Aug. 1, 1933. W. J. ARMSTRONG 1,920,947

ROTARY MATERIAL REDUCING MACHINE

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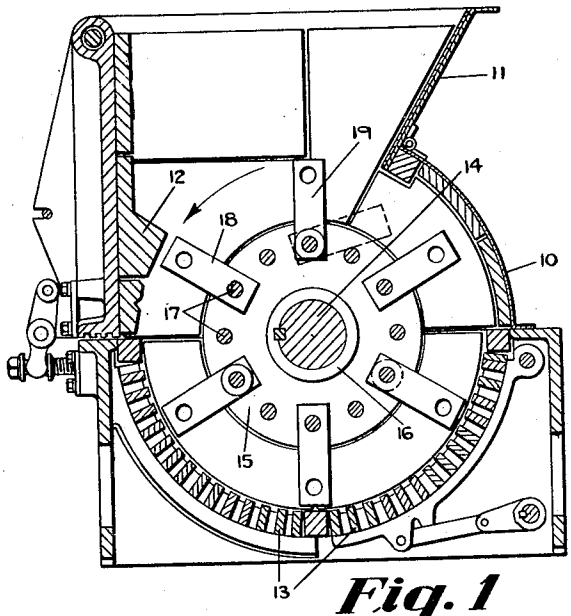


Fig. 1

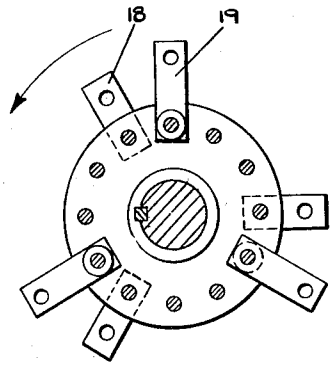


Fig. 4

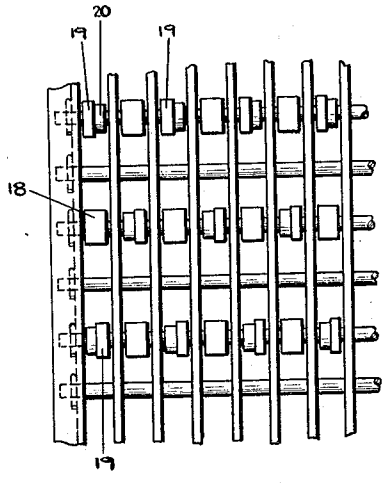


Fig. 3

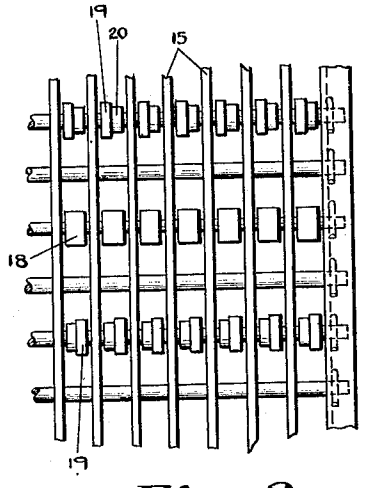


Fig. 2

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ROTARY MATERIAL REDUCING MACHINE

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16 Claims. (Cl. 83—11)

The present invention relates to a machine particularly adapted for use in shredding fibrous materials, such as straw in bales, corn stalks, wood shavings, bagasse, pulp in laps or sheets, and other similar materials not of high specific gravity, but heavy in the masses ordinarily fed to the machine, for example, wet wood chips.

In reducing such materials, the swing hammer machine as customarily constituted, possesses certain defects which render its action unsatisfactory. If light weight swing hammers are used they do not suffice to support the weight of the fed mass at the top of the rotor until it is sufficiently torn apart. Consequently, improper feed occurs, with the result that the hammers are forced back out of radial position so as to lose their full cooperative effect with the screen bars. If, on the other hand, relatively heavy, thick, hammers are used and the rotor is revolved at relatively high speed, the fed material will be supported on the rotor but proper shredding or cutting action will not take place due to the thickness of the hammers and the forcing of the material through the screen bars before it is sufficiently reduced.

The principal object of the present invention is the provision of a rotor embodying flotation hammers and reducing hammers of different structural characteristics so that the material will be floated on the rotor by the flotation hammers, in any event, until it is sufficiently torn apart to be properly acted upon by the reducing hammers. In an improved machine of which I am aware, this general combination of elements has been utilized and the present invention is concerned with specifically different arrangements of the hammers on the rotor and in the combination of light and heavy swing hammers in the same rotor, the heavy swing hammers serving principally to float the fed material and the light swing hammers serving principally to reduce the material. The weight of the heavy swing hammers may be obtained by various expedients, as by giving them relatively great width or thickness, and so forth, and the invention is not necessarily limited in this respect.

