Sept. 24, 1935. C. C. INGRAHAM 2,015,400

GRAIN SEPARATING MACHINE

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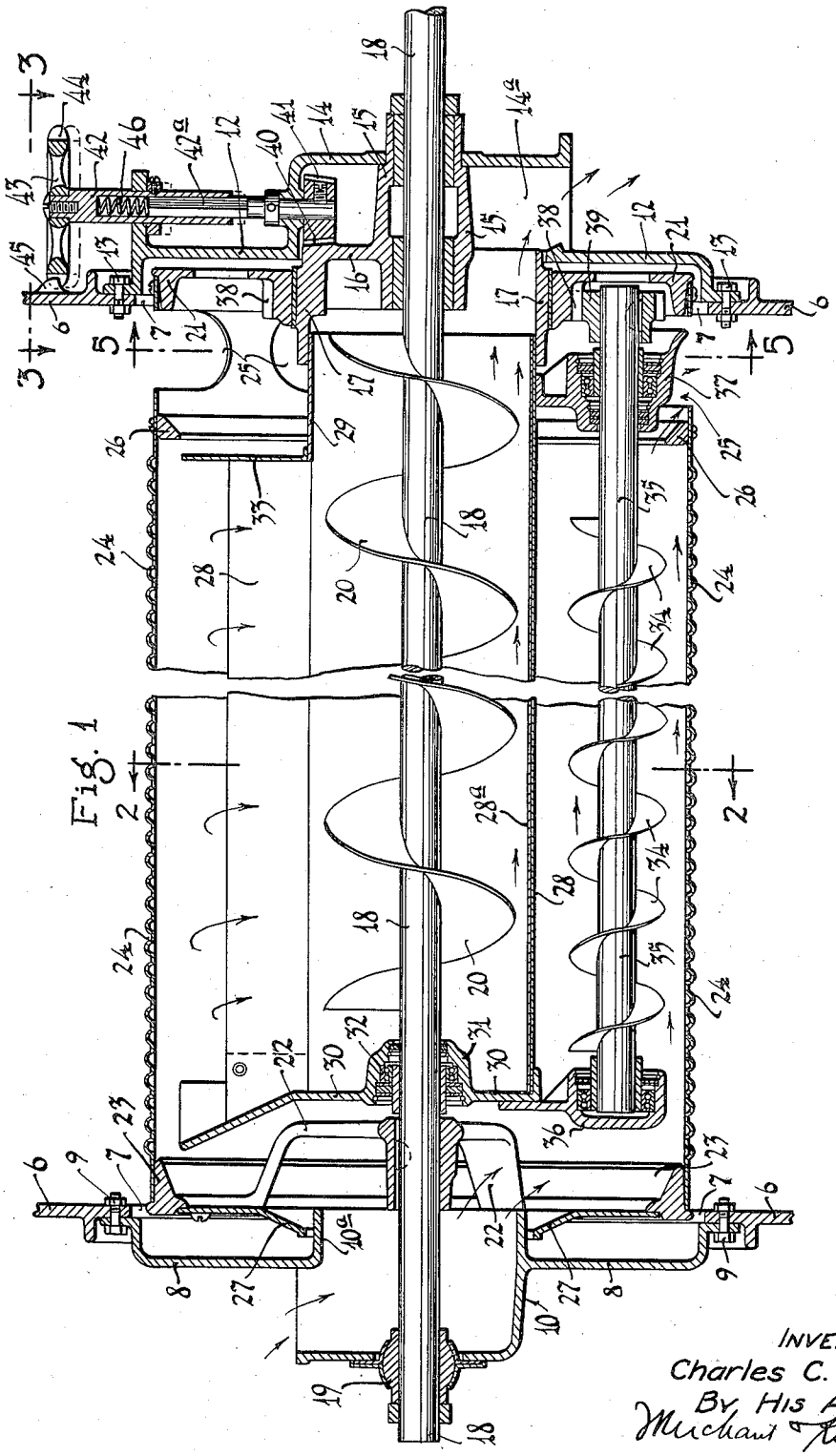


