Jan. 26, 1960 F. E. BARBEE 2,922,450

DEVICE FOR SCOURING RICE AND THE LIKE

Filed Feb. 23, 1956 2 Sheets-Sheet 1

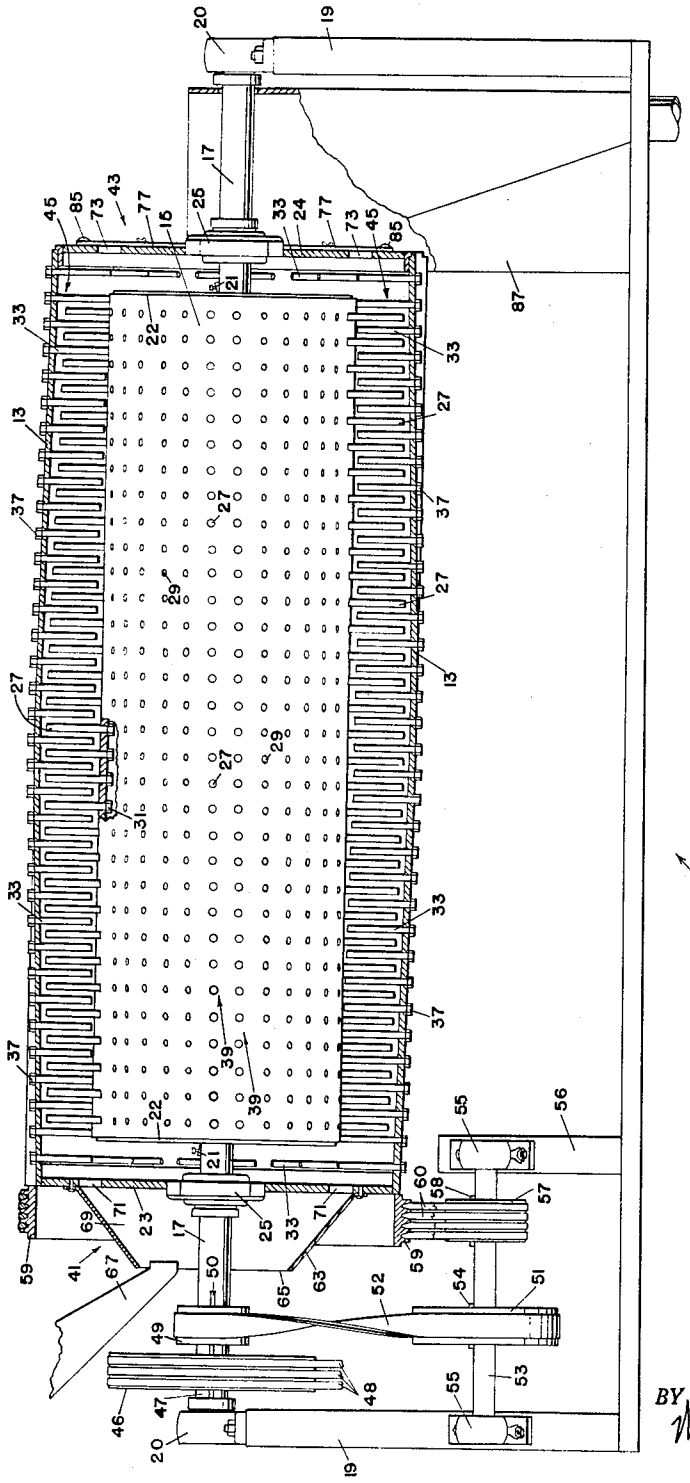


FIG. 1.

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Filed Feb. 23, 1956 2 Sheets-Sheet 2

FIG. 2.

