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Rogers

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[54] **LOW NOISE LEVEL CHIPPER**

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[73] Assignee: **Olathe Manufacturing Inc.**, Raola, Kans.

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[52] **U.S. Cl.** **241/222;** 144/172; 241/294

[51] **Int. Cl.** **B02c 18/06;** B02c 18/18

[58] **Field of Search**..... 241/101.7, 101 M, 221, 222, 241/224, 242, 294; 144/172

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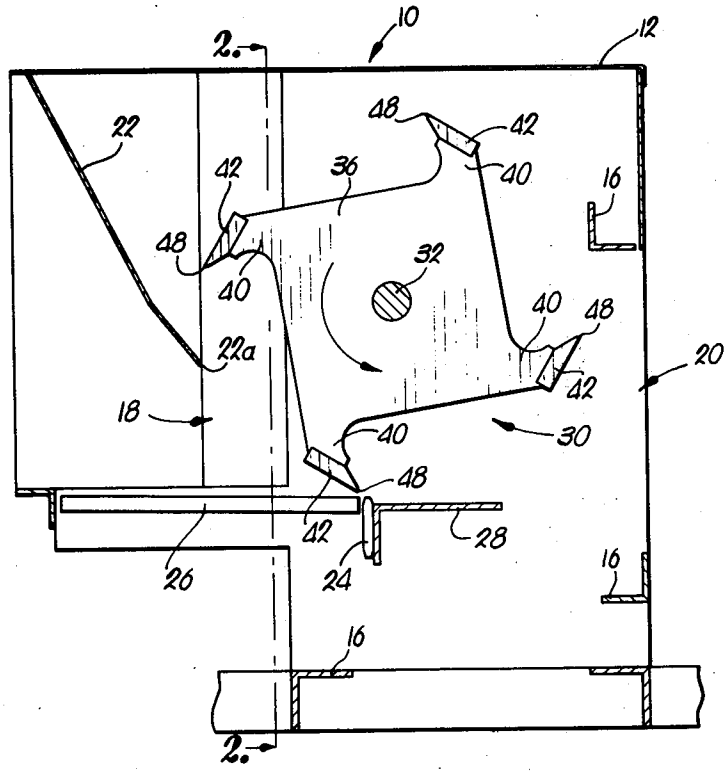
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[57] **ABSTRACT**

The cutting rotor of a low noise level chipper is closely confined within a housing and yet is provided with a series of air escape passages through the body of the rotor so that air which is otherwise trapped within the close confines of the housing and acted upon by the rotor to produce piercing noise is instead released through the rotor itself during rotation thereof whereby to preclude the emission of such noise. A number of generally rectangular blocks are spaced apart along the axle shaft of the rotor to define such air escape passages and are provided with elongated knives at their aligned corners that cooperate with a common shear bar to disintegrate the materials fed to the chipper during operation thereof.