Fig. 1

INVENTOR
Charles C. Ingraham
BY HIS ATTORNEYS
Merchant & Gilpin

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Fig. 2

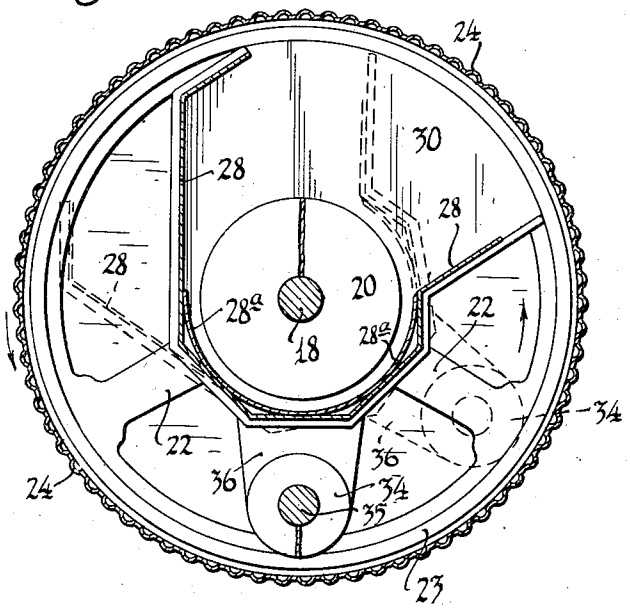
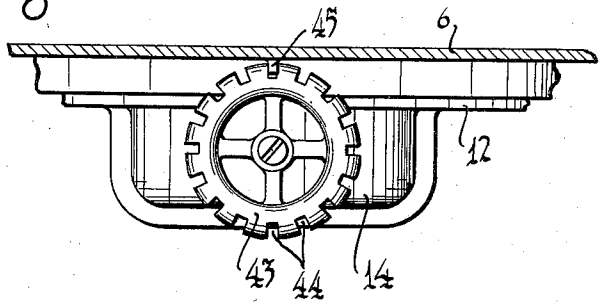


