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GRINDING MACHINE

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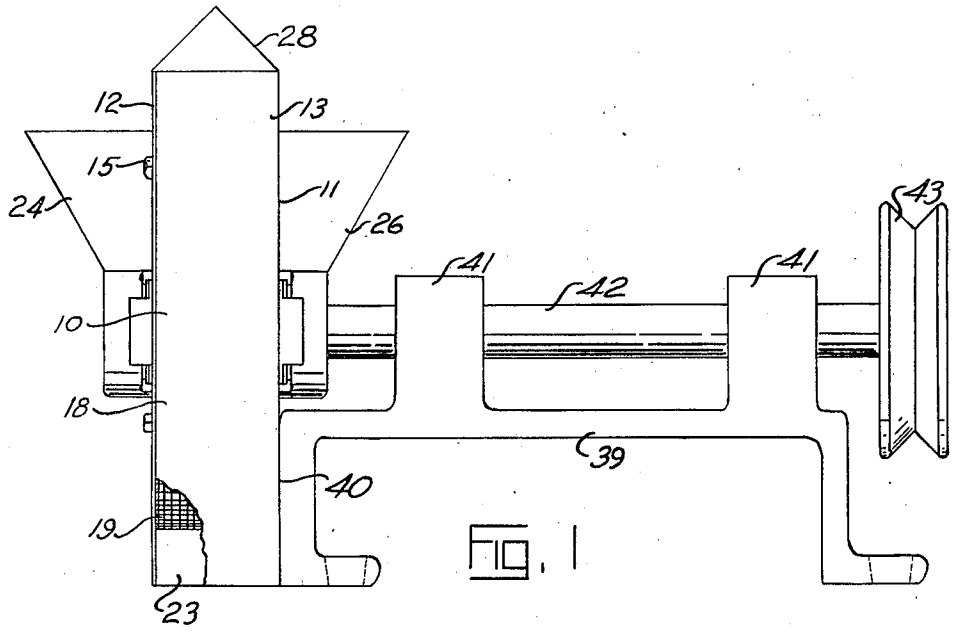


FIG. 1

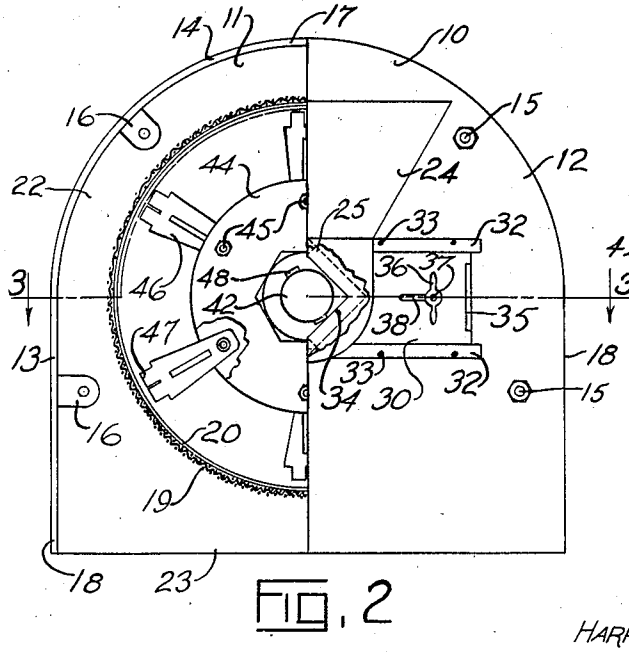


FIG. 2

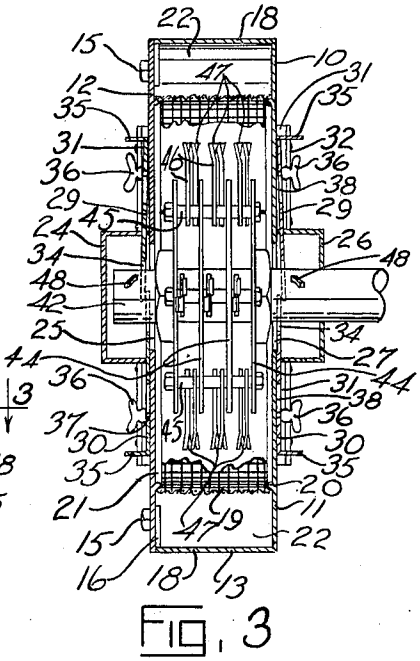


FIG. 3

INVENTORS

HARRY G. DAY JOHN E. JOHNSON

BY G. H. Braddock

ATTORNEY

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GRINDING MACHINE

Harry G. Day, Minneapolis, and John E. Johnson, Atwater, Minn.; said Johnson assignor to said Day

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2 Claims. (Cl. 83—11)

This invention relates to a grinding machine useful to the purpose of cutting and grinding, or pulverizing, grain, roughage, coal, etc. More explicitly, the invention has relation to a grinding machine of the character which employs centrifugally operating hammers or beaters for accomplishing cutting and grinding operations upon materials placed in the machine and includes a cylindrical screen or foraminous member through which the materials when cut and ground, or reduced, to desired size are forced or caused to pass and thence are removed from the machine.