3 Claims, 3 Drawing Figures



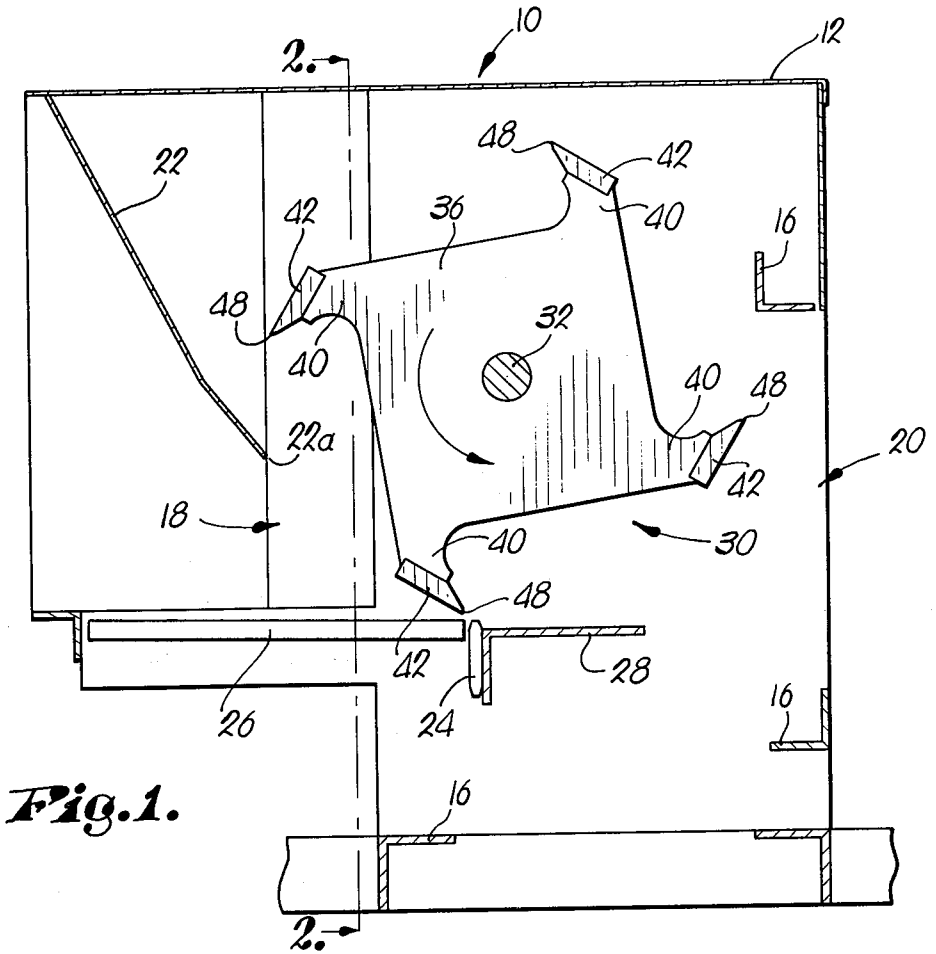


Fig.1.

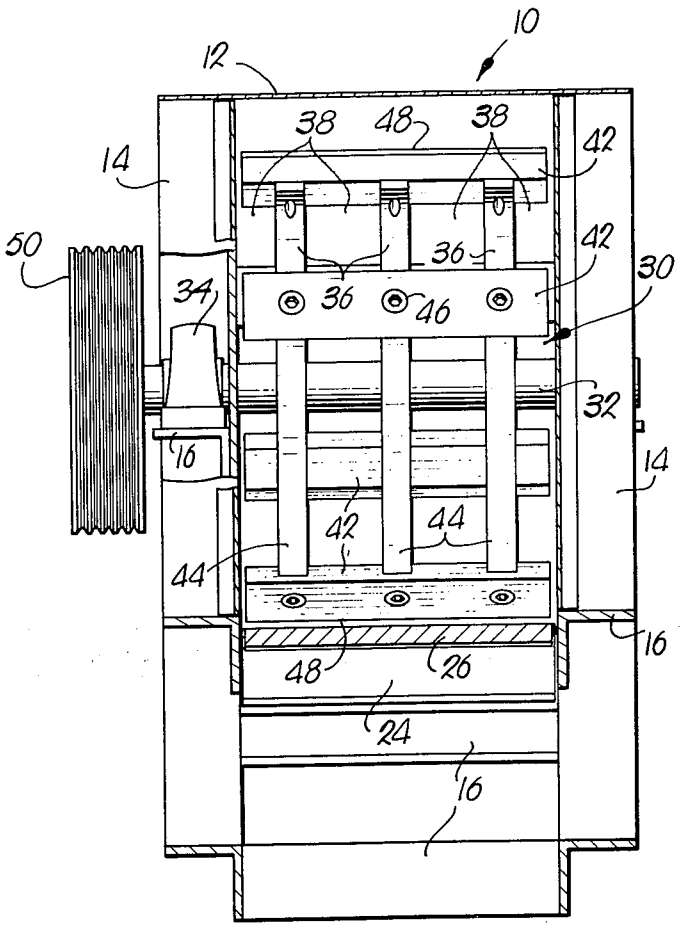


Fig.2.

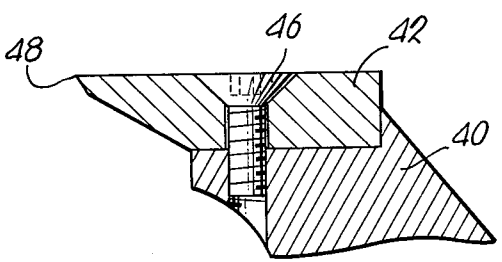


Fig.3.