Fig. 3



INVENTOR
Charles C. Ingraham
BY HIS ATTORNEYS
Merchant & Kilgore

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Fig. 4

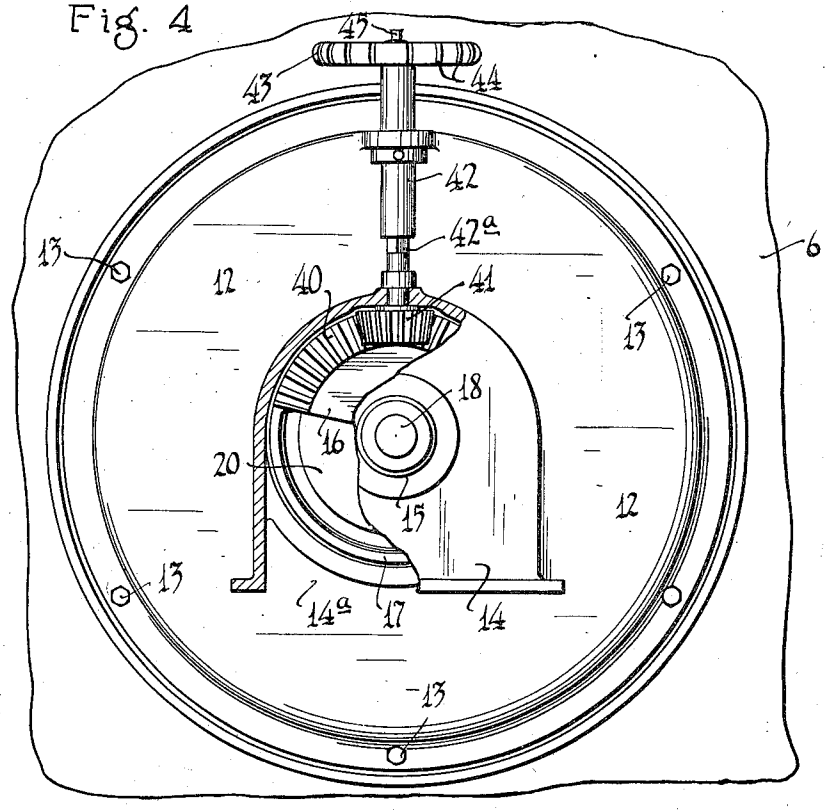
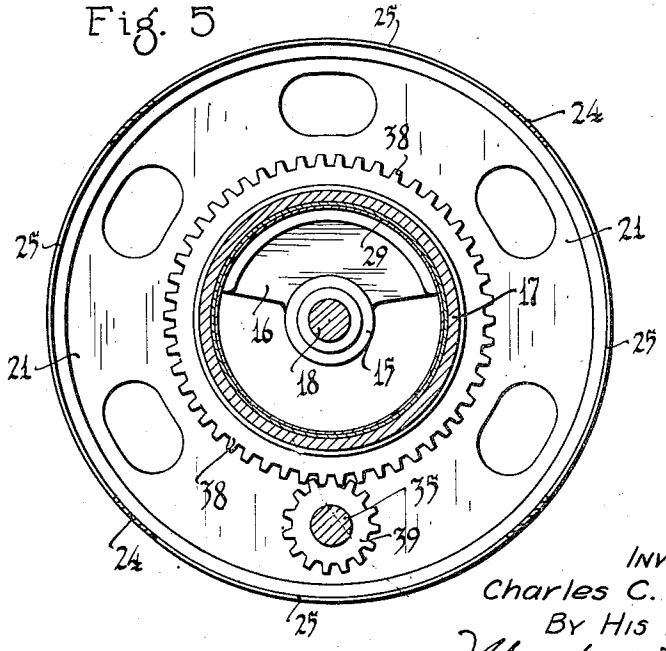


Fig. 5



INVENTOR
Charles C. Ingraham
BY HIS ATTORNEYS
Marchant & Kilgore

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UNITED STATES PATENT OFFICE

2,015,400

GRAIN SEPARATING MACHINE

Charles C. Ingraham, Minneapolis, Minn., assignor to Hart-Carter Company, Peoria, Ill., a corporation of Delaware

Application June 27, 1934, Serial No. 732,611

5 Claims. (Cl. 209—95)

My present invention provides an extremely simple and efficient machine for the separation of materials such, for example, as wheat and oats that vary both in size and general shape; and from this statement it, of course, follows that the machine is adapted for the separation of various other grains and materials that have the different characteristics indicated. The machine is of the type wherein there is provided an indented or internally pocketed drum combined with a catch trough located within the drum and in which machine the relatively small or short grains such as wheat will be carried upward and dropped into the trough, while the relatively large or long grains such as oats will be dropped back and carried out of the delivery end of the drum.

In machines of this kind, as hitherto designed, there has been a tendency of the grain to build up to relatively great depths at the receiving end of the drum, thereby putting on the pockets at the receiving end of the drum, more work than they can handle, and relieving the pockets near the delivery end of the drum from work that they are well adapted to perform.

To correct this defect and improve both the capacity and character of the separation, I have provided a novel device in the nature of a distributor arranged to work below the catch trough and adjacent the bottom of the rotary drum. To adjust the separating action to varying speeds of the drum and for the best separation of the particular grains or materials to be separated, the catch trough is made rotatably adjustable within the drum, and a distributor in the form of a spiral conveyor or worm-equipped shaft is hung from the trough so that it will be supported therefrom and adjustable therewith.

The invention also includes highly important devices or structures whereby the above noted and other features are carried into effect in the most efficient and desirable way.

The improved machine is illustrated in the accompanying drawings wherein like characters indicate like parts throughout the several views.

