



PATENT SPECIFICATION

DRAWINGS ATTACHED

Inventor: SHIGEMOTO TAGUCHI

1012,436

Date of Application and filing Complete Specification Nov. 22, 1961.

No. 41845/61.

Complete Specification Published Dec. 8, 1965.

© Crown Copyright 1965.



1012,436

Index at acceptance:—B2 H(22J, 33B1, 33B2, 33B7, 33B14)

Int. Cl.:—B 02 f

COMPLETE SPECIFICATION

A Grain Classifying Device

We, KYOWA NOKI COMPANY LIMITED, a body corporate, organized under the laws of Japan, of 203-banchi, Satokaida, Nankoku-shi, Kochi Prefecture, Japan, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to devices for classifying and separating a mixture of unhulled grain, dehulled grain, and earth and sand into its constituents.

The invention provides a grain-classifying device which comprises an inclined grain-classifying board freely movably mounted on support means for movement in a straight line which is inclined to the horizontal and which lies in a vertical plane transverse to the vertical plane containing the direction of inclination of the grain-classifying device, means for preventing grain from leaving the side edges of the said board, and oscillatory means arranged to oscillate the grain-classifying board along the said straight line.

When a mixture of unhulled and dehulled grain together with any earth or sand of low specific gravity is permitted to flow down the board, the different properties of the constituents of the mixture allow them to be separated by the oscillatory movement of the grain-classifying board.

A grain-classifying device constructed in accordance with the invention will now be described in greater detail by way of example with reference to the accompanying drawings, in which:

Figure 1 is an isometric view of the device showing the inclined grain-classifying board;

Figure 2 is a side elevation of the device shown in Figure 1;

Figure 3 is a front elevation of the device;

Figure 4 is a front view of the grain outlets;

Figures 5—8 are cross-sectional views taken along the lines A—A, B—B, C—C, D—D respectively of Figure 2 and showing the device in operation; and

Figure 9 is a diagrammatic view of the device from above showing it in operation.

Referring to Figure 1 the grain-classifying device has three grain-classifying boards 3, 3¹ 3¹¹. These boards are parallel to one another and are inclined to the horizontal. A collision plate 1 joins the three classifying boards 3, 3¹ 3¹¹ on one side and a stopper-frame 2 joins them on the opposite side. The three classifying boards 3, 3¹ 3¹¹ are supported on two plates 4 situated under the lower classifying board 3¹¹ which extend across the classifying device, one at the upper end and one at the lower end. A hopper 6 is attached to the upper ends of the three classifying boards 3, 3¹ 3¹¹, and is arranged in operation to feed mixed grain into the three boards 3, 3¹ 3¹¹ from a feed tank 7 mounted on the hopper 6. An under-frame 8 carries two rails 9, one under each plate 4 and these rails 9 are parallel to one another and are inclined upwardly towards the collision plate 1. They each lie in a vertical plane which is at right angles to a vertical plane containing the direction of inclination of the board 1, that is, a line of maximum slope of the board. Each of the plates 4 carries a pair of freely rotatable rollers 5 which rest on the guide rail 9 beneath it. A shaft 11 is journaled in bearings 10 mounted on the under-frame 8 and carries fixed to it an eccentrically mounted guide roller 12. A ring 14 fits slidably around the guide roller 12 and is fixed to the end of a connecting rod 15 the other end of which is connected to an extension 16 fixed to the

diagrammatic

[Price 4s. 6d.]

underside of the lower classification board 3¹¹. The shaft 11 carries a pulley 13 which is driven by a belt to cause the shaft 11 to rotate. Each classifying board is provided with a grain-classification promotion plate 17 which is inclined upwardly relative to the remainder of the board and meets it along a line extending from a point on the lower edge to a point on the inclined side by the collision plate 1. At the sides of the lower edge of the classifying boards 3, 3¹ and 3¹¹ there are provided two plates 19 which project forwards and which are attached to the plate 8 and held together by a cross-bar 20. The cross-bar 20 carries a mixed grain discharge outlet 21 in the form of an open chute. A threaded rod 22 passes through the plates 19 and can be rotated by a handle 28. It carries a pair of internally threaded nuts 24 to which is fixed a dehulled grain outlet 26, and rotation of the rod 22 causes the position of the outlet 26 to be altered. The outlet 26, which is normally positioned on the same side of the device as the collision plate 1, consists of an upper guard-piece which is open towards the device and collects grain flowing over the lower edge of each of the boards 3, 3¹ and 3¹¹, and a lower funnel through which the grain is discharged. A similar unhulled grain outlet 27 is normally positioned on the other side of the device and has fixed to it two nuts 25 which are carried by a threaded rod 23 which also passes through the plates 19, and which can be rotated by a handle 29. The mixed grain outlet 21 discharges all the grain which flows over the lower edges of the boards 3, 3¹ and 3¹¹ between the outlets 26 and 27. In operation, the pulley 13 is driven, and the resulting motion of the eccentric roller 12 drives the grain-classifying boards 3, 3¹ and 3¹¹ up and down the rails 9. At the same time a mixture of unhulled and dehulled grain, together with any remaining earth or sand, is fed from the hopper 6, which is situated at the upper end of the classifying boards 3, 3¹ and 3¹¹ and feeds onto all three of them. It is found that the motion of the board is such as to cause the grain to move towards the side of the classifying boards 3, 3¹ and 3¹¹ nearer the upper end of the rails 9, striking the collision plate 1. Also, because of the difference in specific gravity and in smoothness of surface between the unhulled and the dehulled grain, the grain tends to separate into two layers with the denser, smoother dehulled grain beneath and the less dense, rougher unhulled grain above. As the grain flows down the boards 3, 3¹ and 3¹¹ the lower layer becomes thicker towards the collision plate and the upper layer tends to move down the inclined surface thus formed towards the same side of the device as the stopper-frame 2. This movement of the unhulled grain is assisted by the provision of the grain-classification promotion plate 17, which has itself an inclined