LOW NOISE LEVEL CHIPPER

This invention relates to high speed wood chippers such as commonly used by tree trimming or removing crews to disintegrate branches, brush, and small logs fed into the chipper in order to clear the work site of the tree parts. Upon disintegration of the material, the chips are projected through a discharge chute into a large container such as the enclosed bed of a truck, whereupon the collected chips can be simply hauled away.

Typical chippers operate at extremely high rotative speeds such as 3,000 rpm or better in order to handle the mass of material fed thereinto without choking or overloading the power unit associated with the chipper. While such high speeds are desirable from a purely functional standpoint, they have heretofore been and are increasingly becoming undesirable from an environmental standpoint because such high speeds are conducive to the creation of a continuous, sharp, piercing noise from the spinning rotor of the chipper. With the increasing emphasis on eliminating environmental noise pollution in addition to water and air control, a growing number of local, state and federal governmental entities are developing standards which would severely limit the allowable noise emissions of machines such as wood chippers. The problem can be brought into even clearer focus when it is considered that tree trimming and removing operations are largely confined to residential locations which are likely to be rather densely populated and are most often carried out during the summer months when residents are participating in outdoor activities of various nature and their homes are open to the sights and sounds of the neighborhood.

While a definite amount of noise is produced during the relatively short interval that material is being fed through the chipper, a great amount of noise is produced over a prolonged period simply by rotation of the rotor itself between the periodic feedings of material into the chipper. It is believed that one reason for such noise from the rotating rotor itself is the construction of the rotor, its relationship to the housing with in which it is disposed, and the subsequent effect by these factors upon air that is drawn into the chipper during operation. Heretofore, chippers have commonly been provided with rotors that have massive, solid cylinders provided with knives spaced circumferentially about their periphery. The cylinders rotated within very close confines within their respective housings so that air drawn into the vicinity of the rotor by virtue of its spinning action had no place to go except through the restricted space between the cylinder and the cutter bar operating in conjunction with the knives of the cylinder. Consequently, the air would become trapped within the immediate vicinity of the rotor and would be subjected to repeated impacting and compacting blows from the whirling knives. While it is considered that part of the noise was emitted as a result of purely impact action, it is also theorized that a portion was derived from the instantaneous, high pressure compaction and expansion of the air as it passed from one side of the cutter bar to the opposite side thereof into the discharge chute. With the advancement of each knife toward the cutter bar, a pocket of air would be trapped between the blade and the cutter bar, hence compressing the pocket under high pressure until the knife passed the cutter bar, whereupon pressure would be instantaneously released, causing a retort not appreciably dissimilar to that of a balloon popping or a cork being removed from a pressurized vessel. By the time the rotor reached operational speeds of approximately 3,000 rpm, the individual retorts were blended together in a continuous piercing noise that shattered the calm of an otherwise quiet neighborhood.

Accordingly, it is an important object of the present invention to provide a chipper wherein the noise level produced by the spinning rotor is held to a minimum without sacrificing the ability to handle large masses of wood materials at relatively high operating speeds if such high speeds are desired.

As a correlary to the foregoing, it is another important object of this invention to provide a chipper wherein the rotor thereof, while operating in a relatively confined space enclosed except for an inlet and outlet on opposite sides of the rotor, is constructed in a manner to provide a series of air escape passages through the body thereof so that during operation, air which would otherwise be trapped within the confined operating space of the rotor is instead allowed to pass through such passages and to the discharge outlet, thereby preventing the production of piercing noise.

An additional important object of this invention is the provision of a special, low-noise rotor as aforesaid wherein the low noise characteristics thereof can be obtained without complicated or unduly expensive construction techniques. In the drawing:

FIG. **1** is a fragmentary, largely schematic vertical cross-sectional view through a chipper embodying the principles of the present invention;

FIG. **2** is a fragmentary, vertical cross-sectional view of the chipper taken substantially along Line **2—2** of FIG. **1,** parts of the housing being broken away to reveal details of construction; and

FIG. **3** is an enlarged, fragmentary detail view of the special rotor of the chipper illustrating the manner in which the knives thereof are secured to the mounting plate members of the rotor.