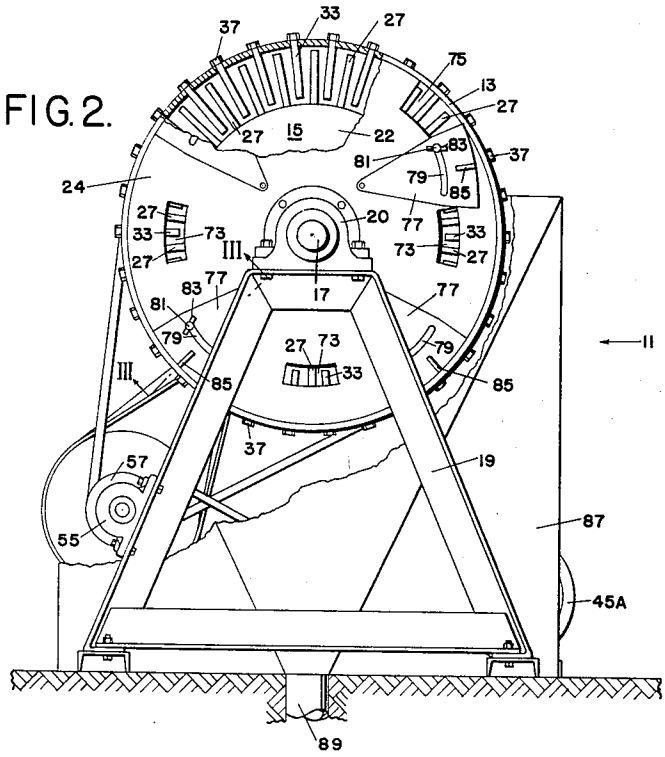


FIG. 5.

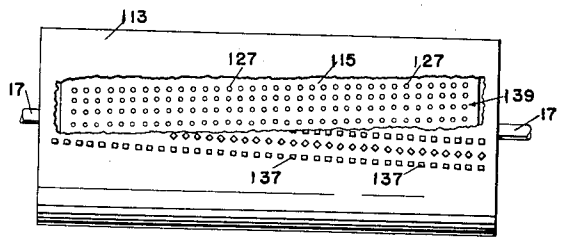
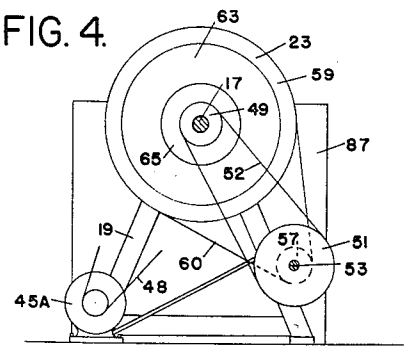


FIG. 4.



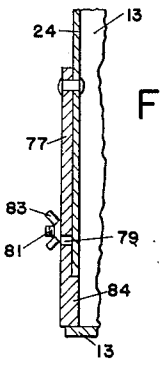


FIG. 3.

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2,922,450

DEVICE FOR SCOURING RICE AND THE LIKE

Fred E. Barbee, Beaumont, Tex.

Application February 23, 1956, Serial No. 567,341

4 Claims. (Cl. 146—295)

This invention relates to device for scouring rice and the like. More particularly, it relates to a device for removing the bran from brown rice and the like by friction. It is contemplated in the present invention that a device be provided which by its unique structure and operation efficiently effects removal of the bran from the rice and yet eliminates excessive grain breakage heretofore encountered in other types of rice debranning devices.

It is further contemplated that such a structure be provided including means effecting movement of the rice through the device in one direction and opposing means attempting to effect movement in the opposite direction but at a slower speed whereby the combined action of the means is effective to move the rice through the device from end to end and at the same time is effective to create great turbulence and agitation of the rice grains which greatly enhances the frictional contact of the grains with one another and with the pins to effect removal of the bran during such movement without causing breakage of the grains.

It is further contemplated that such a means be provided wherein an inner cylinder oppositely rotates within a rotating outer cylinder with said cylinders being provided with radially projecting pins so arranged in relation to one another and to the cylinders that an efficient scouring operation heretofore not possible is performed.

The principal object of the present invention is to provide an efficient means for frictionally removing the bran from rice and the like.

