July 22, 1952 A. A. ARMER 2,604,206

APPARATUS FOR SEPARATING MUD, WEEDS, AND STEMS FROM VEGETABLES

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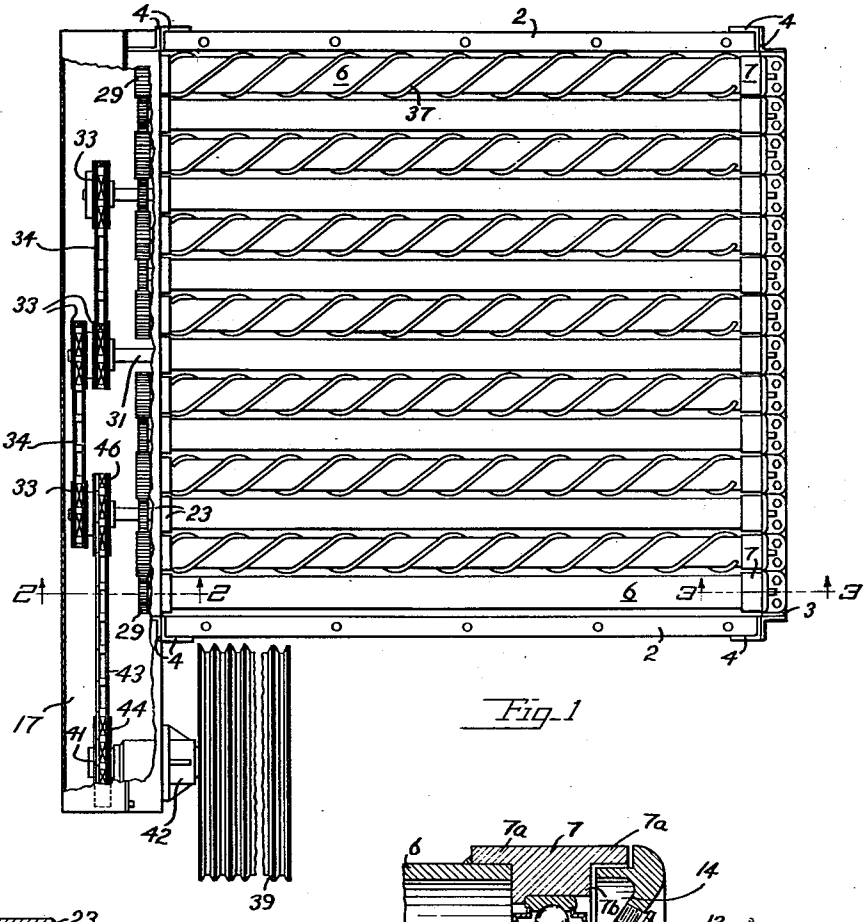

Fig. 1

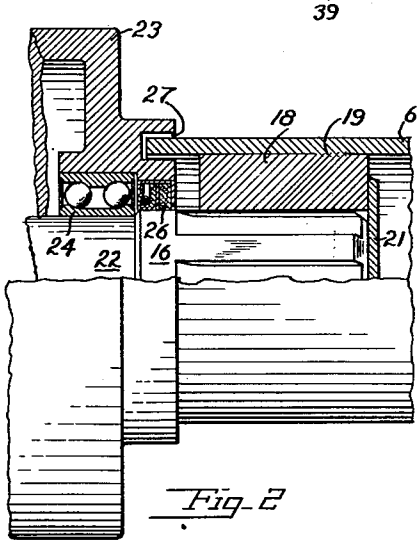

Fig. 2

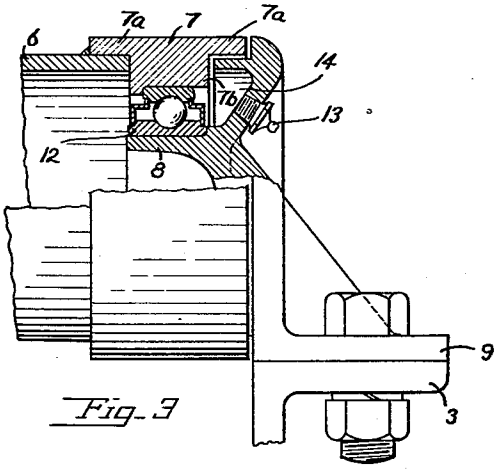

Fig. 3

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APPARATUS FOR SEPARATING MUD, WEEDS, AND STEMS FROM VEGETABLES

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4 Claims. (Cl. 209—107)

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My invention relates to a machine for separating mud, weeds and stems from such vegetables as sugar beets; and it is among the objects of the invention to provide a machine that will remove such "trash" from the vegetables as they pass over it.

