United States Patent

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[72] Inventor **James E. O'Connor**
South Laguna, Calif.

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[73] Assignee **Document Disintegration, Inc.**
Gardena, Calif.

[54] **DESTRUCTOR MILLING MECHANISM**
2 Claims, 2 Drawing Figs.

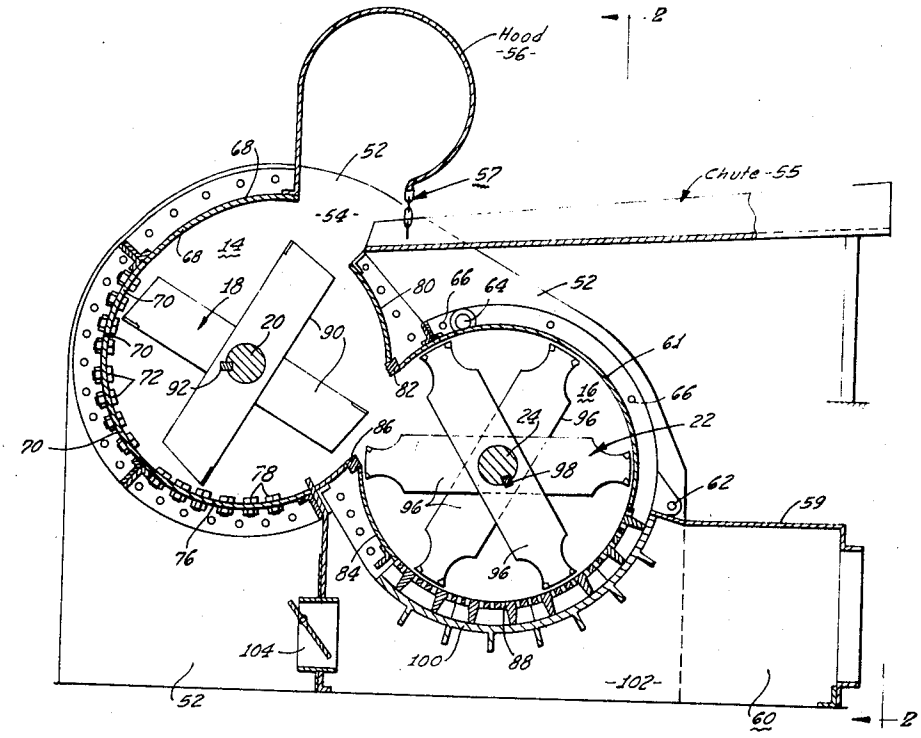
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[51] **Int. Cl.** **B02c 13/06,**
B02c 18/14, B02c 18/22
[50] **Field of Search** ..... 241/189 R,
285, 82, 154, 86

[56] **References Cited**
UNITED STATES PATENTS

1,763,165	6/1930	Liggett	241/189 R
2,204,069	6/1940	Clement	241/82
3,398,901	8/1968	O'Connor	241/154

Primary Examiner—Lester M. Swingle
Assistant Examiner—Michael Koczo, Jr.
Attorney—Jessup & Beecher

ABSTRACT: An improved destructor mechanism is described for reducing documents, paper and similar fibrous materials to a fluffy illegible consistency. The mill to be described is equipped with a hood at the entrance to the mill, into which material which is not accepted initially by the mechanism is discharged back through the entrance and circulated, to be reintroduced through the entrance into the mechanism until it is accepted and reduced to the aforesaid fluffy consistency. The mill to be described is particularly advantageous, in that bulky material can be fed into it without the tendency for the apparatus to become jammed, and no special care need be taken in the manner in which the material is fed into the mechanism, or of the size or weight of the material.



