Dec. 11, 1962 R. GARWIN 3,067,958

SHREDDING MACHINE FOR FOAM MATERIAL

Filed Oct. 11, 1960

FIG. 1.

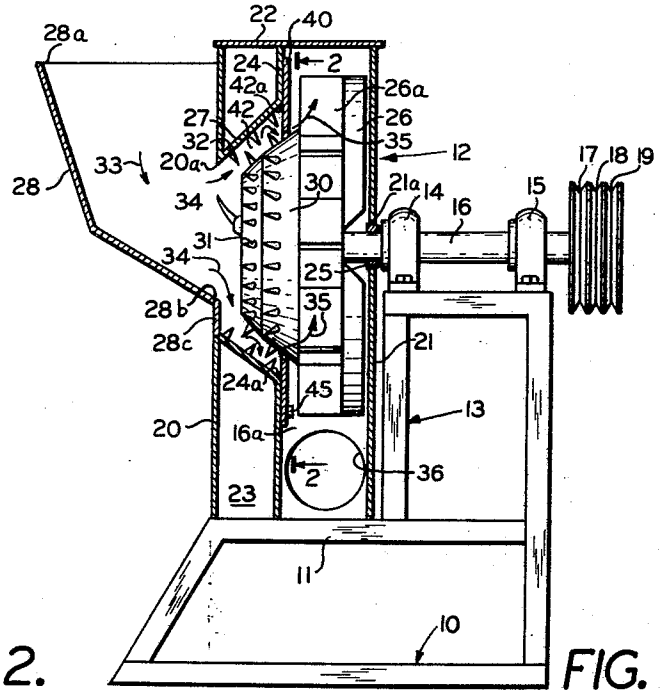


FIG. 2.

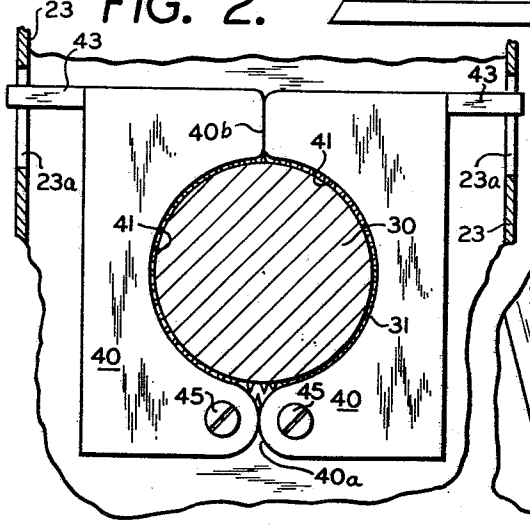
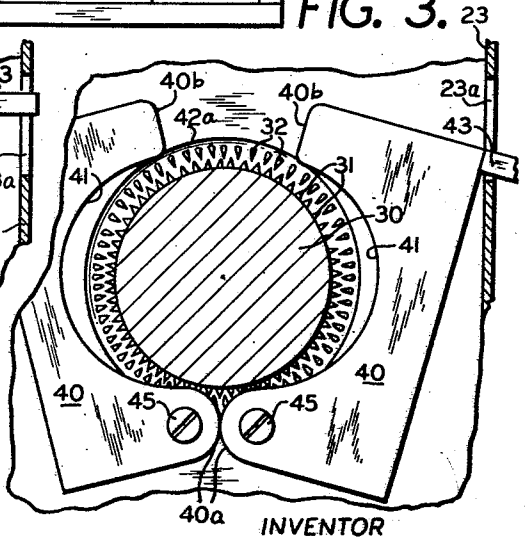


FIG. 3.



INVENTOR
ROBERT GARWIN
BY
Blum, Moscovitz, Friedman & Blum
ATTORNEYS.

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SHREDDING MACHINE FOR FOAM MATERIAL

Robert Garwin, 47 Arden St., New York, N.Y.

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This invention relates to an improved machine for shredding materials.

This machine is of the general type shown in prior U.S. Patents Nos. 1,735,749 and 1,802,249. The machines of said prior patents were particularly suitable for the processing of fibrous filling materials. The machine in accordance with the present invention is particularly suitable for shredding materials such as foam rubber and foam polyurethane, and other "foam" plastic materials.

