Nov. 27, 1951 J. S. HERR 2,576,177

FEED MIXING APPARATUS

Original Filed Dec. 30, 1948

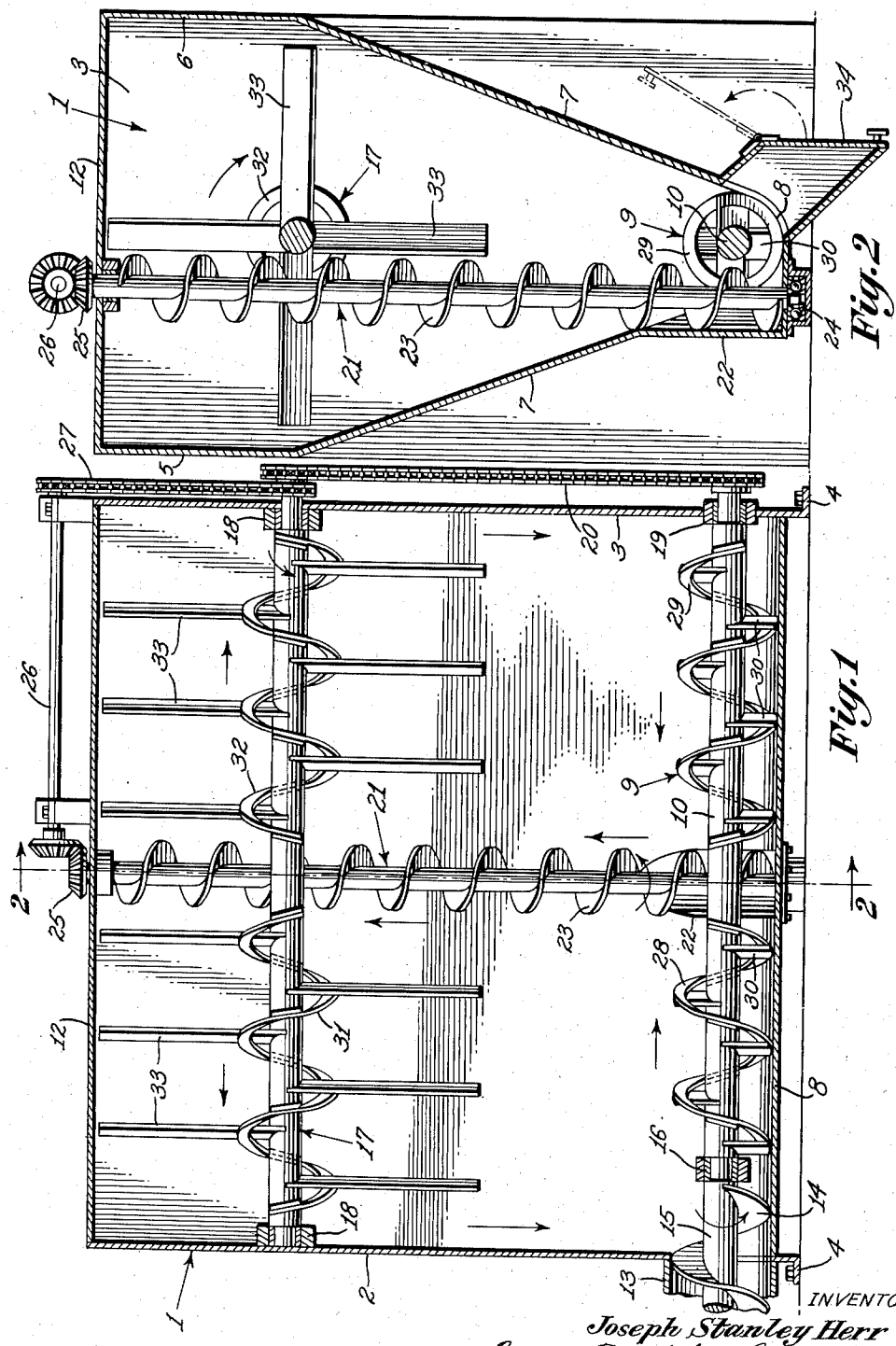


Fig. 2

Fig. 1

INVENTOR,
Joseph Stanley Herr
BY Mason, Fenwick & Lawrence,
ATTORNEYS

Patented Nov. 27, 1951

2,576,177

UNITED STATES PATENT OFFICE

2,576,177

FEED MIXING APPARATUS

Joseph Stanley Herr, Nottingham, Pa.