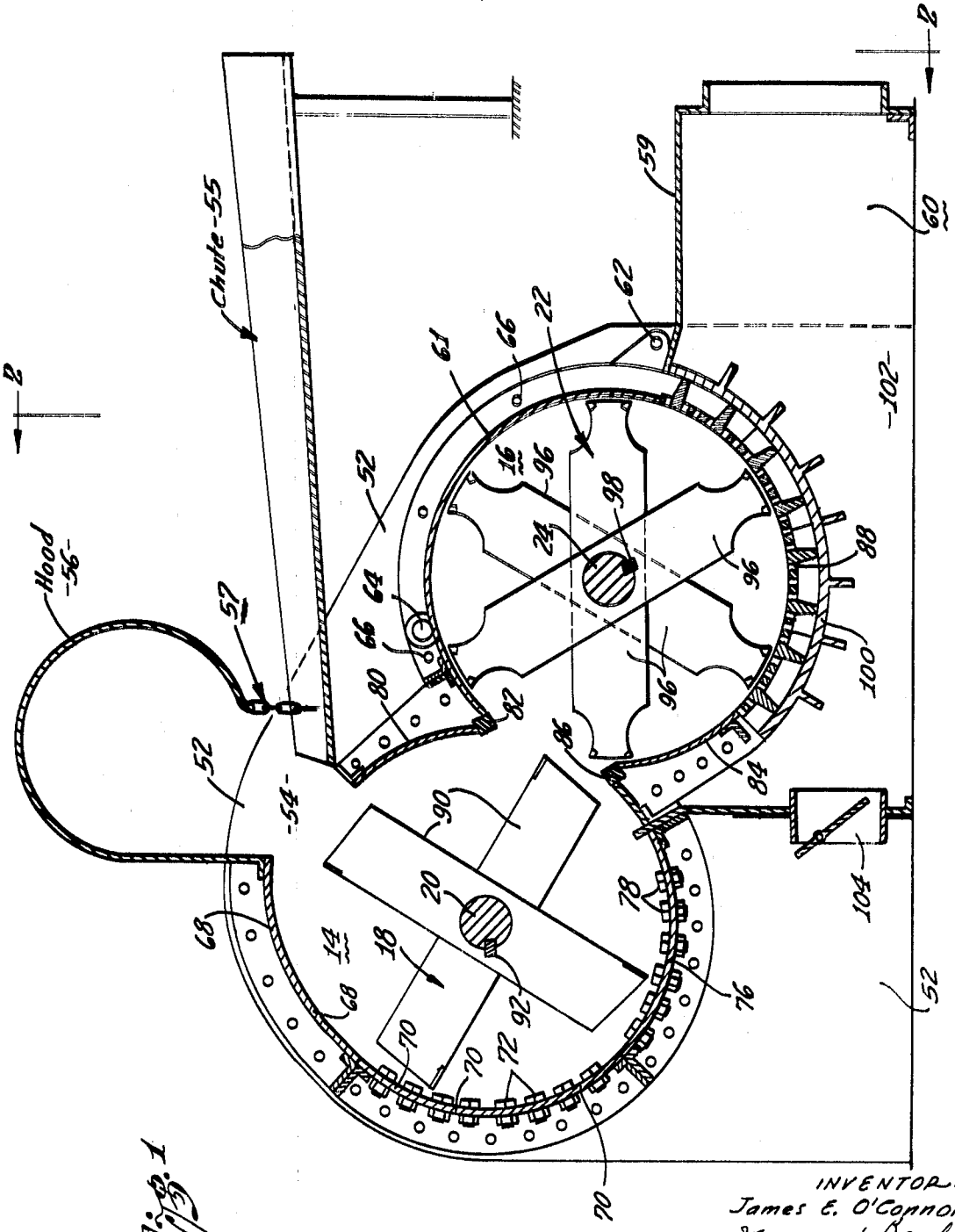


Fig. 1

INVENTOR:
James E. O'Connor
Kemp and Beecher
By Keith D. Beecher
ATTORNEYS

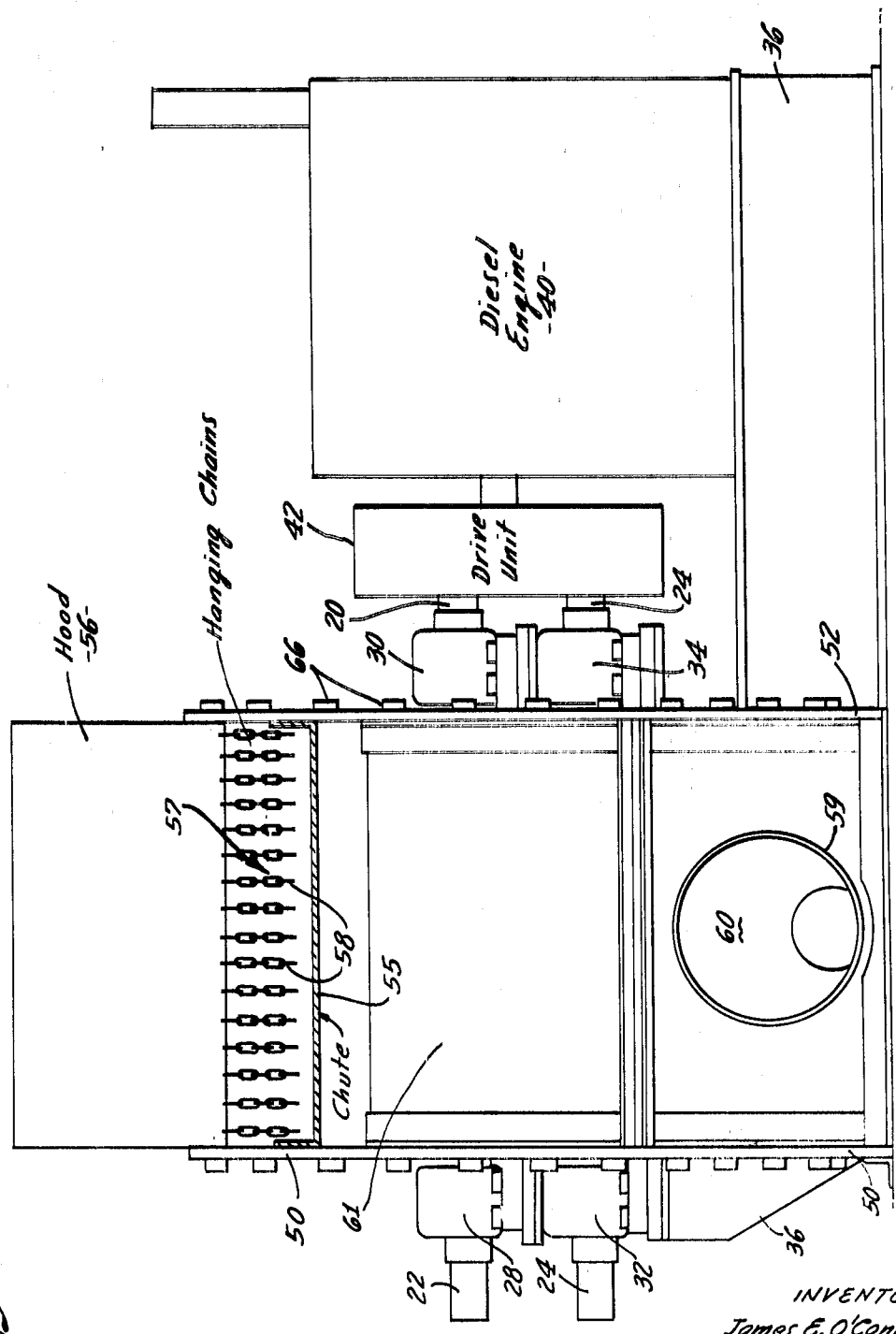


Fig. 2

INVENTOR:
James E. O'Connor
Kemp and Beecher
By Keith D. Beecher
ATTORNEYS

DESTRUCTOR MILLING MECHANISM

BACKGROUND OF THE INVENTION

Apparatus for destroying documents, either of a classified nature, or documents which have served their intended purpose, is described, for example, in U.S. Pat. Nos. 3,189,286; 3,192,853 and 3,398,901, all of which have issued in the name of the present inventor.

The mechanism disclosed in the U.S. Pat. No. 3,398,901, for example, is directly concerned with the problem of adequately destroying documents which are heavy or bulky, such as bound books and papers, and which have a tendency to clog and jam the apparatus. The destruction of such bulky and heavy documents is accomplished in the apparatus of the aforesaid U.S. Pat. No. 3,398,901 by means of a housing providing a pair of interconnecting juxtaposed chambers. In each of the chambers, a power-driven rotor carrying rigidly mounted document-destroying hammers is rotatably mounted, and the rotors are relatively disposed so that the hammers of the two rotors cooperate to produce an "implosive" effect upon the documents which substantially contributes to the desired end result of the destructive operation.

However, even in the apparatus described in the said U.S. Pat. No. 3,398,901, some care must be taken in the feed of documents and other material into the apparatus, so as to avoid clogging the apparatus with the bulky material.

The teaching of the present invention may be applied to apparatus such as described in the U.S. Pat. No. 3,398,901, and the specific embodiment to be described herein will be considered in such an environment. However, it will become apparent as the description proceeds that the concepts and teachings of the invention have general utility, and may be employed in conjunction with a wide variety of document-destroying mechanisms.