An important object of the invention is to provide an improved machine for shredding materials of this type, which is economical to manufacture, has a minimum number of parts, is highly efficient in operation and is readily adaptable to produce particles of varying sizes.

As an important feature of the invention, I provide means for selectively varying the size of the outlet opening of the throat through which the material is fed during the cutting operation. I have found that this structure makes it possible to regulate the size of the particles of foam material effectively.

Other objects and advantages of this invention will become apparent from the following description, in conjunction with the annexed drawing, in which a preferred embodiment of the invention is disclosed.

In the drawings,

FIG. 1 is a vertical section, partly in elevation of my improved machine.

FIG. 2 is a section on line 2—2 of FIG. 1, showing the machine adjusted to produce particles of minimum size.

FIG. 3 is a view similar to FIG. 2, showing the machine adjusted to produce particles of maximum size.

Upon reference to the drawing in detail, it will be noted that it shows a frame 10 having a raised horizontal platform 11. Casing 12 is supported on platform 11 adjacent the front thereof and extends vertically therefrom. Casing 12 has a longitudinal axis. Frame 10 has an extension 13 located behind casing 12 and extending upwardly from platform 11. The upper end of frame extension 13 supports a pair of longitudinally spaced bearings 14 and 15, through which shaft 16 extends turnably. Pulleys 17, 18 and 19 are mounted upon shaft 16 behind bearing 15 and serve for connection of shaft 16 to various sources of power (not shown) so as to rotate shaft 16 at selected rate of speed.

Casing 12 has a vertically and laterally extending front wall 20 and a vertically and laterally extending rear wall 21, both of which rest upon platform 11. Walls 20 and 21 are parallel to each other. The top space of casing 12, between walls 20 and 21, is closed by top wall 22. The casing is further closed by side walls 23 which extend vertically and longitudinally.

Vertically and laterally extending wall 24 is located intermediate walls 20 and 21. Wall 24 is parallel to walls 20 and 21 and extends between the top and the bottom and also between the sides of casing 12.

Shaft 16 extends forwardly through an opening 21*a* in

rear wall 21, which opening is sealed by any suitable packing 25. Fan blade assembly 26 which has radial blades 26*a*, is mounted upon shaft 16 in fan chamber 16*a* between rear wall 21 and intermediate wall 24 and also between walls 22 and 9.

Front wall 20 has an opening 20*a* which is circular and which is co-axial with shaft 16. Intermediate wall 24 has an opening 24*a* which is circular and which is co-axial with opening 20*a* and shaft 16. Opening 24*a* is of greater diameter than opening 20*a*. A frusto-conical wall 27 is disposed between walls 20 and 24 with the opening of smaller diameter of wall 27 coinciding with opening 20*a*, and with the opening of larger diameter of wall 27 coinciding with opening 24*a*. Accordingly, the frusto-conical wall 27 is co-axial with shaft 16.

Hopper 28 is mounted upon the front of front wall 20. Hopper 28 has a top opening 28*a* for reception of material to be shredded and has a rear opening 28*b* which communicates with opening 20*a* for passage of material from hopper 28 to the shredding mechanism. A portion of the rear wall 28*c* of hopper 28 projects into opening 20*a*.

Frusto-conical rotor 30 is fixably mounted upon shaft 16. The smaller end of rotor 30 is at the front thereof. Rotor 30 extends into the bore of wall 27, but the front face of rotor 30 is located rearwardly of opening 20*a*. Rotor 30 projects rearwardly of wall 24, into fan chamber 16*a*, and extends substantially to the front face of fan assembly 26. The blades 26*a* of fan assembly 26 project radially beyond the periphery of rotor 30 and beyond opening 24*a*.

Teeth 31 are mounted upon the periphery of rotor 30, forwardly of opening 24*a*. The inner face of wall 27 serves as the stator of the mechanism and has stator teeth 32 mounted thereon.

The rotor teeth 31 are disposed in a plurality of longitudinally spaced sets, with teeth 31 of each set preferably equally spaced around the circumference of rotor 30 and extending radially outwardly therefrom. Optionally, there are two longitudinally spaced sets of teeth 31, as shown illustratively in the drawing.