An object of the invention is to provide a grinding machine of the general type as stated which will be of novel and improved construction.

A further object is to provide a grinding machine wherein will be incorporated various improved features and characteristics of construction novel both as individual entities of the machine and in combination with each other.

A further object is to provide a grinding machine of the character as mentioned which will include a cylindrical screen or foraminous member, centrifugally operating hammers or beaters within the screen or foraminous member for accomplishing cutting and grinding operations upon materials adapted to be placed within said screen or foraminous member, and a casing surrounding and supporting the screen or foraminous member and including portions thereof in closing relation to the ends of said screen or foraminous member and a portion thereof defining an area or space in open, surrounding relation to the circumference of said screen or foraminous member, said casing being closed save for an inlet opening, or inlet openings, through the casing for the purpose of permitting materials to be cut and ground to be fed or deposited into the interior of the screen or foraminous member and a discharge outlet, or outlets, from a lower portion of the casing for the purpose of permitting removal of cut and ground materials from said area or space.

A further object is to provide in the grinding machine a novel and improved construction and arrangement designed to cause each of the hammers or beaters employed to do substantially an equal amount of work during the cutting and grinding operation.

A further object is to provide in the grinding machine a novel and improved construction and arrangement for adjustably controlling the rate at which materials to be cut and ground will be fed into the machine and its screen or foraminous member from time to time to be there operated upon by the hammers or beaters.

A further object is to provide in the grinding machine a novel and improved construction and arrangement for causing the hammers or beaters to bear the most advantageous cutting and grinding relation possible to the screen or foraminous member employed in said machine. More explicitly, the present object can be stated to be to construct the hammers or beaters and to dispose them in the machine so that the different hammers or beaters will be uniformly spread relatively to or over said screen or foraminous member individually to bear operative cutting and grinding relation to distinct and separate portions of the screen or foraminous member and collectively to bear operative cutting and grinding relation to by far the major portion of said screen or foraminous member.

With the above objects in view, as well as others which will appear as the specification proceeds, the invention comprises the construction, arrangement and combination of parts as now to be fully described and as hereinafter to be specifically claimed, it being understood that the disclosure herein is merely illustrative and intended in no way in a limiting sense, changes in details of construction and arrangement of parts being permissible so long as within the spirit of the invention and the scope of the claims which follow.

In the accompanying drawing forming a part of this specification,

Fig. 1 is a side elevational view, partially broken away, of a grinding machine made according to the invention;

Fig. 2 is an end elevational view of the machine, one-half of the cover plate thereof being removed or cut away, as said machine would appear from the left side of the sheet in Fig. 1; and

Fig. 3 is a horizontal sectional view, taken as on line 3—3 in Fig. 2.

With respect to the drawing and the numerals of reference thereon, the casing of the machine is denoted 10. Said casing consists as shown of a vertical rear wall 11, a vertical front cover plate 12 in spaced relation to the rear wall 11, and a continuous member 13 connecting said rear wall 11 and cover plate 12. The reward marginal edge of the continuous member 13 is integral with the outer marginal edge of the rear wall 11, and the cover plate 12 is removably fastened up against the forward edge 14 of the continuous member 13, as by screw bolts 15

threaded into openings in ears 16 upon said continuous member. The continuous member 13 constitutes the top wall 17 and the side walls 18, 18 of the casing 10. Said top wall 17 is of curvilinear or arc shape in the direction of its length and merges into the side walls 18, 18 at its lower extremities. Said side walls 18, 18 extend vertically downwardly from their locations of jointure with the top wall 17. Said top wall 17 and side walls 18, 18 are perpendicular to the rear wall 11 and the cover plate 12, and the lower edges of said rear wall 11, cover plate 12 and side walls 18, 18 terminate in a single plane as disclosed.