Referring to the drawings:

Fig. 1 is a vertical axial section taken through the complete machine or unit involving my invention;

Fig. 2 is a transverse vertical section taken on the line 2—2 of Fig. 1;

Fig. 3 is a fragmentary view chiefly in plan, but with some parts sectioned on the line 3—3 of Fig. 1;

Fig. 4 is an elevation of the parts shown in Fig. 1, looking at the same from the right toward the left in respect to Fig. 1, some parts being broken away; and

Fig. 5 is a transverse vertical section taken on the line 5—5 of Fig. 1.

Various parts of the machine are supported directly or indirectly from laterally spaced vertically disposed plate-like frames 6 that are provided with large aligned openings 7. In this preferred arrangement, a head plate 8 is detachably secured to the left-hand frame 6 by suitable means such as nut-equipped bolts 9, said head plate being arranged to span the left-hand opening 7. This head plate 8 is formed with a large pocket 10 that affords an intake passage for the material to be delivered to the machine, and is formed with an inwardly projecting annular collar or flange 10a.

Also as shown, a head plate 12 is detachably secured to the right-hand frame 6 by suitable means such as nut-equipped bolts 13. This head plate 12 spans the right-hand opening 7 and is formed with an inverted pocket-like portion 14 that affords a discharge passage 14a.

A bearing sleeve 15 is extended through the outer wall of the inverted pocket 14 and is journaled therein for oscillatory adjustments. This sleeve 15, by a segmental web 16, is rigidly connected to a large collar 17 that projects inward from the right-hand frame 6 and right-hand head plate 12. A power-driven shaft 18 is extended through and journaled in the bearing sleeve 15 and is also extended through and journaled in a bearing 19 applied to the outer wall of the intake pocket 10. This power-driven shaft 18 is provided with a spiral flange 20 that affords a conveyor, as will presently more fully appear.

Rotatably mounted on the collar 17 is an annular drum-carrying head 21, and keyed or otherwise rigidly secured to the shaft 18 is a drum-carrying spider 22, the arms of which, at their outer ends, are rigidly connected to a ring 23. The internally indented or pocketed drum 24, at its left-hand end, is telescoped onto and rigidly secured to the ring 23 and at its right-hand end is telescoped onto and rigidly secured to the outer annular flange of the head 21. Thus the drum or cylinder 24 is mounted for rotary movements around the axis of the shaft 18 and is driven by said power-driven shaft.

Close to the head 21 and beyond its indented surface, the drum 24 is formed with large circumferentially spaced discharge passages 25; and just to the left of said passages 25, said drum, as shown, is provided with an internal annular retarding flange 26. Rigidly secured to the spider

22 and surrounding the inwardly projecting annular portion of the intake pocket 10 is an annular baffle plate or flange 27.

Mounted within the drum is a catch trough 28, the cross-sectional form of which is best shown in Fig. 2 and the longitudinal dimension of which is best shown in Fig. 1. At its right-hand end, this trough is provided with a cylindrical discharge end portion 29 that quite closely surrounds the spiral conveyor 20 and is rigidly secured to the adjustable collar 16. At its left-hand end, said trough has a closed head or end plate 30 shown as formed with a hub 31 journaled on the shaft 18, preferably by means of an anti-friction bearing 32. By reference to Fig. 1 it will be noted that the trough 28, at the left-hand portion of its discharge spout 29 has a raised end plate 33 that is just inward or to the left of the retarding flange 26 and is in a plane approximately at the right-hand termination of the pocketed portion of the drum.

As best shown in Fig. 2, the catch trough, which is preferably made of sheet metal, has a polygonal body portion that is reinforced by a semi-cylindrical lining or wearing surface 28*a*. This structure makes the trough very rigid and capable of taking considerable torque or twisting strains, which is a desirable feature especially for a reason presently to be noted.