Similarly, the stator teeth 32 are divided into a plurality of longitudinally spaced sets, the teeth of each set being preferably equally spaced around the circumference of wall 27. Optionally, there are three such longitudinally spaced sets of stator teeth 32, as shown illustratively in the drawing.

Preferably, each set of rotor teeth 31 are disposed longitudinally between successive sets of stator teeth 27, as shown in the drawing. Preferably, the teeth 31 and 32 are pointed, and the pointed ends of the teeth 31 project radially ouwardly of the pointed ends of the teeth 32.

The annular, frusto-conical space between rotor 30 and stator wall 27 is designated by the reference numeral 42 and is defined as a throat. The material is fed into hopper 28, in the direction of arrow 33, and hence is drawn by the suction of fan assembly 26 into throat 42, in the direction of arrows 34. The material passes through throat 42 and is discharged rearwardly therefrom, in the direction of arrows 35, into fan chamber 16*a*. Said chamber 16*a* has a side outlet opening 36 through which the shredded material is discharged from the machine.

As an important feature of the invention, means are provided for regulating the size of the outlet of throat 42, so as to control the size of the particles shredded by

the machine. It will be appreciated that the outlet of throat 42 is in the form of an annulus 42*a*, the outer periphery of which coincides with the periphery of opening 24*a*, and the inner periphery of which coincides with the surface of rotor 30.

A pair of plates 40 are respectively pivotally mounted upon the rear face of wall 24. Each said plate 40 is rectangular and has an inner semi-circular cutout 41. Each said plate 40 is connected at its inner lower end to plate 24, below opening 24*a*, by means of longitudinal pivot 45. Each said plate 40 has a co-planar handle 43 extending laterally outwardly from the side edge thereof at the top thereof. Each said handle 43 extends through a slit 23*a* in the side wall 23 associated therewith. Accordingly, the two handles 43 are accessible outside the machine for manipulation of the plates 40.

FIG. 2 shows the plates 40 in a first position thereof. In both positions of plates 40, their lower inner edges 40*a*, below the cutouts 41, substantially abut each other, as clearly shown in FIGS. 2 and 3. In the first position of plates 40, their upper inner edges 40*b*, above the cutouts 41, substantially abut each other. Accordingly, the two cutouts 41 cooperate to define a circular opening through the combined plates 40. The plates 40 are of combined size, greater than the opening 24*a*, so that in the position of FIG. 2, the plates 40 completely cover the opening 24*a*, with the exception of the central opening in the plate defined by the cooperating cutouts 41. This central opening defined by the cooperating cutouts 41 is of smaller diameter than opening 24*a* but of slightly greater diameter than rotor 30. It will be appreciated, therefore, that the plates 40, in the position of FIG. 1, completely block outlet opening 42*a* of throat 42, with the exception of the space between cutouts 41 and rotor 30. The distance between the edge of cutout 41 and the surface of rotor 30 may be on the order of approximately one quarter of an inch, by way of example.

FIG. 3 shows the plates 40 in their spread condition, corresponding to a substantially complete clearance by the plates 40 of the throat outlet opening 42*a*. This corresponds to the condition of the maching for producing particles of maximum size. It will be apparent that the plates 40 may be located in any selected intermediate position, so as to provide an exit opening of throat 42 which is intermediate the minimum opening of FIG. 2 and the maximum opening of FIG. 3. Accordingly, the plates 40 provide a simple means for control of the size of the exit space from throat 42, and accordingly provide a simple means for control of the particle size.

While the speed of rotation of the fan may be varied, to secure optimum results, the main control, once the desired fan speed has been obtained, is based upon manipulation of the plates 40. By using the proper number of teeth, in conjunction with the proper speed of rotation of the fan, relatively uniform particle size may be obtained for any size of throat opening.

The machine, as above-described, represents a substantial improvement over existing machines for shredding plastic foam material, such as foam rubber and foam polyurethane, most of which rely upon the use of knives to shred the material. Such machines are not as adaptable as the present machine for producing particles of varying diameters.