It is another object to provide a separating machine capable of continuous operation without clogging or jamming.

A further object of my invention is the provision of a machine which removes "trash" from vegetables by both agitation and positive shearing action.

My invention has other objects and features of advantage which, with the foregoing, will be explained in the following description of that form of the invention which is illustrated in the drawings. It is to be understood, however, that the invention is not limited to this single embodiment, but may be included in a plurality of forms as set forth in the claims.

Referring to the drawings: Figure 1 is a plan view of my separating machine. The top of the drive housing is shown broken away to reveal the drive gear arrangement therein, and a portion of the pulley is removed to reduce its length.

Figure 2 is a detail, partly in vertical axial section, of the bearing arrangement at one end of a roll, the plane of section being indicated by the line 2—2 of Figure 1.

Figure 3 is a similar detail of the roll journaled on an annular flange and bracket at its other end, the plane of section being indicated by the line 3—3 of Figure 1.

Broadly, my separating machine comprises a frame having a plurality of rolls journaled thereon. The rolls are arranged in pairs; and one roll of each pair is provided with a helical flight. A jack shaft journaled on the frame and rotated by a motor is rotatably coupled to the rolls in such a way that adjacent rolls turn in opposite directions and at different speeds. With this arrangement, the vegetables fed to the machine are subjected to a positive shearing action by the revolving flights, and a bouncing motion resulting from the different rates of roll rotation.

While the separating machine of my invention can be successfully used to clean such root crops as onions and table beets, the embodiment described is that adapted for processing sugar beets.

In terms of more specific detail, my machine includes a generally rectangular frame formed by side members 2, end members 3, and angle brackets 4. A plurality of spaced tubular rolls 6 are rotatably mounted on the frame; and one end of each roll is fixed in an annular collar 7 having a T-shaped cross-section. The roll fits

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into the collar just under the flange 7a and abuts the web 7b.

An annular flange 8, conveniently integral with a bracket 9 bolted to the frame end member 3, extends into the collar 7 and provides a mounting for the ball bearing 12. A grease fitting 13 is provided on the bracket adjacent the bearing; and the bracket is shaped to afford a small grease reservoir 14 between the fitting and the bearing, as shown. It will be noted that with this type of collar covering the bearing assembly, the danger of weeds, beet stems or dirt working into the bearing to jam the roll is largely eliminated.

The other end of the roll 6 is mounted on a spindle 16 journaled through one side of the drive housing 17 arranged on the frame end member 3. An annular bushing 18 splined on the spindle is fixed inside the roll by such means as the weld 19. A stop plate 21 fixed across the inner end of the bushing to prevent the spindle from jamming therein limits the amount of axial play of the roll.

The unsplined portion 22 of the spindle 16 extends through the housing member 23 on the drive housing 17, and provides a mounting for the ball bearing 24. A seal 26, which may be a leather and fabric oil seal, is disposed between the spindle and the housing member 23 to prevent lubricant from leaking into the roll. The proportion and arrangement of the parts is such that the annular end of the roll 6 revolves in an annular groove 27 in the housing member, so that the inside bearings are protected from dirt and other foreign matter.

Means for driving the rolls are provided on the spindles. With the exception of the power transmission spindle 31, each spindle 16 is provided with a gear 29 fixed thereon within the drive housing 17. In the embodiment having fourteen rolls and spindles, which is shown in Figure 1, I prefer to have the seventh or eighth spindle employed as the power spindle, so that no other spindle is more than eight spindles away from it. In this way, the tooth pressure between the gears 29 will be reduced to a practical minimum.

The gears 29 on the spindles 16 are meshed, affording a gear train on each side of the power spindle 31. In order to drive the trains, sprockets 33 are arranged on the power spindle 31 and on one of the spindles 16 in each train; and the sprockets are linked with chains 34. With this arrangement, rotation of the power spindle 31 will effect rotation of all of the other spindles and all of the rolls. It will be also seen the adjacent rolls will rotate in opposite directions.

Preferably, the adjacent rolls also turn at different speeds, and this may be conveniently ef-

fected by alternating the sizes of the gears 29 on the spindles. I have found that with rolls four inches in diameter, excellent results may be obtained by having one roll rotate at about 237 R. P. M. while the adjacent roll revolves at about 290 R. P. M.; and any gear combinations that permit speed ratios of this order may be employed. With this differential in roll speed, a desirable agitation and bouncing is imparted to the beets passing over the rolls. Mud adhering to the beets is thus knocked off; and soil, weeds and beet tails which might otherwise cling to the rolls are effectively stripped.