A further object is to provide such means including an inner drum having outwardly disposed pins projecting from the outer surface thereof, and an outer drum having inwardly disposed pins inwardly projecting from the inner surface thereof, said inwardly projecting pins and outwardly projecting pins being overlapped and spaced from the opposed drum and being disposed in longitudinally spiralled series or sets.

A further object is to provide such inner and outer drums with such pins and to oppositely rotate the drums at a speed differential whereby the rice will be moved from one end of the cylinders to the other end between the cylinders under the influence of the outwardly projecting pins with said movement being opposed but not overcome by the action of the inwardly projecting pins to effect a combined action characterized by great turbulence and agitation which efficiently scours the rice.

A further object is to dispose such pins in such a spaced relationship that the rice is scoured efficiently and yet the breakage of the rice is eliminated.

A further object is generally to improve the design of devices for scouring rice and the like.

The means by which the foregoing and other objects of the present invention are accomplished and the manner of their accomplishment will be readily understood from the following specification upon reference to the accompanying drawings, in which:

Fig. 1 is a partly sectionalized side elevational view of the device of the present invention, with the front portion

of the outer cylinder being broken away from a line extending along a top row or series of spirally disposed pins to a line extending along a bottom row of spirally disposed pins and with some of the pins removed for purposes of illustration.

Fig. 2 is an end view of the same with parts broken away for purposes of illustration.

Fig. 3 is a fragmentary sectional view taken as on the line III—III of Fig. 2.

Fig. 4 is a diagrammatic end view illustrating an alternate form of the present invention, parts being broken away for purposes of illustration.

Fig. 5 is a diagrammatic side view of the device of Fig. 4, parts being broken away for purposes of illustration.

Referring now to the drawings in which the various parts are indicated by numerals, the scouring device **11** of the present invention comprises, in general, a hollow outer cylinder **13** and an inner cylinder **15** mounted within the outer cylinder and concentric therewith. Cylinders **13, 15** are preferably substantially cylindrical as illustrated in the drawings notwithstanding the optical illusion to the contrary which appears in Fig. 1, it being understood that such an illusion is created by the breaking away, for purposes of illustration, of the front portion of outer cylinder **13** from a line extending along a top row or series of spirally disposed pins to a line extending along a bottom row of spirally disposed pins.

Inner cylinder **15** is somewhat smaller than outer cylinder **13** whereby an annular space is formed therebetween. Inner cylinder **15** is mounted on a shaft **17** extending axially of the cylinder and beyond the opposite ends thereof. The opposite ends of shaft **17** are respectively rotatably supported from standards **19** by means of bearings **20.** Inner cylinder **15** is keyed to shaft **17** as by means of keys **21,** whereby rotation of the shaft will effect rotation of the inner cylinder. Outer cylinder **13** is preferably somewhat longer than inner cylinder **15** whereby the opposite ends **22** of inner cylinder **15** are respectively spaced inwardly from the entrance end **23** and exit end **24** of outer cylinder **13.** Outer cylinder **13** is rotatably supported from shaft **17** by means of bearings **25** provided in the opposite ends of the cylinder, whereby outer cylinder **13** may rotate relative to inner cylinder **15.**

A plurality of pins **27** project radially outwardly from the outer surface of inner cylinder **15.** Pins **27** may be secured to inner cylinder **15** as by extending the inner ends of the pins through apertures **29** provided in inner cylinder **15** and securing the pins therein as by means of nuts **31** threadedly engaged on threading provided on the inner ends of the pins. The distal ends of pins **27** are spaced from the inner surface of outer cylinder **13.**

A plurality of additional radially extending pins **33** project inwardly from the inner surface of outer cylinder **13.** Pins **33** may be secured to outer cylinder **13** as by means of the pins extending through apertures provided in the outer cylinder and being anchored therein by means of nuts **37** threadedly engaging threading provided on the ends of pins **33.** The distal ends of pins **33** are spaced from inner cylinder **15.**