It will be apparent that the two plates 40 may be adjusted independently of each other. If it is desired to produce particle sizes of varying diameters, one plate 40 may be left in the position of FIG. 2, by way of example, and the other plate 40 may be moved at least partly toward its position of FIG. 3, by way of example.

While I have disclosed a preferred embodiment of my invention and have indicated various changes, omissions and additions which may be made therein, it will be apparent that various other changes, omissions and additions may be made in the invention without departing from the scope and spirit thereof.

For example, while I have described the longitudinal axis of the machine as extending horizontally, it will be apparent that the parts may be positioned so as to permit the machine to be mounted in any desired orientation.

What is claimed is:

1. A machine for shredding foam rubber, foam polyurethane and the like, comprising a casing having a longitudinal axis and having a rear fan chamber and a front shredding chamber in communication with each other, said shredding chamber having an inlet for reception of material to be shredded, said fan chamber having an outlet for shredded pieces of material, a suction fan mounted in said fan chamber for rotation about said axis to draw material through said shredding chamber, said shredding chamber having a frusto-conical peripheral stator wall which is co-axial with said axis and whose end of smaller diameter is at its front, a frusto-conical rotor mounted in said shredding chamber and co-axial with said axis and coupled to said fan for rotary movement in unison therewith, the end of said rotor of smaller diameter being at its front, said rotor having rotor teeth extending from its periphery, said stator having stator teeth extending therefrom toward said rotor, said rotor teeth and said stator teeth being cooperatively shaped and positioned to shred material in said shredding chamber when said rotor is rotated, said rotor and said stator defining an angular outlet opening of said shredding chamber, the inner diameter of said outlet opening being large with respect to the outer diameter thereof, and a pair of blocking plates slidably mounted on said casing adjacent said outlet opening, said plates being transversely movable to inner positions thereof in which they have opposing abutting edges, said abutting edges having opposing semi-circular cutouts which together define a circular cutout in the inner position of said plates which is co-axial with said axis and of diameter intermediate the inner and outer diameters of said outlet opening to thereby restrict said outlet opening to a minimum radial width thereof and thereby determine a minimum diameter of said pieces of shredded material, said plates being outwardly slidable to a position substantially clearing said outlet opening to permit said outlet opening to determine a maximum diameter of said pieces of shredded material, the opening between said plates remaining predominantly generally circular and said outlet being restricted to a predominantly generally annular opening until said plates reach their clearing positions.

2. A machine for shredding foam rubber, foam polyurethane and the like, comprising a casing having a longitudinal axis and having a rear fan chamber and a front shredding chamber in communication with each other, said shredding chamber having an inlet for reception of material to be shredded, said fan chamber having an outlet for shredded pieces of material, a suction fan mounted in said fan chamber for rotation about said axis to draw material through said shredding chamber, said shredding chamber having a frusto-conical peripheral stator wall which is co-axial with said axis and whose end of smaller diameter is at its front, a frusto-conical rotor mounted in said shredding chamber and co-axial with said axis and coupled to said fan for rotary movement in unison therewith, the end of said rotor of smaller diameter being at its front, said rotor having rotor teeth extending from its periphery, said stator having stator teeth extending therefrom toward said rotor, said rotor teeth and said stator teeth being cooperatively shaped and positioned to shred material in said shredding chamber when said rotor is rotated, said rotor and said stator defining an angular outlet opening of said shredding chamber, the inner diameter of said outlet opening being large with respect to the outer diameter thereof, and a pair of blocking plates pivotally mounted on said casing adjacent said outlet opening, said plates being turnable about longitudinal axes to inner positions thereof in which they

have opposing abutting edges, said abutting edges having opposing semi-circular cutouts which together define a circular cutout in the inner position of said plates which is co-axial with said axis and of diameter intermediate the inner and outer diameters of said outlet opening to thereby restrict said outlet opening to a minimum radial width thereof and thereby determine a minimum diameter of said pieces of shredded material, said plates being outwardly turnable to a position substantially clearing said outlet opening to permit said outlet opening to determine a maximum diameter of said pieces of shredded material, the opening between said plates remaining predominantly generally circular and said outlet being restricted to a predominantly generally annular opening until said plates reach their clearing positions.

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