Original application December 30, 1948, Serial No. 68,177, now Patent No. 2,546,747, dated March 27, 1951. Divided and this application October 4, 1950, Serial No. 188,403

7 Claims. (Cl. 259—6)

1

This invention relates to feed mixing apparatus.

One of the objects of the invention is to provide a mixer which includes a system of conveyors for causing the feed to traverse repeatedly a circuitous path, in certain flights of which it is subjected to the action of beating or displacing devices which displace it at an angle to the direction of the circuit through which it is traveling, thus creating continuous turbulence which results in thorough mixing.

Another object of the invention is to provide a mixer in which the bottom portion of a mass of feed is moved in opposite directions toward the middle of the mass by means of open conveyors and then lifted substantially vertical through the middle of the mass toward the top and then moved oppositely away from the middle by other open conveyors, the openness of the conveyors permitting the feed to fall into the conveyors at any point in the course of their length, thereby avoiding the formation or existence of localized regions of nonturbulence in the mass.

Still another object of the invention is the provision of a mixer of the type described, the casing of which tapers downwardly substantially to the width of the lower conveyor, and in which the upper conveyor is provided with radial beaters of such length as to penetrate the upper part of the mass of feed to such depth as to involve the greater part of the volume of the mass of feed, reducing its density by keeping it loose and some of it in the air, thereby relieving the tendency of the upper part of the mass to pack and bear down upon the lower part, producing a condition that might result in "channeling" of the conveyors, without efficient mixing.

Other objects of the invention will appear as the following description of a preferred and practical embodiment thereof proceeds.

This application is a division of my co-pending application Serial Number 68,177, filed December 30, 1948, now Patent No. 2,546,747, dated March 27, 1951.

In the drawing which accompanies and forms a part of the following specification, and throughout the figures of which the same reference characters have been used to denote identical parts:

Figure 1 is a vertical longitudinal sectional view of a mixer embodying the principles of the invention;

Figure 2 is a vertical transverse section taken along the line 2—2 of Figure 1.

Referring now in detail to the figures, the casing 1 comprises the rectangular end walls 2 and 3, which in the form shown have flanges 4 at the bottom, bolted to the floor, and affording support for the mixer. The opposite side walls 5 and 6, which are suitably joined to the end walls, have upper portions in vertical planes and

2

lower downwardly convergent portions 7, which reduce the width of the casing at the bottom substantially to the diameter of the lower conveyor 9. The bottom 8 of the casing is of cylindrical shape coaxial with the shaft 10 of the lower conveyor, and fitting about the lower half of the vane of the lower conveyor, with operating clearance.

The casing, as shown, is closed by the cover 12.

The ingredients to be mixed enter the mixer by way of the conduit 13, being impelled inwardly by means of the vane 14, which is on a shaft 15 coaxial with the shaft 10, coupled thereto by the coupling 16, and which may be regarded as part of the shaft 10. The provision of the shaft 15 as a separate element is merely an incident of expedient in operatively associating the mixer with the other instrumentalities of the system disclosed in the aforementioned parent application.

In the specific embodiment of the invention illustrated in the drawings, the axis of the lower conveyor 9 is in the vertical longitudinal medial plane of symmetry of the casing. There is an upper conveyor 17, the axis of which is in the same plane. Both of said conveyors are horizontal. The upper conveyor is journaled at its ends in bearings 18, in the end walls 2 and 3. The lower conveyor is journaled at one end in a bearing 19, and at the other in a bearing, not shown, in the conduit 13. The shaft 10 of the lower conveyor is driven. The shafts of both conveyors are provided with sprockets at their adjacent ends, connected by the chain 20, by means of which the upper conveyor is driven from the lower conveyor.