In the accompanying drawing, illustrative of the invention,

Figure 1 is a cross section of a machine embodying the invention,

Figure 2 is a developed plan of the rotor of Figure 1,

Figure 3 is a developed plan of a rotor with a modified arrangement of hammers, and

Figure 4 is a section of a rotor illustrating a further modified hammer arrangement.

Referring to the drawing, and first to Figures 1 and 2, reference numeral 10 designates generally a rotor casing, 11 an upwardly open feed hopper, 12 a breaker bar, and 13 a screen bar section. Suitably journaled for rotation in the casing is a shaft 14 to which is keyed a rotor body comprising coaxial circular discs 15 held in spaced relation by collars, as at 16, and supporting in marginal apertures a plurality of mounting rods 17 around shaft 14.

The flotation hammers are designated at 18 and the reducing hammers at 19, these being pivotally mounted on alternate rods 17. As shown in Figure 1, the flotation hammers are of substantially the same length as the reducing hammers, while as shown in Figure 2, the flotation hammers substantially fill the spaces between the discs, whereas the reducing hammers only partially fill the disc spaces and are positioned at one side of the spaces by means of spacing elements or collars 20 strung on the rods. It will be noted that the top row of hammers 19, Figure 2, are positioned against the right hand disc faces, while hammers 19 of the lower row are positioned against the left hand disc faces. Thus the reducing hammers of adjacent rows are in non-tracking relation.

Hammers 18 being heavier than hammers 19, are more rigidly projected under centrifugal force than the latter, and thus are considerably less yieldable under tangentially directed impacts. Hammers 18 are thus particularly adapted to support the fed material, at least when the feed is too heavy to render it unsupportable by hammers 19. The material floating function of hammers 18 is also favorably affected as over hammers 19, due to their greater thickness.

According to Figure 3, the same light and heavy hammers are used, but according to this figure they are alternated in axially extending rows and are also alternated in groups extending around the rotor body. Here again, adjacent hammers 19 in the circumferential direction of the rotor body are in non-tracking relation.

According to Figure 4, the flotation hammers and reducing hammers are arranged on adjoining rods with a pair of vacant rods intermediate each group of hammers. In other words, as compared to the showing of Figure 1, the reducing hammers have merely been advanced around the rotor so as to be closer to the preceding than to the succeeding flotation hammers. This arrangement assures that the reducing hammers will be relieved of impacts.

As shown in Figure 4, hammers 18 may be shorter than hammers 19 so as to render them less sensitive to tangentially directed impacts and also to render them unaffected by unpulverable fragments in the rotor casing. The same length differentiation may, of course, be employed in the hammer arrangements shown in the other figures, and is particularly desirable when unpulverable objects are mixed with the feed, as above men-

tioned, or when the load is relatively light and/or the material is to be finely reduced.

It will be understood that various other hammer arrangements than those shown are possible without departure from the invention, and further that the described rotor may be used in pulverizing and crushing machines as well as in shredding machines.

I do not limit myself in these respects except as in the following claims.

I claim:

1. In a machine of the class described, a rotor body, relatively heavy hammers pivoted to the rotor body and acting to float material on the rotor upon rotor rotation, and relatively light hammers pivoted to the rotor body, said relatively light hammers being relatively yieldable under tangential reducing impact upon said material as compared to the relatively heavy hammers, the heavy hammers having a smaller normal radial projection than the light hammers.

2. In a machine of the class described, a rotor body, relatively heavy hammers pivoted to the rotor body and acting to float material on the rotor upon rotor rotation, and relatively light hammers pivoted to the rotor body, said relatively light hammers being relatively yieldable under tangential reducing impact upon said material as compared to the relatively heavy hammers, said hammers being arranged in alternating rows extending axially of the rotor body.

3. In a machine of the class described, a rotor body, relatively heavy hammers pivoted to the rotor body and acting to float material on the rotor upon rotor rotation, and relatively light hammers pivoted to the rotor body, said relatively light hammers being relatively yieldable under tangential reducing impact upon said material as compared to the relatively heavy hammers, said hammers being arranged in rows extending axially of the rotor body, the light and heavy hammers being alternated in such rows.

4. In a machine of the class described, a rotor body, relatively heavy hammers pivoted to the rotor body, and relatively light hammers pivoted to the rotor body, said hammers being arranged in rows extending axially of the rotor body, the light and heavy hammers being alternated in such rows and also alternated in groups extending around the rotor body.

5. In a machine of the class described, a rotor body comprising a series of equally spaced coaxial discs and rods supported in apertures of the discs around the axis of said discs, relatively heavy hammers pivoted to said rods between the discs, and relatively light hammers pivoted to the rods between the discs, each of said heavy hammers substantially filling the space between the adjacent discs and each of said light hammers only partially filling such a space, and spacing means positioning the light hammers relative to their adjacent discs.