It has been the practice in the prior art to feed the material into document-destroying mechanisms, such as those described in the aforesaid patents, by directing it into the apparatus from a point displaced above the mechanism. Preferably, the material is fed from a relatively high elevation, so that it may fall and gather momentum as it enters through the top of the apparatus. In the apparatus of the present invention, on the other hand, the material is fed into the entrance of the apparatus along a horizontal chute, for example, or one which is inclined slightly to the horizontal.

The entrance is disposed in the side of a hood which, in accordance with the invention, is mounted over the top of the opening at the top of the mechanism and into the interior of the mechanism. The hood is positioned and configured, so as to provide a circulating chamber for material rejected back through the entrance by the milling mechanism.

In the operation of the apparatus of the invention, for example, as material is fed into the mill through the aforesaid entrance, it falls through the opening into the mechanism and circulates around, in the manner described, for example, in the aforesaid patents. However, any excess material is discharged by the mechanism out through the entrance. This action also occurs in the prior art mechanisms. However, the prior art mechanisms are so constructed that any material rejected by the mechanism itself meets the incoming material, and is directly returned into the mechanism with a tendency to jam and clog the apparatus.

By means of the hood of the present invention, any material rejected by the mechanism is caused to circulate around in the hood, and is not directly in the path of the incoming material. The circulating material may then be fed back into the mechanism, and may continue to circulate in and out of the mechanism itself, until it has arrived at a consistency suitable for acceptance by the mechanism, or, until the incoming load has decreased sufficiently, to permit the mechanism to supply additional material.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side section of a milling mechanism similar to that described in the aforesaid U.S. Pat. No. 3,398,901, and equipped with a hood, to embody the concepts of the present invention; and

FIG. 2 is a view substantially along the line 2—2 of FIG. 1.

DETAILED DESCRIPTION OF THE ILLUSTRATED EMBODIMENT

As shown in the drawings, and as described in greater detail in U.S. Pat. No. 3,398,901, the mechanism includes a primary mill section and a secondary mill section, designated **14** and **16** respectively in FIG. **1**. A primary rotor **18** is mounted on a drive shaft **20** in the primary section, and a secondary rotor **22** is mounted on a drive shaft **24** in the secondary section. The shaft **20**, for example, is rotatably supported in a pair of pillow blocks **28** and **30** (FIG. **2**); whereas the shaft **24** is rotatably supported in a pair of pillow blocks **32** and **34**. The pillow blocks are mounted on an appropriate frame **36**.

The secondary section **16** of the mill is disposed at a lower elevation, with respect to the primary section **14**, so that the shafts **20** and **24** lie in a plane which is inclined to the horizontal. This inclination may be of the order of 30°, for example. It has been found that satisfactory results may be achieved with such an inclination. As explained in the aforesaid patent, although the inclination is not too critical, it has been found that with a 30° inclination, the material is held in the primary section long enough so that it can be reduced to a desired broken-up form before it is introduced into the secondary section, and the material introduced into the secondary section enters that section at the optimum angle for maximum explosive effect.

A motor **40** (FIG. **2**) drives the shafts **20** and **24** through an appropriate drive mechanism **42**. The motor **40**, for example, may be a diesel motor, or any other appropriate source of power may be used. The motor **40** drives the shaft **24** through the drive mechanism **42** at the same speed as the shaft **20**.

The mill itself is made up of a pair of side plates **50** and **52**, which are bolted to the frame **36**. The side plates **50** and **52** are mounted in an upright spaced-parallel relationship. The actual primary and secondary sections **14** and **16** of the mill are formed by arcuate-shaped members which extend across from one of the side plates to the other, and which are bolted to the side plates. The side plates **50** and **52**, and associated arcuate components define an opening **54** at the top of the primary section **14** through which the material is fed into the primary section of the mill.

The documents and other material which are to be treated in the mechanism are fed through an entrance **57** at the side of hood **56** into the inlet **54** by means, for example, of a chute **55**. The chute **55**, for example, may be inclined slightly to the horizontal, as shown. The hood **56** is arcuate shaped, as shown, and it is mounted over the opening **54**. The hood **56** defines the entrance **57** at its side, through which the material from the chute **55** is caused to enter, to be fed into the mill through the opening **54**. A plurality of chains **58** may be suspended across the entrance **57** as a protective means.