The chipper **10** has an outer housing **12** that is supported by a number of vertical and horizontal frame pieces such as **14** and **16,** and the housing **12** has a material receiving inlet **18** at one end thereof and a material discharging outlet **20** at the opposite end thereof. Inlet **18** is located at the innermost open end of an entrance hopper **22** forming a part of the housing **12,** and the inlet **18** has its upper termination defined by the lowermost extremity **22***a*of hopper **22** while its lower termination is defined by a cutter bar **24** projecting into the normal path of travel of material from inlet **18** to outlet **20.** A feed platform **26** underlies hopper **22,** leading to inlet **18** for cooperating with hopper **22** to direct materials into inlet **18** during operation of the chipper **10.** The outlet **20** has its upper termination defined by an upper, horizontal frame piece **16** and its lower termination defined by a generally L-shaped apron **28** behind the cutter bar **24.** Although not shown, it is to be understood that a discharge chute or spout is commonly coupled with the outlet **18** for receiving chipped material therefrom and directing the same into a suitable receiving container.

Disposed within the housing **12** across the path of travel of material moving between inlet **18** and outlet **20** is a special rotor **30** constructed in accordance with the principles of the present invention. Rotor **30** has an axle shaft **32** extending transversely to the path of

travel of material through housing **12** and journaled by a pair of suitable bearings **34** at opposite ends thereof (only one bearing **34** being illustrated). Three generally rectangular, massive black members **36** are secured to shaft **32** such as by welding and are spaced axially along the latter to define a series of air escape passages **38** between the members **36** and between the endmost members **36** and their proximal portions of housing **12.** The passages **38** thus extend transversely to the axis of rotation of rotor **30** to openly communicate the inlet **18** and outlet **20** with one another through the body of rotor **30** on opposite vertical sides of shaft **32.**

The plate members **36** are concentrically arranged on shaft **32** and are each disposed with their corner sections **40** in alignment with those of an adjacent member **36,** each corner **40** being prolongated to facilitate the proper mounting and installation of a series of elongated knives **42** about the periphery of rotor **30** on the outermost faces **44** of members **36.** As illustrated, four knives **42** are utilized, one at each corner **40** of the plate members **36,** and each knife **42** spans all three of the members **36,** terminating at its opposite ends in close proximity to the proximal portions of housing **12.** As illustrated best in FIG. **3,** each knife **42** is secured to the members **36** by virtue of screws **46,** and each knife **42** is provided with a cutting edge **48** that passes in close proximity to cutter bar **24** during actuation of rotor **30** for cooperation with cutter bar **24** in chopping or disintegrating materials fed to rotor **30.**

As illustrated best in FIG. **1,** the knives **42** move not only in close proximity to the shear bar **24** during actuation of rotor **30,** but also in close proximity to extremity **22***a* of hopper **22,** thereby severely restricting the available space for air flow between rotor **30** and cutter bar **24,** and between rotor **30** and extremity **22***a*. Moreover, in view of the fact that extremity **22***a* is spaced but a short distance above platform **26** when compared to the overall size of rotor **30,** the inlet **18** is significantly reduced in size relative to rotor **30** so that incoming air is directed solely to the major portion of rotor **30** instead of toward the outer periphery thereof for bypass around the same to outlet **20.** Further, the housing **12** is substantially imperforate between inlet **18** and outlet **20** so that air flowing into housing **12** through inlet **18** cannot avoid the rotor **30** such as by lateral escape means, but instead must move directly to the rotor **30.** While such an arrangement has heretofore been provided in other chippers and is necessary in order to properly control the introduction of wood materials to rotor **30** and the subsequent discharge of the chips from housing **12,** such confined control over the air flow has contributed to the emission of piercing noise in previous chippers, but not in chipper **10** of the present invention as will hereinafter become abundantly clear.

It is contemplated that the chipper **10** may be mounted on the bed of a trailer (not shown) to render the same mobile and may either be powered by the power take-off from a tractor to which the trailer is hitched or, it may be provided with its own prime mover mounted directly on the trailer in which case the towing vehicle may simply be a truck or the like not provided with a power take-off. In either event, a large pulley **50** may be provided on one external end of shaft **32** for supplying driving power to the latter through a belt connection to the source of power.