A vertical conveyor 21 is mounted at the longitudinal middle of the casing 1 and laterally of the longitudinal vertical plane of symmetry of the casing. In order to accommodate this conveyor, the lower part of the casing 1 is provided with the offset semicylindrical bulge 22, which fits about the vane 23 of said conveyor, with operating clearance. The lower end of the shaft of the conveyor 21 is carried by an end thrust bearing 24 in a cap which is bolted to the under side of the casing. The upper end of the conveyor 21 is shown journaled in a bearing in the cover 12. The conveyor 21 is driven by means of a sprocket 25 at its upper end, operatively connected through the lay shaft 26 and chain and sprocket connection 27, with the upper conveyor 17.

The lower conveyor 9 is provided with vanes 28 and 29 of the ribbon type, that is to say, they are not an imperforate vane extending from the shaft outwardly as does the vane 14 of the shaft 15. The vanes 28 and 29 are narrow, spaced from the shaft 10, and being supported therefrom by the radial supports 30, which in order to have

some conveying function are shaped to follow the spiral contour of the vanes. The vanes 28 and 29 are oppositely twisted on opposite sides of the vertical conveyor 21, and the direction of drive of the conveyor 9 is such that the conveyor moves feed from both ends toward the middle. The upper transverse conveyor 17 likewise is provided with ribbon type vanes 31 and 32, which are oppositely twisted on opposite sides of the vertical conveyor 21, the direction of drive being such that feed is moved from the region of the vertical conveyor toward the ends of the conveyor 17. The ribbon type vanes not only act as conveying elements, but have the added function of sweeping through the feed in a direction at right angles to the movement of the feed toward or away from the vertical conveyor, and thus perform a useful mixing function.

The vanes 31 and 32 of the upper conveyor are supported in spaced relation to the shaft of said conveyor by the inner ends of the radial blades 33, which are secured to the shaft of said conveyor and to said vanes. Said blades extend radially beyond the periphery of the vanes 31 and 32, and are mounted in an inclined manner so as to have a conveying function as well as a beating or mixing action.

In operating this mixer its full efficiency does not begin to be realized until sufficient feed has been supplied to the mixer to bring the feed level up to or slightly above the upper conveyor 17. With the feed at this level it is obvious that the blades 33 penetrate deeply into the mass of feed in that part of the mixer which is of major width, so that it may be correctly said that ordinarily the greater part of the feed within the mixer is loosened and displaced by the action of the blades 33, some of which being carried into the air by the rotation of the blades, and dropped upon the surface of the feed mass. Thus, the greater part of the feed is kept in loose condition. Its density is kept low, and its tendency to bear down upon the portion of the feed mass in the lower part of the mixer is minimized so that packing and bridging of the feed within the mixer is prevented. Both the transverse and vertical conveyors are preferably open, that is, without housings, so that the feed is free to fall into them at any point throughout their length.

The operation of the mixer is as follows. The conveyors are set in motion by the power means, not shown, which drives the shaft of the conveyor 9. Feed constituents are fed in by the vane 14 and are carried by the vane 28 toward the middle of the conveyor. Presently, enough feed constituents have been supplied to be carried upwardly some distance by the vertical conveyor 21 and then fall back, forming a mound about the lower part of this conveyor which grows in extent until the casing is filled to the desired level, which as stated, is at least up to the upper level of the conveyor 17. The feed constituent supply is then cut off and the mixer continues to operate. In this operation it will be understood that both the upper and lower transverse conveyors and almost the entire vertical conveyor are submerged beneath the mass of feed in the casing. The lower conveyor is moving feed toward the vertical conveyor. The latter is moving feed in an upward direction to be caught by vanes of the upper conveyor. Said vanes move the feed in an outward direction and the feed moves by gravity downward to take the place of feed displaced by the vanes of the lower conveyor. In addition to the conveying circuit thus described, the ribbon type vanes 28, 29, 31 and 32 are sweeping laterally through the feed mass, assisting in the mixing. At the same time, the blades 33 are rotated in planes perpendicular to the plane of circuitous movement of the feed, penetrating deeply into the feed mass and contributing to the efficient mixing operation Since feed can fall into any of the conveyors at any point in their length, the entire feed mass is in a condition of turbulence conducive to the most complete mixing.