Working below the trough and close to the bottom of the drum is a spiral feed screw or conveyor 34 carried by a shaft 35 that is parallel to the shaft 18. As an important feature this distributing conveyor is hung from and carried by and hence is adjustable with the catch trough. Hence, the shaft 35 preferably through anti-friction bearings, is journaled in hanger brackets 36 and 37, rigidly secured to and depending, respectively, from the left-hand end of the trough and the bottom of the trough spout 29. Particularly, by reference to Fig. 1, it will be noted that the hanger bracket 36 is spaced from ring 23 and from the bottom of the drum and that the hanger bracket 27 is spaced from the retarding flange 26 and from the bottom of the drum, so that there will be a free passage and discharge of the grain.

As a means for driving the shaft 35 directly from the rotary drum and indirectly from the power-driven shaft 18, the drum head 21 on its hub is provided with an annular spur gear 38 that meshes with a spur pinion 39 keyed or otherwise rigidly secured to the right-hand end of said shaft 35.

For rotatively adjusting the catch trough and with it the distributing conveyor 34—35, suitable means is provided for adjusting the collar 17. As shown, this means includes a beveled segmental gear 40 on the segmental flange 16 that meshes with a bevel pinion 41 secured to the lower section of a two-part telescopic shaft 42*a*. The shaft section 42 has an angular bore that engages the angular upper end of the shaft section 42*a* so that the two shaft sections rotate together with the pinion 41.

A hand-wheel 43 is shown as secured to the upper end of the section 42. This hand-wheel has peripheral notches 44 normally engaged with the lock lug 45 on the right-hand frame 6 under the action of a coiled spring 46 interposed between the sections 41 and 42. Obviously when the hand-piece 43 is pressed downward against the tension of the spring 46, it will be unlocked from the lug 45 and may then be rotated to impart rotative adjustments to the collar 17 and hence to the catch trough and distributing conveyor.

The operation of the machine here illustrated will be made clear from a description of the action thereof in the separation of wheat and oats, a mixture of grain frequently designated as succotash. The drum will be rotated in the direction of the arrow marked on Fig. 2, to wit: in a counter-clockwise direction in respect to that view. The commingled grain will be fed into the pocketed drum 24 through the inlet pocket 10 and subjected to the action of the pockets of said drum. These pockets will vary when adapted for the separation of various different materials, but for the separation of wheat from oats, they will be of such size and depth to completely receive the wheat kernels therein, but only of such size as to partially receive the longer oat kernels. Of course, small seeds, if any, will be received in the said pockets with the wheat.

The commingled grain as it is delivered into the receiving end of the drum will be acted upon by the spider or distributing screw or spiral 34 and will be spread out quite evenly over the bottom or lower portion of the drum so that all of the pockets of the drum will be given a chance to operate on the stock within the drum under rotation of the drum. The wheat will be carried upward by the pockets in the drum and finally dropped and delivered into the catch trough while the oats, after they have been moved forward and upward but a short distance, will slide back toward the bottom of the drum. The higher the speed of the drum, the higher will be the points where the oats slide back, and the higher will be the points where the wheat kernels drop from the pocket into the trough. The proper speed having been determined and the machine set for that speed, then the trough will be rotatably adjusted until its lower radially projecting portion is set at such altitude as to effect the proper separation as between the wheat and oats. Obviously, the lower this lower edge of the hopper is set, the greater will be the tendency of some oats to be carried with the wheat into the trough and the lesser the tendency of some of the wheat to fall back with the oats. Hence it is important to make the said trough adjustable so that it may be set at the place where the best separation of the wheat and the oats may be accomplished. With the arrangement illustrated, the trough may be rotatably adjusted from its lower set position, shown by full lines in Fig. 2, into its highest set position shown by dotted lines in said view.

