Oct. 31, 1933. E. H. GERMER 1,932,777

GRAIN GRADING MACHINE

Filed March 16, 1931

Fig. 1

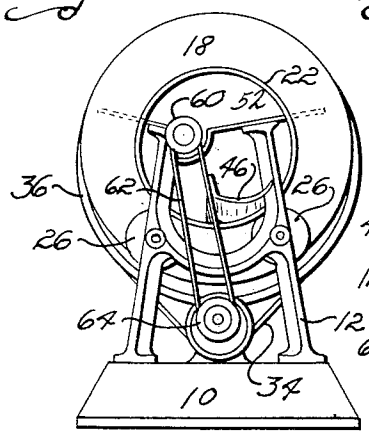



Fig. 2

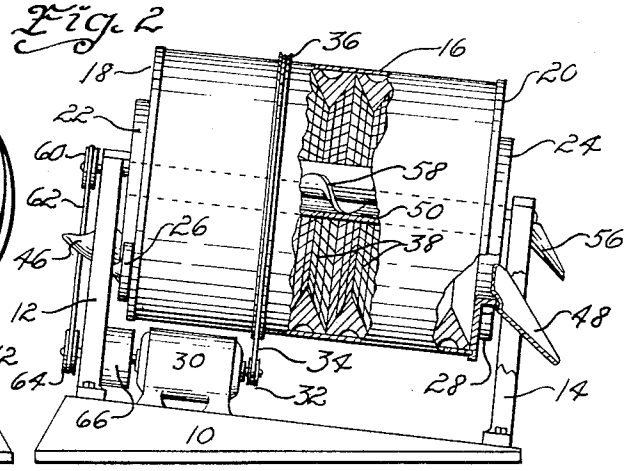



Fig. 3

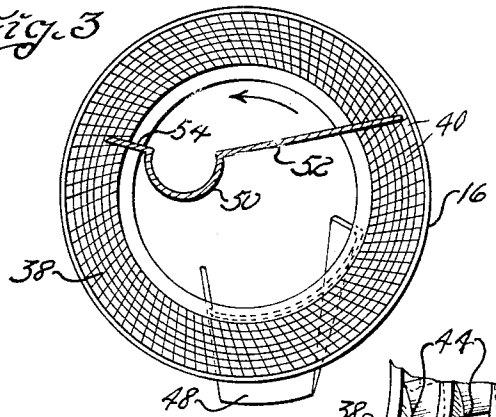



Fig. 4

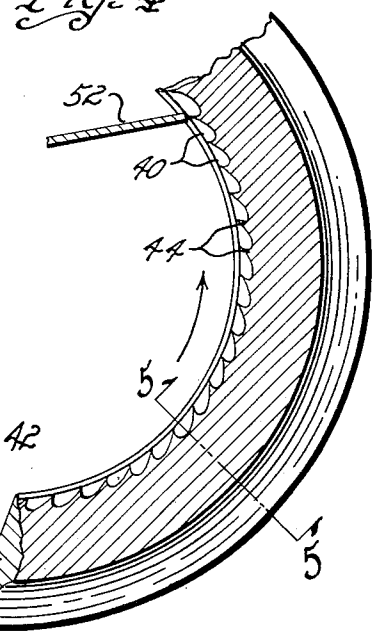



Fig. 6

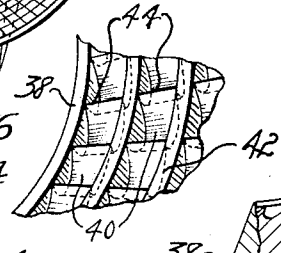



Fig. 5

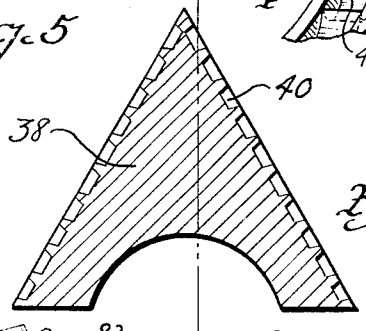



Fig. 7

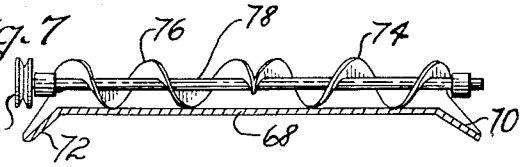



Fig. 8

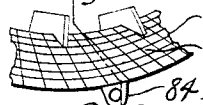
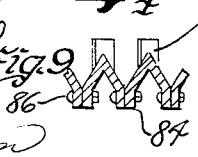



Fig. 9




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# UNITED STATES PATENT OFFICE

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## GRAIN GRADING MACHINE

Elmer Henry Germer, Fort Dodge, Iowa

Application March 16, 1931. Serial No. 522,991

2 Claims. (Cl. 209—95)

The object of this invention is to provide an improved construction for a machine for separating and grading grain or other granular material.

Another object of the invention is to provide an improved grain grading machine so constructed and arranged as to provide a maximum capacity in proportion to the size of the machine.