The pins **27, 33** are so disposed and cylinders **13, 15** so rotated that rice or the like interposed between the cylinders is adapted to be moved from one end of the cylinders to the other by the action of one of the sets of pins, either pins **27** or **33,** and the action by the other set of pins is adapted to resist such movement. By this combination of movement in one direction and resistive or back flow movement in the other direction such an effective action is set up in the scouring device which is characterized by considerable turbulence and agitation that the grains of rice frictionally engage the pins and other grains of rice to efficiently remove the bran from the rice as it is being moved from one

end of the cylinder to the other. This novel action accomplished by the scouring device of the present invention, while being effective to remove the bran from the rice, does not damage the grains of rice as have previous scouring devices heretofore used. It will be understood that various combinations of pin disposition and direction of rotation of cylinders may be employed to effect the above-mentioned forward movement and back flow movement without departing from the spirit and scope of the present invention.

In the preferred disposition of pins **27** on inner cylinder **15**, the pins are disposed in a plurality of longitudinally extending series, two of such series being shown in Fig. 1 wherein each is designated as at **39**. Other of pins **27** on the front side of cylinder **15** have been removed in Fig. 1 for the sake of clarity. Each of series **39** forms a spirally disposed line shown as twisted in a counter-clockwise direction as viewed from the entrance end **41** of the scouring device **11**. Corresponding pins of the plurality of series **39** are disposed in a circular path perpendicular to shaft **17**. From the foregoing it will be understood that pins **27** are disposed in a plurality of spaced circular patterns extending from one end of the drum to the other and at the same time being disposed in a plurality of longitudinally and spirally extending series.

In the preferred embodiment, inner cylinder **15** is rotated clockwise as viewed from entrance end **41** whereby rice interposed between inner cylinder **15** and outer cylinder **13** will be moved by the spiral effect of pins **27** on the rice from entrance end **41** towards the exit end **43** of the scouring device. It will be understood that the direction of spiral and direction of rotation of inner cylinder **15** may be opposite to that hereinabove described and yet produce the same direction of movement of the rice. Thus pins **27** may be disposed in a clockwise direction and inner cylinder **15** rotated in a counter-clockwise direction as viewed from the entrance end **41**.

Pins **33** are preferably disposed similar to pins **27**, that is, with the pins being disposed in a plurality of longitudinally extending series **45**, and each of the series forming a spirally disposed line having the same pitch as series **39** and extending in a counter clockwise direction as viewed from the entrance end **41**. This counter-clockwise disposition is best shown in Fig. 1. With the above disposition of pins **33**, cylinder **13** is preferably rotated oppositely from cylinder **15**, that is, in a counter-clockwise direction as viewed from entrance end **41**.

It will be understood that with this combination of disposition of pins **33** and rotation of outer cylinder **13**, pins **33** will exert a force towards entrance end **41** on the rice interposed between cylinders **13**, **15**, resisting passage of the rice toward the exit end and turbulently agitating the rice in the device. It will be understood that this same movement may be accomplished by disposing pins **33** in a spiral disposition opposite to that hereinabove described, and by rotating outer cylinder **13** in a clockwise direction.

Outer cylinder **13** is preferably rotated at a speed slower than the speed of inner cylinder **15**, whereby the longitudinal force exerted on the rice by pins **27** will be greater than the opposite force exerted on the rice by pins **33** whereby the combination of these two forces will move the rice from the entrance end **41** to the exit end **43** and at the same time cause effective frictional engagement of the grains of rice with one another and with the pins. It will be understood that other speeds of cylinders **13**, **15** may be employed without departing from the spirit and scope of the present invention. Cylinders **13**, **15** are preferably slightly inclined downwardly towards exit end **43**, as best illustrated in Fig. **1**, whereby to assist the rice in its movement towards the exit end.

