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H. G. HENARES

METHOD AND APPARATUS FOR EXTRACTING FIBERS FROM FIBROUS HUSKS

Filed Sept. 9, 1941

Serial No. 410,217

3 Sheets-Sheet 1

Fig. 1.

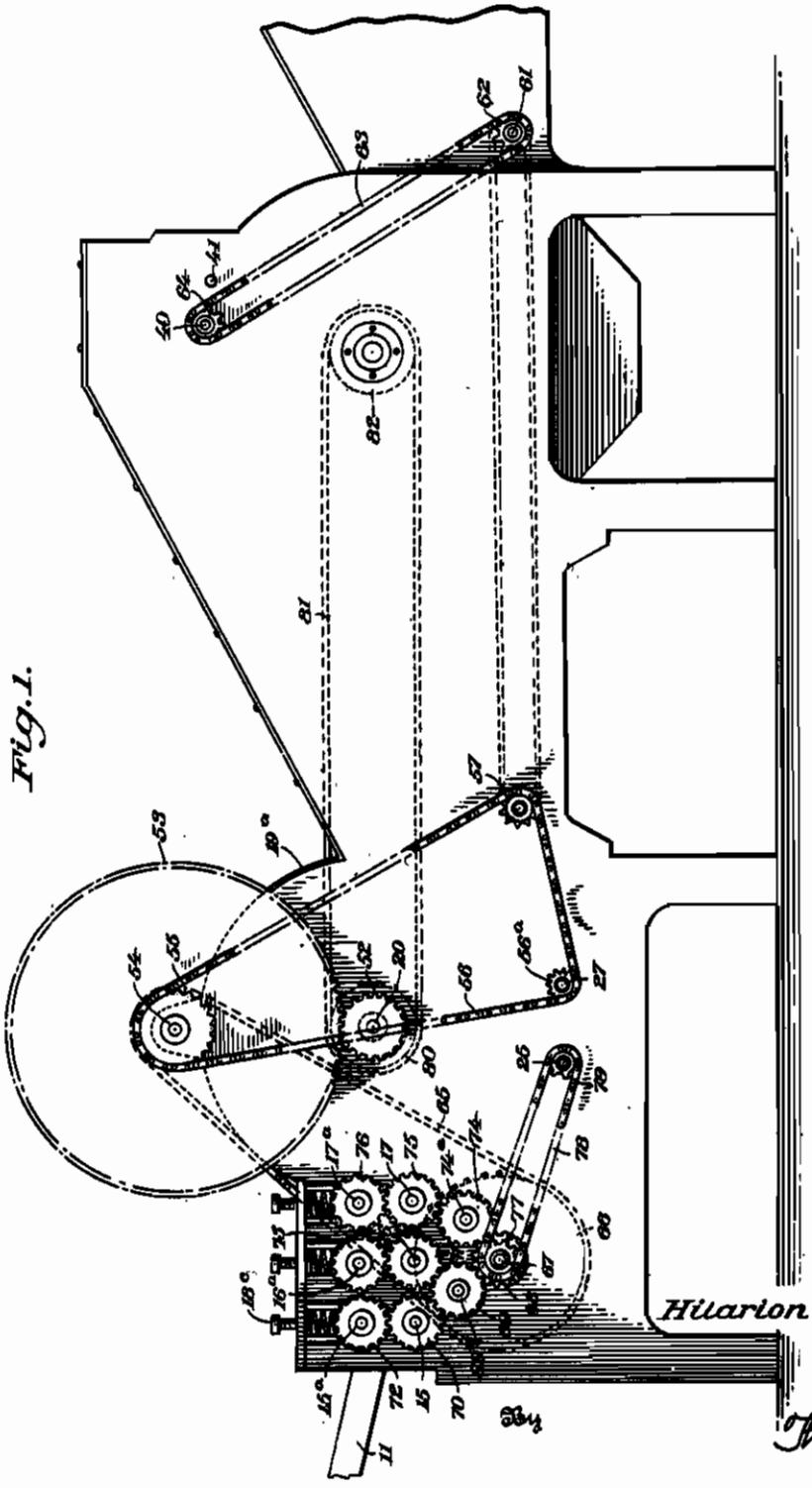

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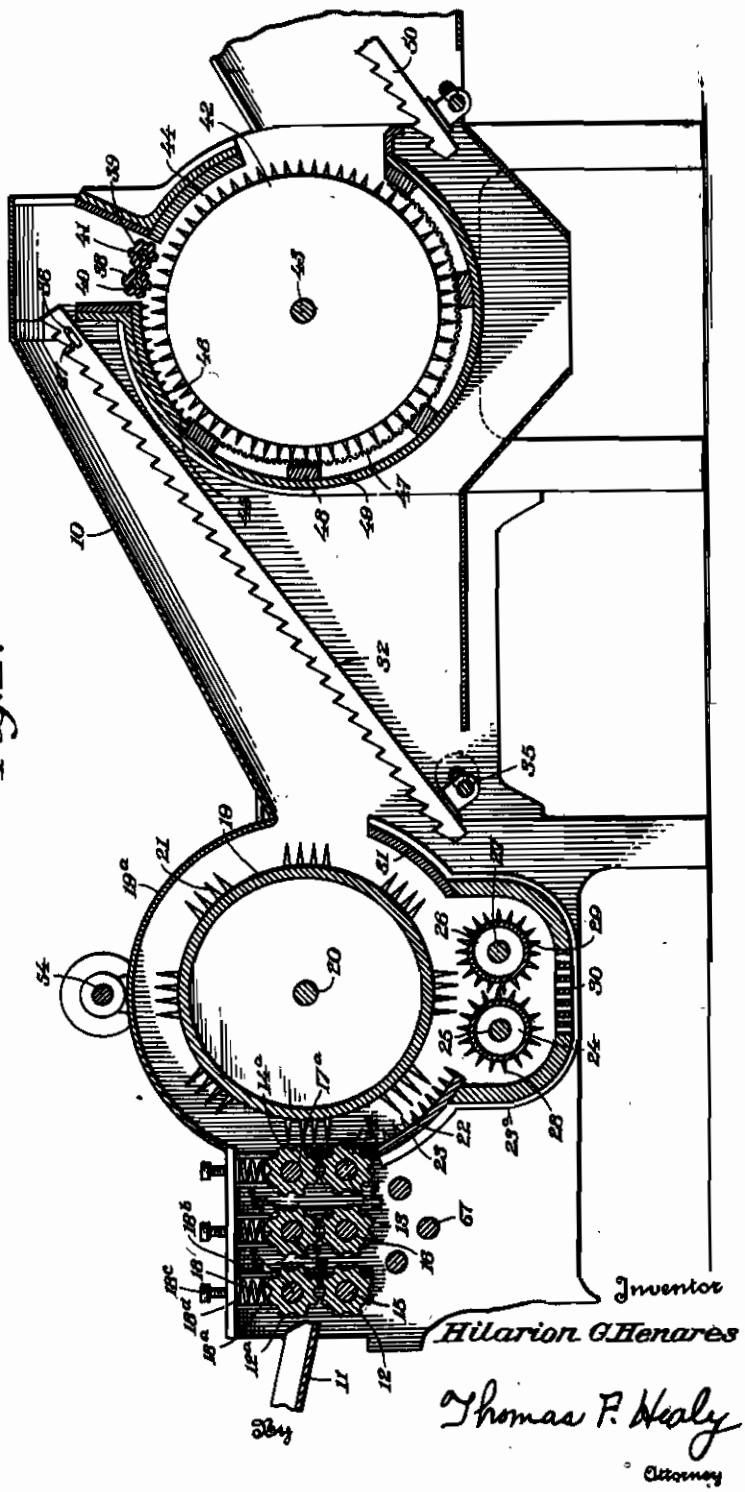
Fig. 2.