A cylindrical screening structure or foraminous member 19 of the machine is situated within the casing 10. As illustrated, said screening structure or foraminous member 19 is stably, fixedly mounted in said casing between the rear wall 11 and the cover plate 12 with its rear and front edges in snug engagement with said rear wall and cover plate, respectively. More explicitly, an annular element 20 upon the rear wall 11 is fitted into the end of the screening structure or foraminous member 19 which is adjacent said rear wall, and an annular element 21 upon the cover plate 12 is fitted into the end of said screening structure or foraminous member which is adjacent said cover plate. The cylindrical screening structure or foraminous member 19 and the annular elements 20 and 21 which support said screening structure or foraminous member are in spaced relation to the continuous member 13 to provide an area or space 22 within the casing 10 in open, surrounding relation to the circumference of said screening structure or foraminous member. The lower portion of the casing 10 is open, as at 23, to provide a discharge outlet for cut and ground materials leading from the area or space 22 of said casing and from the machine.

The cover plate 12 integrally supports a hopper 24 which leads to an aperture 25 through said cover plate affording communication between the hopper 24 and the interior of the cylindrical screen or foraminous member 19. Likewise, the rear wall 11 integrally supports a hopper 26 which leads to an aperture 27 through said rear wall affording communication between the hopper 26 and said interior of said cylindrical screen or foraminous member. That is, the aperture 25 leads into the screen or structure 19 at the forward end thereof and the aperture 27 leads into said screen or structure at the rearward end thereof. The hoppers 24 and 26 may be constituted as a single hopper including a V member 28 at a midportion thereof.

Save for the apertures 25 and 27 and the discharge outlet 23 the casing 10 is closed.

Devices are provided for controlling the rate at which materials to be cut and ground are fed into the screening structure or foraminous member 19 from the hopper 24 through the aperture 25 and from the hopper 26 through the aperture 27. Each of said devices is constituted as a pair of slides, denoted 29 and 30, respectively, adapted to overlap each other, to a greater extent to reduce the size of the opening from each hopper to the interior of the screening structure or foraminous member 19, and to less extent to increase the size of the opening from each hopper to said interior of said screening structure. That is, the slides 29, 30 are disposed over the apertures 25 and 27 to partially cover said apertures. More explicitly, each slide 29, 30 of each pair of slides is movable longitudinally in a guide way defined by oppositely disposed slots 31, 31 each provided by an angle piece 32 suitably secured, as at 33, upon the casing 10, or its cover plate 12, as the case may be. As shown, the end portions of the slides 29, 30 of each pair of slides which are adjacent each other are each constructed to provide an L-shape, or equivalent, cut-away portion 34, and the cut-away portions 34, 34 of the cooperating slides of a pair together provide a rectangular opening which in each instance is adjacent an aperture 25 or 27. The slides 29, 30 are adjustable manually along the guide slots 31, 31 by employment of finger pieces 35, one upon each slide, and said slides are adapted to be fastened in set position by means of clamping nuts 36, one for each slide, upon threaded posts 37, including a threaded post 37 for each slide 29, 30 integral with the casing 10, or its cover plate 12, and disposed within an elongated slot 38 in the corresponding slide. The clamping nuts 36 are adapted to be turned down upon the threaded posts 37 and against the slides to rigidly, but releasably, fasten said slides against and in fixed relation to the casing 10, or its cover plate 12, adjacent the locations of the apertures 25 and 27. When the slides 29, 30 of either pair of slides are adjusted toward each other the rectangular opening provided by the L-shape cut-away portions 34, at the location of the aperture 25 or the aperture 27, as the case may be, is decreased in size, and vice versa.

A bracket 39 adapted to be fastened and supported upon a floor, or in other manner, rigidly in turn supports the casing 10, as at 40, and, in the disclosure as made, the bracket 39 includes bearings 41 in which a driven shaft 42 is rotatably mounted. A V-pulley 43 fixed upon the shaft 42 can constitute means through the instrumentality of which said shaft can be driven, or, instead, the shaft 42 can be electric motor driven.

The driven shaft 42 extends through the hopper 26 and into the hopper 24 and through the rectangular openings provided by the L-shape cut-away portions 34, 34, in spaced relation to said rectangular openings, as well as through the apertures 27 and 25 and across the width of the cylindrical screening structure or foraminous member 19. Said driven shaft 42 is located concentrically of said cylindrical screening structure or foraminous member and fixedly carries a plurality of spaced apart discs 44. Said discs in turn support pivot pins 45 disposed parallel to the driven shaft 42 in spaced relation to said driven shaft, and the pivot pins 45 oscillatably support spaced apart, centrifugally operating hammers or beaters 46 the outer or free end portions 47 of which are adapted to travel in proximity to the screening structure or foraminous member 19 when the shaft 42, and with it the discs 44, pivot pins 45 and hammers or beaters 46, is rotated.