surface. The steps of the classification are shown in Figures 5, 6 and 7.

At the bottom edge of the boards 3, 3¹ and 3¹¹ the unhulled grain is on the right of the device as seen in Figure 8 and discharges into the unhulled grain outlet 27, and the dehulled grain is on the left hand side of the device as seen in Figure 8 and discharges into the dehulled grain outlet 26. Between the separated streams of unhulled and dehulled grain there is a mixed region where the components are not completely separated. This mixed grain falls into the mixed-grain outlet 21.

The positions of the dehulled and unhulled grain outlets 26 and 27 are adjusted, depending on the particular mixture fed, by the handles 28 and 29 so that each of them collects as much as possible of its component without there resulting the introduction into it of the other component.

Earth or sand introduced from the hopper with the mixed grain is usually of low specific gravity and is classified by the device with the unhulled grain.

In order to assist the classification the surface of the board may be roughened. The dehulled grain outlet 26 may be provided at its end with a trap door which can be shut if the classification does not result in the unhulled grain being completely removed from the dehulled grain; when the lower funnel part of the outlet 26 is filled the grain falls into the mixed grain outlet 21, which extends sufficiently far under the other two outlets 26 and 27 to catch grain overflowing from them. The device may be suitably modified to allow the grain outlets 21, 26 and 27 to be oscillated in unison with the rest of the device.

WHAT WE CLAIM IS:—

1. A grain-classifying device which comprises an inclined grain-classifying board freely movably mounted on support means for movement in a straight line which is inclined to the horizontal and which lies in a vertical plane transverse to the vertical plane containing the direction of inclination of the grain-classifying device, means for preventing grain from leaving the side edges of the said board, and oscillatory means arranged to oscillate the grain-classifying board along the said straight line.

2. A grain-classifying device as claimed in claim 1, in which the support means are inclined rails on which the said board is supported by rollers, and the oscillatory means comprise a connecting rod connecting the said board to a ring mounted for eccentric motion.

3. A grain-classifying device as claimed in claim 1 or claim 2, in which the said board is provided with a plate whose surface is inclined relative to the surface of the remainder of the said board and meets it along a line which extends from a point on the lower edge of the board to a point on that inclined side edge of the board which

underside of the lower classification board 3¹¹. The shaft 11 carries a pulley 13 which is driven by a belt to cause the shaft 11 to rotate. Each classifying board is provided with a grain-classification promotion plate 17 which is inclined upwardly relative to the remainder of the board and meets it along a line extending from a point on the lower edge to a point on the inclined side by the collision plate 1. At the sides of the lower edge of the classifying boards 3, 3¹ and 3¹¹ there are provided two plates 19 which project forwards and which are attached to the plate 8 and held together by a cross-bar 20. The cross-bar 20 carries a mixed grain discharge outlet 21 in the form of an open chute. A threaded rod 22 passes through the plates 19 and can be rotated by a handle 28. It carries a pair of internally threaded nuts 24 to which is fixed a dehulled grain outlet 26, and rotation of the rod 22 causes the position of the outlet 26 to be altered. The outlet 26, which is normally positioned on the same side of the device as the collision plate 1, consists of an upper guard-piece which is open towards the device and collects grain flowing over the lower edge of each of the boards 3, 3¹ and 3¹¹, and a lower funnel through which the grain is discharged. A similar unhulled grain outlet 27 is normally positioned on the other side of the device and has fixed to it two nuts 25 which are carried by a threaded rod 23 which also passes through the plates 19, and which can be rotated by a handle 29. The mixed grain outlet 21 discharges all the grain which flows over the lower edges of the boards 3, 3¹ and 3¹¹ between the outlets 26 and 27.