Pins **27** preferably radially overlap pins **33**, that is, the circular paths in which pins **27** travel will be interposed between the circular paths in which pins **33** travel. Pins **27**, **33** extend into adjacency with their opposing cylinders, the ends of the pins being respectively spaced from the opposing cylinders by the same amount. Additionally, pins **27** and pins **33** are preferably cylindrical and of the same diameter, with this diameter preferably being the same as the lateral spacing between pins **27** and **33** and the same as the spacing between the distal ends of the pins and the opposing cylinders. Additionally, the above-mentioned diameter and spacings are preferably greater than the maximum dimension of the grains of rice or the like which the scouring device **11** is designed to accommodate. Thus, the spacings between the pins and the opposing cylinders give freedom of movement of the grains. An extra row of pins **33** may be respectively provided adjacent the entrance end **41** and the exit end **43** for agitating the rice to keep it free and loose for entrance into the scouring zone and for discharge from the device after scouring.

The means for rotating cylinders **13**, **15** may comprise suitable drive means, as for example a motor, **45A**, may be coupled to a pulley **46** which is fixedly mounted on shaft **17** as by key means **47**. The coupling of said motor to pulley **46** may be by means of V-belts **48** whereby the motor is effective to rotate shaft **17** and consequently to rotate inner cylinder **15** in the same direction since it is keyed thereto. A second pulley **49** is fixedly mounted on shaft **17**, as by a key **50**, and is coupled to a pulley **51** by means of a belt **52** crossed or reversed for opposite rotation of pulley **51** relative to pulley **49**. Pulley **51** is fixedly mounted on an auxiliary shaft **53** as by means of a key **54**, shaft **53** being rotatably supported at its ends as by bearings **55** respectively attached to standard **19** and an auxiliary standard **56**. A pulley **57** is fixedly mounted on auxiliary shaft **53** as by means of a key **58**. Pulley **57** is coupled to an annular pulley **59** as by means of V-belts **60**. Annular pulley **59** is fixedly mounted on cylinder **13** adjacent the outer periphery of entrance end **23** of outer cylinder **13**, whereby rotation of shaft **53** is effective through belts **60** to rotate cylinder **13**. Pulley **49** is preferably smaller than pulley **51** to provide for a speed reduction of shaft **53** relative to shaft **17**, and pulley **57** is preferably smaller than pulley **59** to provide speed reduction from shaft **53** to annular pulley **59**.

In the preferred embodiment illustrated in Figs. **1** and **2** wherein belt **52** is crossed, it will be understood that cylinders **13**, **15** will be oppositely rotated with cylinder **13** being rotated slower than cylinder **15**, but it will be understood that belt **52** may be uncrossed as illustrated diagrammatically in Fig. **4** to rotate shaft **53** in the same direction as shaft **17** thereby rotating cylinders **113**, **115** in the same direction. In this alternate embodiment, wherein cylinders **113**, **115** are rotated in the same direction, the direction of spiral of the pins carried by the respective cylinders **113**, **115** will be opposite, that is, one of the sets of pins being disposed clockwise and the other set **139** being disposed counter-clockwise as illustrated diagrammatically in Fig. **5** wherein it will be seen pins **127** are disposed counter-clockwise and pins similar to pins **33** and mounted by nuts **137** similar to the pin mounting by nuts **37** are disposed clockwise as viewed from entrance end **41**.

Means are provided for delivering the rice to the entrance end **41** of the scouring device **11** which may comprise a frusto-conical casing **63** attached to entrance end **23** of cylinder **13**. Casing **63** is provided with a central opening **65** adjacent the apex thereof and is adapted to to receive a spout **67** which projects into the entrance chamber **69** defined by conical casing **63**. Entrance chamber **69** is communicated with the space between cylinders **13**, **15** by means of openings **71** provided in entrance end **23**. Thus the rice will enter the scouring device **11** by the means herein described and will travel

between cylinders 13, 15 from the entrance end thereof to the exit end thereof.