Still another object of the invention is to provide an improved grain grading and separating machine comprising a hollow rotating drum having an internal corrugated surface formed with a large number of pockets adapted to receive granular material of a certain type and elevate such material for the purpose of discharging it at an elevated point and thereby separating it from other material not capable of being received in said pockets.

More specifically, an object of the invention is to provide an improvement in the shape and in the method of forming the grain receiving pockets, which are of special shape and arrangement to facilitate the operation of the machine and to increase its capacity.

With these and other objects in view, my invention consists in the construction, arrangement and combination of the various parts of my device, whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in my claims, and referred to in the accompanying drawing, in which:—

Figure 1 is an end view of a machine embodying my invention.

Figure 2 is a side elevation of the same, partly in section.

Figure 3 is a cross section through the revolving drum and illustrating more or less conventionally the shape and arrangement of the grain receiving pockets on the corrugated interior surface of the drum.

Figure 4 is an enlarged section circumferentially of a segment of one of the substantially triangular plates which go to make up the corrugated internal surface of the drum, this section being taken substantially on the line 4—4 of Figure 5.

Figure 5 is a cross section on the line 5—5 of Figure 4.

Figure 6 is a detail perspective view of one of the pocket carrying members, illustrating in detail the shape and arrangement of the grain receiving pockets.

Figure 7 is a sectional elevation of a modified form of grain trough and conveyor which may be employed if desired, this construction including means for causing the elevated grain to travel in two different directions, thereby effecting a further separation, particularly as to grains of different size and weight.

Figure 8 is a detail elevation of a section of a modified form of a pocket carrying ring, which may be assembled in series to form a drum without using an external shell.

Figure 9 is a cross section of the same on the line 9—9 of Figure 8.

Any suitable mounting may be employed for the machine, but I prefer to make use of a base 10 having an inclined upper surface whereby the machine is slightly inclined to facilitate its operation.

On the base 10 are mounted a pair of spaced frame members or machine heads 12 and 14 between which a drum is rotatably mounted.

The drum is composed of a cylindrical shell 16 having heads 18 and 20 at its respective ends. The heads 18 and 20 are of annular formation having rather large central openings surrounded by outwardly projecting annular flanges 22 and 24 respectively. The drum is supported for rotation by means of a pair of rollers 26 pivoted on the machine head 12 and engaging the annular flange 22 at one end of the drum and by another pair of rollers 28 pivoted on the machine head 14 and engaging the annular flange 24 at the other end.

The drum may be rotated by any suitable means, such as an electric motor 30 which may be mounted on the base 10, and provided with a belt pulley 32 on its shaft. A belt 34 engages the pulley 32 and also engages a grooved ring 36 which encircles the shell of the drum.

Within the shell 16 are mounted side by side a plurality of pocket carrying rings 38 which preferably are substantially triangular in cross section, thereby producing a corrugated internal surface for the drum.

Each of the exposed surfaces of each of the pocket carrying rings 38 is formed with a plurality of annular rows of grain receiving pockets 40 and the rows are separated by annular ribs or partitions 42.

Each annular row of pockets is of substantially serrated formation as illustrated for instance in Figure 4, and each pocket of the row is shallow at its forward end and deeper at its trailing end with respect to the rotation of the drum. The pockets are arranged close together on the surfaces of the rings and the serrated formation just referred to produces tooth-like partitions 44 between the pockets of each row.

Each pocket 40 preferably is of substantially

uniform width throughout its length as defined by the several annular partitions 42. However, the tooth-like partitions 44 between pockets in a row are not arranged on radial lines but are on lines tangential to a circle concentric with the axis of rotation of the drum. Because of this arrangement the pockets 40 are of somewhat diamond or rhomboidal formation as illustrated conventionally in Figure 3, and with one forward corner traveling slightly in advance of the other as the drum rotates.

A mass of grain or other granular material to be graded and separated is introduced to the upper end of the drum through a chute 46 projecting through the opening defined by the annular flange 22. This material is received on the corrugated surface at the lower side of the drum and is subjected to constant agitation and mixing through the rotary movement imparted to the drum by the motor and belt connections. There is also a tendency for the granular material to travel slowly toward the lower end of the drum because of its inclination.

The mass of grain or granular material is supposed to be composed of dissimilar particles and units, such as hulled grains, whole grains which have not been hulled, and empty husks or hulls which have been removed from particles of the grain, and it is the function of the machine particularly to remove and separate the hulled grain from the rest of the mass.

Naturally, the hulled grains are smaller and also of greater weight for their size than either the unhulled grains or the empty hulls. The agitation caused by the rotary movement of the drum and by the slow travel of the material through the drum causes these heavier particles of hulled grains to settle to the bottom of the mass so that they may be received in the pockets 40. It will be understood, moreover, that the pockets of a given machine are made to conform as to size and shape with the kind of grain or other material which is to be graded and separated.

As the relatively heavier particles or hulled grains settle to the bottom of the machine they are received in the pockets 40 and carried upwardly as the drum is rotated. The other larger and relatively lighter particles travel on the upper part of the mass of material within the drum and are finally discharged through the lower opening, defined by the annular flange 24, through the discharge chute 48.

