provided with a removable interior wall portion 70 which has a plurality of shredding elements 72 projecting outwardly from the inner wall of the housing and toward the rotor 62. In FIG. 1 the wall

portion 70 is shown removed from the housing 40 so that the elements inside housing 40 may be viewed. The shredding elements 72 preferably take the form of rod-like studs which are arranged in rows as best shown in FIG. 3.

It should be noted that the shredder rods 72 project directly into the path of the upwardly rotating wire elements 66. Thus, as the refuse materials are swept upwardly on the wire elements 66 they are impinged upon the shredder rods 72 and shredded into relatively fine materials. The impinging action of the wire elements upon the shredder rods also causes any heavy particles adhering to the lightweight materials to be dislodged therefrom and to fall back down upon the belt conveyor 30.

Located downstream of the shredder rods 72 and formed in the wall of housing 40 is a perforated grill or screen element 76. The finely shredded lightweight materials are carried by the rotating brush members 66 and forced through the grill 76. After passing through the grill 76, the lightweight materials are channeled between a pair of baffle members 77 and 78 and drop to a collection area 79 which is preferably provided with conveyor means (not shown) for removing the materials. Baffle member 78 is provided with a fine mesh screen 80 whose function will be described below.

A suction fan is provided as shown at 81 and communicates with the housing via conduit means shown at 82. The function of the suction fan 81 will now be described. As refuse materials pass through housing 40 on conveyor 30, the suction fan 81 pulls air through the refuse materials forcing a separation of light and heavy weight materials. As the lightweight materials pass through the grill 76, the dust-like and very small particles pass through the cloth mesh 80 under the influence of the suction fan 81. The very fine particles then pass through the conduit 82 and may be collected in a bag which may be attached downstream of the fan, for example at 83.

Collection area 79 is adjacent to housing 40. The area 79 is a pipe, open on the top throughout the housing 40 and closed outside the chamber, through which a conveyor 85 is passed to exhaust the material from collection area 79.

A function of screen 80 is to allow air to pass through and form dead air space 87 on the bottom of the air chamber to allow the lightweight material to drop into collection area 79.

The embodiment of the invention shown in FIGS. 1-3 relates to a single stage garbage classifier system in which the lighter weight materials are removed to the area 79 and the heavier materials pass on through the system on the conveyor 30. It should be understood that the invention can also be practiced with the use of a plurality of classifier units which progressively remove heavier materials until only extremely heavy objects remain on the belt conveyor 30.

FIG. 4 illustrates a modified embodiment of the invention wherein two classifier units are utilized. In FIG. 4 there is shown generally a frame structure 90 which is similar in all respects to the frame elements of the embodiment shown in FIGS. 1-3. A belt conveyor 92 is also provided for passing materials through the system from left to right as shown in FIG. 4.

A first stage classifier is shown at 94 and a second stage classifier is shown at 96 and the two enclosed classifiers are sealably connected to each other at 98.

Both classifiers 94 and 96 are similar in all respects to the classifier described in detail in FIGS. 1-3.

A rotor 100 extends through both classifiers upon which wire element are mounted similar to the wire element 66 of FIG. 1. A motor 102 drives the rotor 100. Also shown are exhaust conduits 104 and 106 which lead to a common conduit 108. A suction fan (not shown) is located downstream in conduit 108 for removing fine dust-like particles from the classification system. Although not shown in FIG. 4, each of the classifiers 94 and 96 is provided with a collection area similar to the arrangement shown at 77, 78 and 79 of FIG. 2.

In operation, the wire element of classifier 94 are located about 12 inches above the conveyor 30 while the wire elements of classifier 96 are located approximately 3 inches above the conveyor. In this manner the lighter weight materials are separated out in classifier 94 while somewhat heavier weight materials are separated out in classifier 96 with the remaining heavy weight objects passing on through the system on conveyor 30.

I claim:

1. A garbage classification system for separating lightweight refuse materials from heavier refuse materials comprising:

- a. conveyor means for conveying both light and heavy weighted refuse materials to a first stage classifier;
- b. said first stage classifier comprising an enclosed housing having a rotor centrally mounted therein and motor means associated with the housing for rapidly rotating said rotor;
- c. a plurality of outwardly extending stiff wire elements mounted on said rotor, said wire elements projecting directly into the path of said conveyor means at a predetermined distance thereabove so that, upon rotation, said wire elements sweep lighter weight refuse materials upwardly into the housing;
- d. a plurality of shredding members mounted on the inner wall of said housing and projecting into the path of said rotatable wire elements to cause shredding of said refuse into relatively fine materials and to dislodge heavy particles adhering to the lightweight materials;
- e. a perforated grill formed in said housing downstream of said shredding members so that said finely shredded materials are carried by said rotatable wire elements to the grill and forced there-through;
- f. baffle means located on the outer side of said grill to channel said finely shredded materials to a collection area; and
- g. a second conveyor means located in the collection area for removing said finely shredded materials from the first stage classifier.

2. A garbage classification system as set forth in claim 1 wherein an enclosed chamber is provided outside the perforated grill; a suction fan is operatively associated with said enclosed chamber for removing very fine dust-like particles from the chamber; and dust collection means are associated with said suction fan to collect said particles.

3. A garbage classification system as set forth in claim 1 wherein said wire elements are comprised of very stiff wire.

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4. A garbage classification system as set forth in claim 3 wherein said stiff wire element are provided with a helical coil lengthwise thereof to prolong the life of said stiff wire brush members.

5. A garbage classification system as set forth in claim 1 wherein said shredding members comprise rod-like studs.

6. A garbage classification system as set forth in claim 1 wherein the distance between said wire brush members and said conveyor is approximately 12 inches.

7. A garbage classification system as set forth in claim 1 wherein a second stage classifier is operatively associated with the conveyor belt and located downstream of the first stage classifier, said second stage classifier comprising:

- a. an enclosed housing having a rotor centrally mounted therein and motor means associated with the housing for rapidly rotating the rotor;
- b. a plurality of outwardly extending stiff wire elements mounted on said rotor, said wire elements projecting directly into the path of said conveyor

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means at a distance above the conveyor which is substantially closer to the conveyor than the distance between said wire elements and the conveyor associated with the first stage classifier, so that upon rotation, the wire elements sweep relatively heavy weighted refuse materials upwardly into the housing; and

c. aperture means formed in the wall of the housing and conduit means associated with the housing aperture whereby the heavy weighted materials are swept by the wire elements through the aperture and into conduit means for collection.

8. A garbage classification system as set forth in claim 7 wherein common motor means are used to rapidly rotate both the rotor of said first stage classifier and the rotor of said second stage classifier.

9. A garbage classification system as set forth in claim 7 wherein the distance between the wire element of the second stage classifier and said conveyor is approximately 3 inches.

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