A double helical flight 37 of rounded cross-section is disposed on each alternate roll 6 to move the beets across the machine. The flights are preferably fixed on the slower roll of each pair; and may be conveniently made by welding round steel wire, which may be about ⅜'' in diameter, helically on each specified roll. I have found that the approximate limits of the range for the lead angle of the flights are 35° and 50°. Smaller angles tend to be less effective in propelling the beets; while larger angles move the beets so smoothly across the machine that the very desirable bouncing is eliminated.

Naturally, the arrangement of the flights 37 and the gears 29 should be such that the beets are discharged over the ends of the rolls opposite the drive housing 17. By inclining the entire machine at an angle of about 10° to the horizontal with the drive housing at the upper end, this may be aided.

It will be noted that by mounting the annular flange 8 and the bearing 12 within the collar 7 at the lower end of each roll 6, a minimum of obstruction is afforded to the outflowing beets.

Power means are provided for driving the rolls. A multiple groove V-belt pulley 39 is mounted on a jack shaft 41 journaled in a bearing 42 at one end of the drive housing 17. Any well known drive means, such as a 30 H. P. 1800 R. P. M. motor, not shown, may be combined with suitable V-belting to rotate the pulley and jack shaft. A chain 43 connects the sprocket 44 on the jack shaft to a sprocket 46 on the same spindle 16 as the nearest sprocket 33. Thus, when the motor is rotatably coupled to the pulley, the combination of chains 34 and 43; sprockets 33, 44 and 46; and gears 29 will rotate the smooth rolls at about 290 R. P. M.; while the rolls having the double helical rounded flights 37 thereon will turn at about 237 R. P. M. in the opposite direction.

When my separating machine is in operation, uncleaned sugar beets fresh from the fields are fed to it at its upper end. As the beets travel across the machine, such foreign matter as stems, leaves, grass and weeds is grasped by the rotating rolls and discharged under them. The difference in the speeds of the adjacent rolls causes the beets to wobble and bounce on the machine, thus shaking off adhering mud or soil. Because the helical flights 37 have a rounded rather than a rectangular cross-section, they propel the beets across the table to the discharge end of the machine without cutting them, yielding a clean undamaged product.

I claim:

1. A separating machine comprising a frame, a pair of spaced rolls journaled on the frame, one of said rolls having a plain cylindrical surface and the other roll having a helical flight disposed on its surface, a jack shaft journaled on the frame, drive means for rotating the jack shaft, means rotatably connecting the jack shaft and one of the rolls, and gear means on the rolls for rotating them in opposite directions and at different speeds, with said first-mentioned plain cylindrical surface roll having a faster rotary movement than the other roll.

2. A separating machine comprising a frame, a plurality of pairs of tubular rolls mounted for rotation on the frame and having their longitudinal axes inclined to the horizontal, a helical flight having a rounded cross-section on only one of the rolls of each pair, a fixed flange on the frame upon which one end of a roll is journaled, a spindle journaled on the frame and mounted in the other end of the roll, gear means on the spindles of one pair of rolls for rotating them at different speeds and in opposite directions with the helical flight roll rotating at a lower speed than its companion roll, sprocket means on one of the spindles, a jack shaft journaled on the frame, sprocket means on the jack shaft, drive means for rotating the jack shaft, and chain means rotatably connecting the sprocket means on the jack shaft and spindle.

3. A separating machine comprising a frame, a plurality of pairs of tubular rolls arranged on the frame, one roll of each pair having a plain cylindrical surface and the other roll of each pair having a helical flight disposed on its surface, a cylindrical flange on the frame adjacent the end of each roll and concentric with the axis thereof, a cylindrical collar on the end of each roll and overlying the adjacent flange, a bearing interposed between each collar and the frame and constituting a journal for the roll at the collared end, means for journaling the other end of each roll, and means for rotating the rolls.

4. A separating machine comprising a frame, a plurality of pairs of tubular rolls arranged on the frame at an angle to the horizontal, one roll of each pair having a plain cylindrical surface and the other roll of each pair having a helical flight disposed on its surface, cylindrical flanges on the frame overlying each roll at its high end and adjacent each roll at its low end, a cylindrical collar on each roll at said low end and overlying the adjacent flange, a bearing interposed between each collar and the frame and constituting a journal for the roll at the low end, a spindle engaged in the high end of each roll, a bearing interposed between the spindle and the frame, and means for rotating the spindles to rotate the rolls.

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