A trough 50 is arranged longitudinally within the drum and preferably is located slightly above the axial center thereof. It is also nearer to that side of the periphery of the drum toward which the rotary movement takes place as indicated by the arrow in Figure 3.

The granular material carried by the pockets 40 is elevated above the plane of the axial center of the drum and is discharged upon an inclined plate 52, which delivers it to the trough 50. The plate 52 is formed on or fixed to the trough 50 at one of the upper margins of said trough and extends in an inclined plane to the corrugated internal periphery of the drum. It may be notched or otherwise formed at its free margin to conform substantially to the formation of the corrugated periphery so that its margin may extend very close to such corrugated surface and thereby be arranged to receive all of the material discharged from the pockets 40.

Fixed to the opposite side of the trough 50 is an inclined baffle plate 54 which projects upwardly toward the opposite periphery of the drum and serves to deflect any grains which may be thrown over the trough and prevent them from falling to the bottom of the drum.

The trough 50 extends through the drum on an inclined line parallel with the axis thereof and terminates in a discharge chute 56.

It may be desirable to provide mechanical means for causing the separated granular material to travel more rapidly through the trough 50 and for that purpose a spiral conveyor 58 may be mounted in said troughs. The conveyor 58 is provided at one end with a belt pulley 60 engaged by a belt 62 which is driven by a pulley 64. The pulley 64 is a part of a transmission mechanism including reducing gears mounted in a gear box 66 and driven by the motor 30.

The corrugated internal surface of the revolving drum, produced by the series of rings 38, provides a relatively large surface in which the grain receiving pockets 40 may be formed. In this way I provide for a machine of large capacity and capable of performing a maximum amount of work as compared with the length of the drum.

Another important feature of my machine is the shape and arrangement of the pockets 40. Their increased depth at their trailing ends facilitates the reception and holding of the granular material therein while the pockets are traveling upwardly to a point beyond the horizontal plane of the axis of rotation. When the pockets reach substantially the elevation of the outer edge of the plate 52, the force of gravity causes the granular material to be discharged upon said plate. The diamond or rhomboidal shape of the pockets, with one forward corner somewhat ahead of the other, also serves to facilitate the discharge of the grain at the desired point in the rotation of the drum. It will be noted that the shape and arrangement of the pockets may be varied to make them more or less diamond shaped and that the substances will be discharged therefrom sooner when the pockets are more oblique.

If desired, a type of spiral conveying means for the trough may be employed in the machine as illustrated in Figure 7. In this view the trough is designated by the numeral 68 and it is formed with a discharge spout 70 at its lower end, and also with a discharge spout 72 at its upper end. The spiral conveying means consists of two flights 74 and 76 mounted on a shaft 78 having a belt pulley 80 at one end. The two spiral flights 74 and 76 are oppositely arranged so as to cause material to travel in opposite directions in the trough 68 from its central portion.

The heavier grains tend to travel in a downward direction in the trough 68 because of the greater gravitational force and are consequently engaged and carried along by the spiral member 74 so as to be discharged through the chute 70. The lighter grains are engaged by the spiral member 76 and are carried in an upward direction in the trough and discharged through the spout 72.

This arrangement permits a further separation of the hulled grains after they have been elevated to the trough 68, whereby the lighter grains may be separated from the heavier, or whereby grains of different character may be separated from each other.

It is also possible to construct the rotary drum without using the outer shell 16, and such construction is illustrated in Figures 8 and 9. The pocket carrying rings 82 are formed on their outer peripheries with series of apertured ears

84 and the rings may be secured together in series by means of bolts 86 mounted through these ears. The inner inclined surfaces of the rings 82 are formed with the same type of grain receiving pockets 40 as previously described.

Another feature is illustrated in Figures 8 and 9, this being a series of blades 88 formed on or fixed to the inner peripheries of the rings 82 at suitably spaced intervals. The blades 88 are inclined relative to the axis of the drum and it is their function, in the rotation of the drum, to engage the grain or other substance contained in the drum and to apply force for moving the substance toward the lower end of the drum.

Some changes may be made in the construction, arrangement and combination of the various parts of my device, without departing from the real spirit and purpose of my invention, and it is my intention to cover by my claims, any modified forms of structure or use of mechanical equivalents, which may be reasonably included within their scope.

I claim as my invention:—

1. In a grain grading machine, a cylindrical shell rotatably mounted, a series of rings mounted side by side within said shell, each ring being formed with surfaces inclined relative to the axis of said drum, said surfaces being formed with series of grain receiving pockets, said pockets being substantially rhomboidal or diamond shaped in plan and with one corner in advance of the rest, said pockets being of greater depth at their trailing than at their leading ends.

2. In a grain grading machine, a cylindrical shell rotatably mounted, a series of rings mounted side by side within said shell, each ring being formed with surfaces inclined relative to the axis of said drum, said surfaces being formed with series of grain receiving pockets, said pockets being substantially diamond shaped and being arranged in annular rows on said surfaces and being separated in the rows by tooth-like serrations arranged on continuous lines oblique to radial lines of the rings.

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