The driven shaft 42 supports feed members 48, including at least one feed member in each of the hoppers 24 and 26, for insuring that materials to be cut and ground will be positively fed or deposited into the interior of the screening structure or foraminous member 19.

The construction and arrangement is such that centrifugal operation of the hammers or beaters 46, upon rotation of the driven shaft 42, in comparatively close relation to the cylindrical screen 19 will cause materials placed within said cylindrical screen to be cut and ground and eventually forced, or caused to pass, outwardly through the cylindrical screen, and thence removed from the machine by way of the discharge outlet 23.

Each of the hammers or beaters **46** is adapted to accomplish substantially an equal amount of work during the cutting and grinding operation by reason of the double-feed hopper construction and arrangement utilized with a main purpose in view of substantially equal feed of materials to be cut and ground to the different hammers or beaters. Thus, no hammer or beater is liable to become unduly worn and unfit for use while other hammers or beaters are in good working condition, and, also, the manner of feed in the disclosure as made has tendency toward insuring equal distribution of work to the various entities of the machine, which is, obviously, an advantageous feature.

As will be clear from Fig. 3, the hammers or beaters **46** bear maximum cutting and grinding relation to the screening structure or foraminous member **19**. That is, said hammers or beaters are constructed and are disposed in the machine so that the different hammers or beaters are uniformly spread relatively to or over the screening structure or foraminous member individually to bear operative cutting and grinding relation to distinct and separate portions of said screening structure or foraminous member and collectively to bear operative cutting and grinding relation to by far the major portion of the screening structure or foraminous member.

Because of the fact that the casing **10** includes only the inlet openings or apertures **25** and **27** and the discharge outlet **23**, and is otherwise closed, nothing whatever can enter the interior of said casing except materials to be cut and ground and nothing whatever can be removed from the casing except cut and ground materials during the cutting and grinding operation.

Plainly, then, the machine and the operations thereof are self-contained, and there is no liability at all for the spreading or distribution of dirt or dust to atmosphere while the machine is working. That is, the machine is capable of carrying on its intended cutting and grinding operations without liability of loss of any portion of the materials being cut and ground and without liability of accumulation of dirt, dust, or cut and ground materials at location outside of the casing **10** of the machine.

What is claimed is:

1. A grinding machine comprising a cylindrical screening structure, a casing surrounding and supporting said screening structure, said casing including a rear wall thereof in closing relation to the rear end of said screening structure, a removable cover plate thereof in closing relation to the front end of said screening structure, a portion thereof defining an area in open, surrounding relation to the circumference of the screening structure, a first inlet opening into said rear end of said screening structure, a second inlet opening into said front end of said screening structure and a discharge outlet from said area, a first material receiving hopper upon said rear wall contiguous with said first inlet opening, a second material receiving hopper upon said removable cover plate contiguous with said second inlet opening, a shaft rotatable in said screening structure and situated concentrically thereof, said shaft including an intermediate portion disposed in said first material receiving hopper and an end portion disposed in said second material receiving hopper, a first feed means supported by said shaft situated within said first material receiving hopper, a second feed means supported by said shaft situated within said second material receiving hopper, operating hammers supported by said shaft disposed within said screening structure, and means at the side of said first material receiving hopper opposite said casing rotatably supporting said shaft.

2. A grinding machine comprising a cylindrical screening structure, a casing surrounding and supporting said screening structure, said casing including a rear wall thereof in closing relation to the rear end of said screening structure, a removable cover plate thereof in closing relation to the front end of said screening structure, a portion thereof defining an area in open, surrounding relation to the circumference of the screening structure, a first inlet opening into said rear end of said screening structure, a second inlet opening into said front end of said screening structure and a discharge outlet from said area, an annular element upon said rear wall within and supporting said rear end of the screening structure, an annular element upon said removable cover plate within and supporting said front end of the screening structure, a first material receiving hopper upon said rear wall contiguous with said first inlet opening, a second material receiving hopper upon said removable cover plate contiguous with said second inlet opening, a shaft rotatable in said screening structure and situated concentrically thereof, said shaft including an intermediate portion disposed in said first material receiving hopper and an end portion disposed in said second material receiving hopper, a first feed means supported by said shaft situated within said first material receiving hopper, a second feed means supported by said shaft situated within said second material receiving hopper, centrifugally operating hammers supported by said shaft disposed within said screening structure, and means at the side of said first material receiving hopper opposite said casing rotatably supporting said shaft.

HARRY G. DAY.
JOHN E. JOHNSON.