An exhaust duct **59** is mounted adjacent an outlet **60** in the housing, and the outlet extends from below the secondary section **16**. The pulverized material from the mill is drawn through the exhaust duct **59**, and is subsequently disposed of in any suitable manner. The pulverized material may be drawn through the exhaust duct by means of a vacuum pressure, as described in the aforesaid patents.

As shown in FIG. **1**, for example, the milling mechanism is actually a dual mill, as described in the aforesaid patent, including the primary section **14** and the secondary section **16**. The secondary section **16** is displaced down from the primary section, as mentioned above, and each operates in conjunction with the other, as described in the patent. That is, neither of the mill sections is suitable for independent operation, and each complements the other, so as properly to perform the

desired pulverizing action. A cover **61** forms one of the arcuate components which extends between the side plates **50** and **52**. The cover **61** is pivoted to the frame **36** on a shaft **62**. A lifter eye **64** is provided at the other end of the arcuate cover **61**. The cover is held in place by bolts, such as the bolts **66** extending through a flange of the cover and through the side plates **50** and **52**. When the machine is to be opened, these bolts are removed, and the cover may be moved back by a block or a tackle, or by other suitable lifting mechanisms which may be coupled to the eye **64**. When the cover is opened, the interior of the secondary section **16** of the mill is revealed.

An arcuate section **68** is bolted to the side plates **50** and **52**, and as shown in FIG. **2** this section extends between the side plates adjacent the opening **54** at the top of the section **14**. The hood **56** is attached to the arcuate section **68**, as best shown in FIG. **1**. The inner surface of the section **68** is smooth, so as to define an open area with the primary rotor **18**. The material introduced through the side entrance **57** and through the opening **54** into the interior of the primary section **14** is initially exposed to the action of the primary rotor, without any further fracturing action in this open area. In this way, the primary rotor **18** is able to break up the incoming material to some extent as a preliminary measure, so as to minimize the tendency for bulky or heavy material to jam the mechanism.

Moreover, the primary rotor tends to eject the heavy and bulky material back up through the opening **54** and up into the section defined by the hood **56**. In this way, the heavy bulky material is recirculated through the primary section and back through the hood **56**, and this may occur several times until the bulky material has a composition so as to enable it to be accepted by the mill and further treated without any tendency to jam the mechanism.

A second arcuate section **70** is bolted to the side plates **50** and **52** adjacent the section **68**, and this latter section likewise extends from one of the side plates to the other. It will be appreciated that the arcuate sections **68** and **70**, and other arcuate sections making up the mechanism, serve to define, with the side plates **50** and **52**, the primary section **14** and the secondary section **16** of the mechanism.

A plurality of short breaker bars **72** extend through the arcuate section **70**, with the heads of the bars disposed inside the primary section **14** as described in U.S. Pat. No. 3,398,901 referred to above. These bars are bolted in place, as shown, and are formed, for example, of case hardened steel, with additional hardening being provided for the heads. After the material is fed into the primary section it undergoes a preliminary breaking up action in the open area defined by the arcuate section **68**, as mentioned above, and the material is then driven against the heads of the breaker bars **72** by the primary rotor **18**, so as to initiate the pulverizing action of the mill. A further arcuate section **76** extends between the side plates **50** and **52** adjacent the arcuate section **70**, and in position further to enclose the primary mill section **14**. A further group of breaker bars **78** extend through the arcuate section **76**, and these breaker bars are held in place by suitable nuts, as shown in FIG. **1**.

A further arcuate section **80** is bolted to the side plates **50** and **52**, and this latter section extends between the side plates on the opposite side of the inlet **54**. A top breaker bar **82** is welded, or otherwise affixed, to the arcuate section **80**, and this breaker bar extends between the side plates **50** and **52** to define the upper edge of the opening between the primary section **14** and the secondary section **16**. Yet another arcuate section **84** is bolted to the side plates **50** and **52**, and extends between the side plates. A bottom breaker bar **86** is welded, or otherwise attached, to the arcuate section **84**, and this latter breaker bar forms the lower edge of the opening between the primary and secondary sections **14** and **16** of the mill. The breaker bars **82** and **86** also may be formed of case hardened steel, or other appropriate material.

As mentioned above, the arcuate sections which have been described cooperate with the side plates **50** and **52** to define the primary section **14** of the mill, and the arcuate sections **80** and **84** additionally define a portion of the secondary section **16**. The cover **61** also helps to define the secondary section **16**, and that section is completed by an arcuate grating **88** which extends between the side plates **50** and **52** at the bottom of the secondary section **16**.