The wheat delivered into the trough will, by the spiral conveyor 20, be discharged through the ring 17 and discharge passage 14*a* of the inverted pocket 14. The oats, which remain in the lower portion of the drum when it reaches the discharge end of the drum, under the action of the conveyor 34, will be discharged over the flange 26 and out through the circumferentially spaced discharge passages 25 at the delivery end of said drum. Here it will be noted that the hanger bracket 37 has a bell-shaped flange that prevents the discharged oats from coming into contact with the pinion 39.

The hanging or carrying of the distributing or spreader conveyor 34—35 from the feed trough is important for several reasons. In the first place, it keeps the said conveyor always near to the lowermost portion of the drum 24 and always under the bottom portion of the trough. In the second place, the structure is made simply

by utilizing the trough as the support for the said conveyor, thereby eliminating independent hanging and adjusting devices for the said distributor or spreader. In this manner of hanging or supporting the distributing conveyor, the torque or twisting strain produced by or necessary to the adjustment of said conveyor is taken into the trough structure which in itself is a strong but light structure, capable of resisting torque strains.

As already indicated, the machine may be designed for the separation of various materials other than wheat and oats which have the characteristics necessary for the kind of separations discussed. For example, when the drum is provided with smaller pockets, the machine can be used for the separation from wheat for example, of relatively small seeds, which in a machine for separation of wheat and oats, will carry the smaller seeds with the wheat. In fact, several of the machines such as described and having drums with pockets of different dimensions are adapted to be connected up in tandem or in a unitary plant for effecting the several different kinds of separations. Also from what has been said, it is obvious that the machine described is capable of various modifications as to details of construction and arrangement of parts within the scope of the invention herein disclosed and claimed.

What I claim is:

1. In a machine of the kind described, an internally pocketed rotary drum through which the material to be separated is arranged to be passed, a catch trough mounted in said drum, a collar at one end of said drum to which the delivery end of said trough is secured, an annular gear-equipped member mounted on said collar and secured to the delivery end of said drum, a power-driven shaft extended axially through said drum and through said trough and to which said drum is secured at its receiving end, said shaft having a spiral conveyor working in said trough, said collar having a passage for the discharge of stock from said trough, of a spiral distributing conveyor having a shaft hung from and working below said trough near the bottom of said drum and provided with a pinion driven from the gear of said annular drum-connected member.

2. The structure defined in claim 1 in combination with means for rotatably adjusting said collar and hence said trough and distributing conveyor.

3. The structure defined in claim 1 in combination with means for rotatably adjusting said collar and hence said trough and distributing conveyor, said structure including a pocket delivering into the receiving end of said drum, and the shaft of the conveyor working in said trough being extended axially outward through the bearing formed on said adjustable collar.

4. The structure defined in claim 1 in combination with means for rotatably adjusting said collar and hence said trough and distributing conveyor, said structure including a pocket delivering into the receiving end of said drum, and the shaft of the conveyor working in said trough being extended axially outward through the bearing formed on said adjustable collar, said drum having circumferentially spaced discharge passages adjacent to the annular gear-equipped member to which said gear is secured.

5. In a machine of the kind described, the combination with laterally spaced frame members having large axially aligned openings, of head plates detachably secured to said frame members and provided with axially aligned bearings, one of said head plates having a pocket-like intake passage and the other having an inverted pocket-like discharge passage, a collar mounted for rotative adjustments in respect to the latter noted head plate, an annular gear-equipped drum-supporting member journaled on said collar, a shaft equipped with a spiral conveyor and journaled in the axially aligned bearings of said head plates, a spiral secured to said shaft adjacent said intake pocket, of an internally pocketed drum secured to said bracket and to said gear-equipped drum-supporting member, said drum having circumferentially spaced discharge passages adjacent the latter, a catch trough in said drum journaled on said shaft at one end and at its other end connected to said collar for rotative adjustments therewith, hanger brackets secured to and depending from said trough, and a spiral distributing conveyor having a shaft journaled in said depending hanger brackets and provided with a pinion meshing with and driven from the gear of said gear-equipped drum-supporting member.

CHARLES C. INGRAHAM.