6. In a machine of the class described, a rotor body comprising a series of equally spaced coaxial discs and rods supported in apertures of the discs around the axis of said discs, relatively heavy hammers pivoted to said rods between the discs, and relatively light hammers pivoted to the rods between the discs, each of said heavy hammers substantially filling the space between the adjacent discs and each of said light hammers only partially filling such a space, and spacing means positioning the light hammers relative to their adjacent discs, said hammers being arranged in alternating rows extending axially of the rotor body.

7. In a machine of the class described, a rotor body comprising a series of equally spaced coaxial discs and rods supported in apertures of the discs around the axis of said discs, relatively heavy hammers pivoted to said rods between the discs, and relatively light hammers pivoted to the rods between the discs, each of said heavy hammers substantially filling the space between the adjacent discs and each of said light hammers only partially filling such a space, and spacing means positioning the light hammers relative to their adjacent discs, said hammers being arranged in rows extending axially of the rotor body, the light and heavy hammers being alternated in such rows.

8. In a machine of the class described, a rotor body comprising a series of equally spaced coaxial discs and rods supported in apertures of the discs around the axis of said discs, relatively heavy hammers pivoted to said rods between the discs, and relatively light hammers pivoted to the rods between the discs, each of said heavy hammers substantially filling the space between the adjacent discs and each of said light hammers only partially filling such a space, and spacing means positioning the light hammers relative to their adjacent discs, said hammers being arranged in rows extending axially of the rotor body, the light and heavy hammers being alternated in such rows, and also alternated in groups extending around the rotor body.

9. In a machine of the class described, a rotor body comprising a series of equally spaced coaxial discs and rods supported in apertures of the discs around the axis of said discs, relatively heavy hammers pivoted to said rods between the discs, and relatively light hammers pivoted to the rods between the discs, each of said heavy hammers substantially filling the space between the adjacent discs and each of said light hammers only partially filling such a space, and spacing means positioning the light hammers relative to their adjacent discs, the heavy hammers having a smaller normal radial projection than the light hammers.

10. In a machine of the class described, a rotor body, relatively heavy hammers pivoted to the rotor body and acting to float material on the rotor upon rotor rotation, and relatively light hammers pivoted to the rotor body, said relatively light hammers being relatively yieldable under tangential reducing impact upon said material as compared to the relatively heavy hammers, said hammers being alternated in groups extending around the rotor body, each light hammer being mounted closer to the preceding than to the succeeding heavy hammer.

11. In a machine of the class described, a rotor body, relatively heavy hammers pivoted to the rotor body and acting to float material on the rotor upon rotor rotation, and relatively light hammers pivoted to the rotor body, said relatively light hammers being relatively yieldable under tangential reducing impact upon said material as compared to the relatively heavy hammers, said hammers being alternated in groups extending around the rotor body, each light hammer being mounted closer to the preceding than to the succeeding heavy hammer, the light hammers being of greater length than the heavy hammers.

12. In a machine of the class described, a rotor body comprising a series of equally spaced co-

axial discs and rods supported in apertures of the discs around the axis of said discs, relatively heavy hammers pivoted on spaced ones of said rods, and relatively light hammers pivoted on rods succeeding the rods supporting the heavy hammers, the rod following the rods supporting the light hammers being vacant.

13. In a machine of the class described, a rotor body comprising a series of equally spaced coaxial discs and rods supported in apertures of the discs around the axis of said discs, relatively heavy hammers pivoted on spaced ones of said rods, and relatively light hammers pivoted on rods succeeding the rods supporting the heavy hammers, the rod following the rods supporting the light hammers being vacant, the light hammers being longer than the heavy hammers.

14. In a machine of the class described, a rotor body comprising a series of equally spaced coaxial discs and rods supported in apertures of the discs around the axis of said discs, relatively heavy hammers pivoted on spaced ones of said rods, and relatively light hammers pivoted on rods succeeding the rods supporting the heavy hammers, the rod following the rods supporting the light hammers being vacant, the light hammers being thinner than the heavy hammers.

15. In a machine of the class described, a rotor body comprising a series of equally spaced coaxial discs and rods supported in apertures of the discs around the axis of said discs, relatively heavy hammers pivoted on spaced ones of said rods, and relatively light hammers pivoted on rods succeeding the rods supporting the heavy hammers, the rod following the rods supporting the light hammers being vacant, the light hammers being thinner than the heavy hammers and having a normally greater radial projection than the latter.

16. In a machine of the class described, a rotor body comprising a series of equally spaced coaxial discs and rods supported in apertures of the discs around the axis of said discs, relatively heavy hammers pivoted to said rods between the discs, and relatively light hammers pivoted to the rods between the discs, each of said heavy hammers substantially filling the space between the adjacent discs and each of said light hammers only partially filling such a space, and spacing means positioning the light hammers relative to their adjacent discs, said hammers being arranged in rows extending axially of the rotor body and being alternated in groups extending around the rotor body, the adjacent light hammers of each of such groups being positioned in non-tracking relation.

WALTER J. ARMSTRONG.