The feed constituents may consist of various whole or ground or otherwise specially prepared grains, and may also include liquid ingredients such as molasses, etc., also mineral or fiber additives. When the mixing is completed, the mixed feed may be discharged by opening the gate 34 while the conveying mechanism is in motion. The lower conveyor functions to bring feed from both directions to the discharge point, thus accomplishing the final step of mixing.

While I have in the above description disclosed what I believe to be a preferred and practical embodiment of the invention, it will be understood by those skilled in the art that the specific details of construction and arrangement of parts are by way of example and not to be construed as limiting the scope of the invention as claimed.

What I claim as my invention is:

1. Mixer for feeds or the like comprising a casing, transverse screw conveyors at different levels below the normal depth of feed in said casing, the lower conveyor being at the bottom of the casing, said casing being convergently narrow toward the bottom to a width substantially equal to the diameter of said lower conveyor, means for driving said transverse conveyors in such direction as to convey feed in opposite directions, a conveyor for conveying feed from the discharge end of the lower conveyor to the anterior end of the upper conveyor, means for driving said last named conveyor, means for admitting feed constituents to said casing, said conveyors operating submerged beneath a mass of feed in said casing, said transverse conveyors having vanes consisting of peripheral ribbons supported in spaced relation from the shafts of said conveyors, and the upper of said transverse conveyors being provided with radial mixing blades extending radially beyond the vane of said conveyor.

2. Mixer for feeds and the like comprising a casing, transverse screw conveyors at different levels below the depth of feed within said casing, the lower of said conveyors being close to the bottom of said casing, an upstanding conveyor extending from the lower to the upper of said transverse conveyor, closely adjacent thereto at intermediate points in the length of said transverse conveyors, the vanes of each of said transverse conveyors being oppositely twisted on opposite sides of said intermediate points, means for driving said transverse conveyors in such directions that the lower of said conveyors conveys feed from both ends to the intermediate point while the upper of said conveyors conveys feed from the intermediate point to both ends, means for driving said upstanding conveyor to convey feed in an upward direction, and means for admitting feed constituents to said casing, said conveyors operating submerged beneath the mass of feed within said casing.

3. Mixer for feeds and the like comprising a casing, transverse screw conveyors at different levels below the depth of feed within said casing, the lower of said conveyors being close to the bottom of said casing, said casing being con-

vergently narrow toward the bottom to a width substantially equal to the diameter of said lower conveyor, an upstanding conveyor extending from the lower to the upper of said transverse conveyors, closely adjacent thereto at intermediate points in the length of said transverse conveyors, the vanes of each of said transverse conveyors being oppositely twisted on opposite sides of said intermediate points, means for driving said transverse conveyors in such directions that the lower of said conveyors conveys feed from both ends to the intermediate point while the upper of said conveyors conveys feed from the intermediate point to both ends, means for driving said upstanding conveyor to convey feed in an upward direction, and means for admitting feed constituents to said casing, said conveyors operating submerged beneath the mass of feed within said casing.