A plurality of openings 73 are provided in exit end 24 of outer cylinder 13 whereby exit means is provided for discharge of the rice from the scouring device. Additionally, a plurality of access openings 75 are provided in exit end 24, said access openings being provided adjacent the outer periphery of the exit end whereby means is provided for gaining access to pins 27, 33 (or the pins 127 and the pins mounted by nuts 137) as for the cleaning thereof. Closure plates 77 are respectively pivotally mounted on exit end 24 and adapted to respectively slide across access openings 75 to close or open the openings. Closure plates 77 may be respectively provided with elongated slots 79 through which extends threaded studs 81 secured to exit end 24. Butterfly nuts 83 threadedly engage studs 81 and engage the outward face of closure plates 77 whereby the closure plates may be anchored in the desired position. A projection 84 may be attached to the inner side of each of closure plates 77 adjacent its lower edge. Projection 84 may comprise a metal plate attached as by welding to plate 77 or may be formed integrally therewith. Each of projections 84 projects substantially perpendicularly inwardly from its related plate and is of a size to project into and fit closely into an adjacent access opening 75 when the access opening is outwardly closed by said closure plate, so that the access opening is also effectively peripherally sealed or plugged by projection 84 to prevent rice from escaping therethrough, and the plate is additionally held against accidental swinging movement. A thumb grip extension 85 may be provided on each of closures 77 to facilitate the positioning thereof.

A hopper 87 or the like may be disposed to underlie exit end 24 whereby means is provided for receiving the grain discharged from openings 73. If desired, a conduit 89 may be provided at the bottom of hopper 87 to convey the rice to the desired point of delivery.

From the foregoing description it will be apparent that novel means is provided for removing the bran from brown rice and the like by causing frictional engagement of the grains of rice with one another and with the pins in the scouring device of the present invention whereby the bran is removed without damage to the rice grains. Such frictional engagement of the grains of rice is accomplished through the unique structure and disposition of the cylinders, the arrangement of the pins and the related structure, whereby a unique action is imparted to the grains of rice to accomplish efficient scouring of the grains heretofore not possible in other types of grain scouring devices.

I claim:

1. A scouring device for removing the bran from rice and the like comprising a rotatable outer cylinder having inwardly extending pins secured thereto, said inwardly extending pins being disposed in a plurality of longitudinally extending series, each of said series of inwardly extending pins forming a spirally disposed line, corresponding pins of said plurality of longitudinally extending series being disposed in a circular pattern, a rotatable inner cylinder mounted within and concentric with said outer cylinder and having outwardly extending pins secured thereto, said inner cylinder being spaced from said outer cylinder for the passage of rice and the like therebetween, said outwardly extending pins overlapping said inwardly extending pins and adapted to pass therebetween, said outwardly extending pins being disposed in a plurality of longitudinally extending series, each of said series of outwardly extending pins forming a spirally disposed line pitched the same direction as the spirally disposed line of said inwardly extending pins, corresponding pins of said longitudinally extending series of the outwardly extending pins being disposed in a circular pattern intermediate the circular pattern of said inwardly extending pins, the ends of said outwardly and said inwardly extending pins being spaced from their opposing cylinders, the distance between adjacent said inwardly extending pins and said outwardly extending pins being substantially equal to the distance between the ends of the pins and the opposing cylinders, driving means coupled to said outer cylinder and said inner cylinder for effecting rotation thereof, said outer cylinder being rotated at a slower speed and in the opposite direction from rotation of said inner cylinder whereby rice introduced at one end of the cylinders is turbulently moved between the cylinders and discharged at the other end thereof and while being so moved frictionally engages the pins and other grains of rice to remove the bran from the rice.