In operation, the pulley 13 is driven, and the resulting motion of the eccentric roller 12 drives the grain-classifying boards 3, 3¹ and 3¹¹ up and down the rails 9. At the same time a mixture of unhulled and dehulled grain, together with any remaining earth or sand, is fed from the hopper 6, which is situated at the upper end of the classifying boards 3, 3¹ and 3¹¹ and feeds onto all three of them. It is found that the motion of the board is such as to cause the grain to move towards the side of the classifying boards 3, 3¹ and 3¹¹ nearer the upper end of the rails 9, striking the collision plate 1. Also, because of the difference in specific gravity and in smoothness of surface between the unhulled and the dehulled grain, the grain tends to separate into two layers with the denser, smoother dehulled grain beneath and the less dense, rougher unhulled grain above. As the grain flows down the boards 3, 3¹ and 3¹¹ the lower layer becomes thicker towards the collision plate and the upper layer tends to move down the inclined surface thus formed towards the same side of the device as the stopper-frame 2. This movement of the unhulled grain is assisted by the provision of the grain-classification promotion plate 17, which has itself an inclined

surface. The steps of the classification are shown in Figures 5, 6 and 7.

At the bottom edge of the boards 3, 3¹ and 3¹¹ the unhulled grain is on the right of the device as seen in Figure 8 and discharges into the unhulled grain outlet 27, and the dehulled grain is on the left hand side of the device as seen in Figure 8 and discharges into the dehulled grain outlet 26. Between the separated streams of unhulled and dehulled grain there is a mixed region where the components are not completely separated. This mixed grain falls into the mixed-grain outlet 21.

The positions of the dehulled and unhulled grain outlets 26 and 27 are adjusted, depending on the particular mixture fed, by the handles 28 and 29 so that each of them collects as much as possible of its component without there resulting the introduction into it of the other component.

Earth or sand introduced from the hopper with the mixed grain is usually of low specific gravity and is classified by the device with the unhulled grain.

In order to assist the classification the surface of the board may be roughened. The dehulled grain outlet 26 may be provided at its end with a trap door which can be shut if the classification does not result in the unhulled grain being completely removed from the dehulled grain; when the lower funnel part of the outlet 26 is filled the grain falls into the mixed grain outlet 21, which extends sufficiently far under the other two outlets 26 and 27 to catch grain overflowing from them. The device may be suitably modified to allow the grain outlets 21, 26 and 27 to be oscillated in unison with the rest of the device.

WHAT WE CLAIM IS:—

1. A grain-classifying device which comprises an inclined grain-classifying board freely movably mounted on support means for movement in a straight line which is inclined to the horizontal and which lies in a vertical plane transverse to the vertical plane containing the direction of inclination of the grain-classifying device, means for preventing grain from leaving the side edges of the said board, and oscillatory means arranged to oscillate the grain-classifying board along the said straight line.

2. A grain-classifying device as claimed in claim 1, in which the support means are inclined rails on which the said board is supported by rollers, and the oscillatory means comprise a connecting rod connecting the said board to a ring mounted for eccentric motion.

3. A grain-classifying device as claimed in claim 1 or claim 2, in which the said board is provided with a plate whose surface is inclined relative to the surface of the remainder of the said board and meets it along a line which extends from a point on the lower edge of the board to a point on that inclined side edge of the board which



is nearer the upper end of the said straight line, the arrangement being such that grain flowing down the said board can flow over the said plate.

- 5 4. A grain-classifying device as claimed in any one of the preceding claims in which at the lower edge of the said board there are provided outlets, a first arranged to receive grain flowing over the lower edge at one side thereof, a second arranged to receive grain flowing over the said lower edge at the other side thereof, and a third arranged to receive grain flowing over the said lower edge between the first and second outlets, the positions of
10
15 the first outlet and of the second outlet being

adjustable relative to the inclined sides of the said board.

5. A grain-classifying device as claimed in claim 4, in which there is provided a plurality of grain-classifying boards mounted on a common frame and there is provided only a single one of each of the said outlets. 20

6. A grain-classifying device substantially as hereinbefore described with reference to and as shown in the accompanying drawings. 25

ABEL & IMRAY,
Chartered Patent Agents,
Quality House, Quality Court,
Chancery Lane, London, W.C.2. *AI*

Leamington Spa: Printed for Her Majesty's Stationery Office by the Courier Press.—1965.

Published at The Patent Office, 25, Southampton Buildings, London, W.C.2, from which copies may be obtained.



* C L M S *