4. Mixer for feeds and the like comprising a casing, transverse screw conveyors at different levels below the depth of feed within said casing, the lower of said conveyors being close to the bottom of said casing, said casing being convergently narrow toward the bottom to a width substantially equal to the diameter of said lower conveyor, an upstanding conveyor extending from the lower to the upper of said transverse conveyor, closely adjacent thereto at intermediate points in the length of said transverse conveyors, the vanes of each of said transverse conveyors being oppositely twisted on opposite sides of said intermediate points, means for driving said transverse conveyors in such directions that the lower of said conveyors conveys feed from both ends to the intermediate point while the upper of said conveyors conveys feed from the intermediate point to both ends, means for driving said upstanding conveyor to convey feed in an upward direction, and means for admitting feed constituents to said casing, said conveyors operating submerged beneath the mass of feed within said casing, said transverse conveyors having vanes consisting of peripheral ribbons supported in spaced relation from the shafts of said conveyors, and the upper of said transverse conveyor being provided with radial mixing blades extending beyond the vane of said conveyor.

5. Mixer for feeds and the like comprising a casing, transverse screw conveyors at different levels below the normal depth of feed within said casing having their axes in the medial longitudinal vertical plane through the ends of said casing, the lower conveyor being at the bottom of said casing, said casing being convergently narrow toward the bottom to a width substantially equal to the diameter of said lower conveyor, an upstanding conveyor extending from the bottom of said casing to the upper of said transverse conveyors closely adjacent to both of said transverse conveyors at intermediate points in their length, the vanes of each of said transverse conveyors being oppositely twisted on opposite sides of said intermediate points, means for driving said transverse conveyors in such directions that the lower of said conveyors conveys feed from both ends to said upstanding conveyor while the upper of said conveyors conveys feed from said upstanding conveyor to both ends, means for driving said upstanding conveyor to convey feed in an upward direction, said casing being formed with a well on one side of the lower transverse conveyor to receive the lower portion of said upstanding conveyor, and with a discharge gate on the other side opposite said well, and means for admitting feed constituents to said casing.

6. Mixer for feeds and the like comprising a casing, transverse screw conveyors at different levels below the normal depth of feed within said casing having their axes in the medial longitudinal vertical plane through the ends of said casing, the lower conveyor being at the bottom of said casing, said casing being convergently narrow toward the bottom to a width substantially equal to the diameter of said lower conveyor, an upstanding conveyor extending from the bottom of said casing to the upper of said transverse conveyors closely adjacent to both of said transverse conveyors at intermediate points in their length, the vanes of each of said transverse conveyors being oppositely twisted on opposite sides of said intermediate points, said vanes consisting of peripheral ribbons supported in spaced relation to the shafts of said transverse conveyors, the upper of said transverse conveyors being provided with radial mixing blades extending beyond the vane of said conveyor, means for driving said transverse conveyors in such directions that the lower of said conveyors conveys feed from both ends to said upstanding conveyor while the upper of said conveyors conveys feed from said upstanding conveyor to both ends, means for driving said upstanding conveyor to convey feed in an upward direction, said casing being formed with a well on one side of the lower transverse conveyor to receive the lower portion of said upstanding conveyor, and with a discharge gate on the other side opposite said well, and means for admitting feed constituents to said casing in the vicinity of an end of said lower transverse conveyors.

7. Mixer for feeds and the like comprising a casing and conveyor means therein adapted to operate submerged beneath a mass of feed for producing circuitous movement of feed in an upward column through said mass, outwardly through said mass from the top of said upward column and inwardly through said mass toward the base of said upward column, said means comprising a vertical screw conveyor driven to convey upwardly, and upper and lower horizontal screw conveyors having an end of each respectively adjacent the upper and lower ends of said vertical conveyor, said upper conveyor being driven to convey away from said vertical conveyor and said lower conveyor being driven to convey toward said vertical conveyor, said vertical and horizontal conveyors being uncased whereby they may receive and discharge feed through out their linear extent.

JOSEPH STANLEY HERR.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
490,611	Miller	Jan. 24, 1893
1,616,547	Pontoppidan	Feb. 8, 1927
1,632,975	Kempter	June 21, 1927
1,720,360	Haines	July 9, 1929
1,721,553	Haines	July 23, 1929
1,880,284	Schenk	Oct. 4, 1932
2,177,910	Smit	Oct. 31, 1939

FOREIGN PATENTS

Number	Country	Date
583,654	Great Britain	Dec. 23, 1946