2. A scouring device for removing the bran from rice and the like comprising a rotatable outer cylinder having inwardly extending pins secured thereto, said inwardly extending pins being disposed in a plurality of longitudinally extending series, each of said series of inwardly extending pins forming a spirally disposed line, corresponding pins of said plurality of longitudinally extending series being disposed in a circular pattern, a rotatable inner cylinder mounted within and concentric with said outer cylinder and having outwardly extending pins secured thereto, said inner cylinder being spaced from said outer cylinder for the passage of rice and the like therebetween, said outwardly extending pins overlapping said inwardly extending pins and adapted to pass therebetween, said outwardly extending pins being disposed in a plurality of longitudinally extending series, each of said series of outwardly extending pins forming a spirally disposed line pitched in the same direction as the spirally disposed line of said inwardly extending pins, corresponding pins of said longitudinally extending series of the outwardly extending pins being disposed in a circular pattern intermediate the circular pattern of said inwardly extending pins, driving means coupled to said outer cylinder and said inner cylinder for effecting rotation thereof, said outer cylinder being rotated at a different speed and in the opposite direction from rotation of said inner cylinder whereby rice introduced at one end of the cylinders is turbulently moved between the cylinders and discharged at the other end thereof and while being so moved frictionally engages the pins and other grains of rice to remove the bran from the rice.

3. A scouring device for removing the bran from rice and the like comprising a rotatable outer cylinder having inwardly extending pins secured thereto, said inwardly extending pins being disposed in a plurality of longitudinally extending series, each of said series of inwardly extending pins forming a spirally disposed line, corresponding pins of said plurality of longitudinally extending series being disposed in a circular pattern, a rotatable inner cylinder mounted within and concentric with said outer cylinder and having outwardly extending pins secured thereto, said inner cylinder being spaced from said outer cylinder for the passage of rice and the like therebetween, said outwardly extending pins overlapping said inwardly extending pins and adapted to pass therebetween, said outwardly extending pins being disposed in a plurality of longitudinally extending series, each of said series of outwardly extending pins forming a spirally disposed line spiralled in the opposite direction from the spiral of said inwardly extending pins, corresponding pins of said longitudinally extending series of the outwardly extending pins being disposed in a circular pattern intermediate the circular pattern of said inwardly extending pins, the ends of said outwardly and said inwardly extending pins being spaced from their opposing cylinders, the distance between adjacent inwardly and outwardly extending pins being substantially equal to the distance between the ends of the pins and the opposing cylinders, driving means coupled to said outer cylinder and said inner cylinder for effecting rotation thereof, said outer cylinder being rotated at a different speed from and in

the same direction as the rotation of said inner cylinder whereby rice introduced at one end of the cylinders is turbulently moved between the cylinders and discharged at the other end thereof and while being so moved frictionally engages the pins and other grains of rice to remove the bran from the rice.

4. A scouring device for removing the bran from rice and the like comprising a rotatable outer cylinder having inwardly extending pins secured thereto, said inwardly extending pins being disposed in a plurality of longitudinally extending series, each of said series of inwardly extending pins forming a spirally disposed line, corresponding pins of said plurality of longitudinally extending series being disposed in a circular pattern, a rotatable inner cylinder mounted within and concentric with said outer cylinder and having outwardly extending pins secured thereto, said inner cylinder being spaced from said outer cylinder for the passage of rice and the like therebetween, said outwardly extending pins overlapping said inwardly extending pins and adapted to pass therebetween, said outwardly extending pins being disposed in a plurality of longitudinally extending series, each of said series of outwardly extending pins forming a spirally disposed line spiralled in the opposite direction from the spiral of said inwardly extending pins, corresponding pins of said longitudinally extending series of the outwardly extending pins being disposed in a circular pattern intermediate the circular pattern of said inwardly extending pins, the ends of said outwardly and said inwardly extending pins being spaced from their opposing cylinders, driving means coupled to said outer cylinder and said inner cylinder for effecting rotation thereof, said outer cylinder being rotated at a different speed from and in the same direction as the rotation of said inner cylinder whereby rice introduced at one end of the cylinders is turbulently moved between the cylinders and discharged at the other end thereof and while being so moved frictionally engages the pins and other grains of rice to remove the bran from the rice.

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