Operation

When rotative power is supplied to the shaft **32** through pulley **50,** the rotor **13** is driven in a counterclockwise direction viewing FIG. **1** at speeds ranging from 700 rpm to 3,000 rpm. Wood material such as brush, branches and small logs may be fed to rotor **30** through hopper **22,** whereupon the whirling knives **42** almost instantaneously grab the fed material and disintegrate the same, projecting the chips thereof rearwardly of housing **12** through outlet **20** and an appropriate chute (not shown) for collection at a remote point. This manner of operation is quite similar to the basic aspects of operation of prior chippers in that the same basic chipping function is performed at relatively high speeds. Moreover, the operation of the rotor **30** in close proximity to extremity **22***a* of hopper **22** and to the cutter bar **24** is similar to that of prior chippers in that such an arrangement limits the flow of incoming air to a path of travel that is directly to rotor **30** instead of peripherially around the latter for bypass to the outlet **20.** But while this restricted air travel led to excessive noise emission in prior chippers, such an arrangement does not in fact produce piercing noise in the present chipper because of the air escape passages that are provided between block members **36.**

Thus, while in the past, the incoming air might be impacted by the whirling knives **42** and instantaneously compacted between the cutter bar **24** and an approaching knife **42** for subsequent instantaneous expansion on the opposite side of cutter bar **24,** air entering inlet **18** can now simply pass through the passages **38** to outlet **20** without ever being subjected to the compacting action of the knives **42.** Once the incoming air stream is contacted by a knife **42** moving downwardly past extremity **22***a*, the air is immediately swept into and through passages **38** ahead of the knife **42** so that it is not squeezed between knife **42** and cutter bar **24.**

Consequently, the impact action of the knives **42** against the incoming air is drastically reduced inasmuch as no backup surface functioning as an anvil is presented such as in the chippers having solid cylinders as part of their rotors. Moreover, the instantaneous compaction and expansion of the incoming air heretofore existing is no longer caused because once such compaction attempts to begin, the air immediately takes the path of least resistance through the passages **38** to outlet **20.** Therefore the staccato-like, repetitious retorts caused by the violently expanding air in prior chippers operating at low speeds and the strident, piercing noise when such retorts merged together at high speeds are completely avoided with the special rotor **30.**

Noteworthy is the fact that many conventional chippers heretofore available operated at decibel levels of approximately 120 to 125, which levels are extremely irritating to the human ear. Many environmentalists and noise pollution control authorities consider 85 decibels as an acceptable level for noise emissions, and the chipper **10** provided with the special rotor **30** of the present invention has been operated at levels of 75 decibels or lower while at full operating speeds, thus placing the chipper **10** well within the normally accepted noise control range.

Having thus described the invention, what is claimed as new and desired to be secured by Leters Patent's.

1. In a low noise level, high speed, wood and brush chipper:

a housing having an inlet and an outlet;

a cutting rotor rotatable within said housing between said inlet and outlet thereof across the normal path of travel of material moving through the housing,

said housing being substantially imperforate between said inlet and outlet and being provided with means limiting incoming air to flow to said rotor without appreciable bypass of the latter about the periphery thereof to the outlet; and

a cutter bar mounted in the housing directly below the axis of rotation of said rotor for cooperating with the latter to disintegrate wood materials presented thereto into chips,

said rotor including a shaft, a series of massive, solid blocks spaced along said shaft for rotation therewith, a plurality of elongated knives supported on said blocks with their chopping edges in parallel relationship to said shaft and the cutter bar, and fas-

tener means securing the blades on the blocks,

said blocks each having a pair of opposed, radial sides and a continuous, broad, flat, peripheral face extending between said sides,

said blades lying against said faces of the blocks and said fastener means extending into said faces to retain the blades in place,

said blocks defining transverse air escape passages therebetween for continuously releasing air to said outlet during rotation of the rotor.

2. A low noise level chipper as claimed in claim 1, wherein said inlet is of reduced size relative to said rotor, having one terminus thereof disposed in spaced opposition to said cutter bar and in close proximity to the periphery of the rotor, and air limiting means including said one terminus.

3. A low noise level chipper as claimed in claim 1, wherein said blocks are each generally rectangular, there being a knife at each corner thereof.

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