The primary rotor **18**, as also described in U.S. Pat. No. 3,398,901, includes a plurality of rigid striplike hammer members **90** which are keyed to the shaft **20** by means, for example, of a key **92**. The hammer elements **90** are formed, for example, of case-hardened steel, with additionally reinforced corners. These hammer members **90** are spaced along the shaft **20** and rotate with the shaft. The secondary hammers are indicated **96**, and they are keyed to the shaft **25** by means, for example, of a key **98**. The secondary hammers, likewise, are rigid and may be formed of case-hardened steel and have additionally hardened edges. As mentioned above, the rotors **18** and **20** are driven in the same direction. Therefore, as the hammers **90** move up in the right-hand portion of the primary section **14**, the hammers **96** move down in the left-hand portion of the secondary section **16**.

As the material to be destroyed is introduced through the side entrance **57** and down through the opening **54** in the top of the primary section **14**, the hammers **90** originally break it up into relatively small pieces in the open area defined by the arcuate section **68** described above. The material is then driven down against the heads of the breaker bars **72** and **78**, so that the pulverizing action may begin. Then the material is driven up towards the opening between the primary section **14** and secondary section **16**, and against the breaker bars **82** and **86** which define that opening, by the action of the primary rotor **18**.

As explained above, part of the material is rejected back through the top opening **54** and up into the chamber formed by the hood **56**. The material is then circulated back into the primary section of the mill, and it is ultimately driven up towards the opening between the primary section **14** and the secondary section **16**. An implosion area for the material which enters the area between the two sections occurs where the tips of the two sets of hammers **90** and **96** successively pass one another in the opposite direction.

That is, the material fed into the secondary section **16** by the primary hammers **90** is driven directly into the path of the oncoming tips of the secondary hammers **96**. Therefore, the tips of the secondary hammers meet the particles of material in midair and contact the particles with a relatively high force. Also, particles from the primary hammers **90** smash at a high force into particles from the oncoming tips of the secondary hammers **96**. This implosion of smashing particles against each other creates an additional destruction phase. This action creates a high-speed destruction condition of the material so that it is rapidly reduced to a desired fluffy state. The secondary hammers **96** then carry the fluffy material down against the grating **88**, and it is passed through the grating when it reaches a desired illegible fluffy consistency. A further grating **100** is provided, so that the material must be reduced to a particular consistency before it will be passed to the exhaust duct **59**. The material to be discharged from the mechanism collects in a chamber **102** under the secondary section **16**, and which communicates with the outlet **60**. The material may then be withdrawn by appropriate vacuum pressure, as mentioned above, and as described in the aforesaid patent.

An important feature of the mechanism of the present invention is the concept of the hood **56** which permits the material to be fed into the mill through the side entrance **57** by means of the chute **55** from a relatively low position with respect to the floor. This obviates any need to transport the material to a high position relative to the mill and to drip it vertically into the top opening **54**. The resulting combination is such that material may be conveniently and easily fed into the mill, and the likelihood of the mill becoming jammed is reduced to minimum, since any excess material is merely rejected back through the top opening **54** and up into the

chamber formed by the hood **56** to recirculate in and out of the mill itself, until the necessary conditions are met for the material to be completely processed by the mechanism.

It will be appreciated, of course, that although the mill illustrated in FIG. **1** and **2** herein is shown as a permanent installation, it could just as well be mobile, and could be carried from place to place by means of an appropriate vehicle.

What is claimed is:

1. A milling mechanism for reducing fibrous material, such as documents, paper and the like, into a fluffy illegible consistency including: a housing defining at least one compartment for the milling mechanism; a rotor including a plurality of hammer elements mounted in said compartment for rotation about a horizontal axis; said housing including components defining a wall for said compartment, said components defining an opening in the wall at the top of said compartment for receiving material into said compartment; and a further component mounted on said housing and extending as a hood around said opening, said hood defining a side entrance for receiving said fibrous material into said milling mechanism and having a generally arcuate configuration so that material discharged from said compartment through said opening is circulated unimpeded around the inner surface of the arcuate wall of a chamber formed by said hood and back into said opening.

2. The combination defined in claim **1**, and which includes a chute disposed in a generally horizontal plane and mounted adjacent said side entrance for feeding said fibrous material into the interior of said milling mechanism through said entrance and down through said opening.