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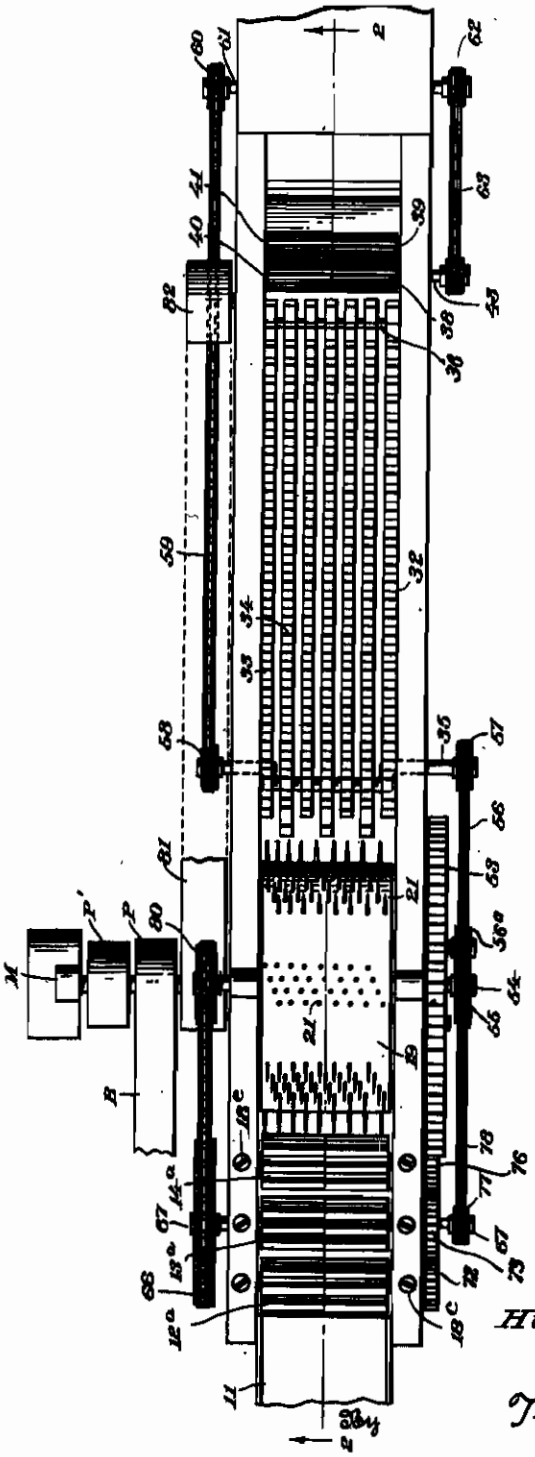

Fig. 3.

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ALIEN PROPERTY CUSTODIAN

METHOD AND APPARATUS FOR EXTRACTING FIBERS FROM FIBROUS HUSKS

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Application filed September 9, 1941

The present invention relates to a separating apparatus and more particularly to a machine and method for extracting coir from coconut husks and recovering the coir dust.

An object of this invention is to provide a mechanical coconut husk defibering machine which efficiently separates the coir fiber from the coir dust of retted or boiled coconut husks.

Another object is to provide mechanical means comprising a plurality of cooperating elements whereby a coconut husk or the like is subjected to a series of steps to separate coir fiber from coir dust.

Yet another object is to provide apparatus for the efficient separation of coir dust from the coir fiber of retted coconut husks which includes a pressure treatment of the husks, combing the husks, separating the dust from the fiber, and conveying the fiber to effectuate a further combing of the fiber and a more complete separation of the dust therefrom.

Another object is to provide a method of separating fiber from fiber dust which comprises passing retted coconut husks between a plurality of fluted pressure rollers to crush the same, combing the crushed husks, bringing the fiber to a separate area to separate the dust from the fiber, carrying the fiber to a saw-tooth conveyor provided with a plurality of saw-tooth bars, moving the fiber with a jiggling motion to effectuate the removal of more fiber dust, further combing the fiber to remove any remaining fiber dust, and conveying the dust-free fiber to a remote point.

Another object is to provide a husk defibering machine, the principle of which is to first crush the husk between rollers and thereby loosen the fiber from the dust or corky material and then to comb the broken or crushed husk as it passes through a breaker and worker and doffer to cause the dust to separate and fall or be thrown through slots beneath the worker and doffer to be recovered, and to throw the fiber upon a saw-tooth conveyor which further shakes the dust from the fiber, and thence to drop the fiber to a finisher where it is thoroughly cleaned.

In its broad aspect this invention embraces a series of coordinated steps for efficiently separating fiber dust from fiber and, more particularly, relates to mechanical means for separating and recovering coir dust from the coir fiber of retted or boiled coconut husks.

In the drawings:

Figure 1 shows an elevation of the defibering machine illustrating the drive mechanism;

Figure 2 shows a longitudinal vertical section taken along the lines 2—2 of Figure 3; and

Figure 3 is a top plan of the defibering machine.

Referring now to the drawings and more particularly to Figure 2, the numeral 10 generally indicates a casing or housing of any suitable material for the defibering machine to permit the dust to be separated from the fiber so as to confine the separated dust within limited areas in order that it may be easily recovered.

A chute 11 engages through the housing 10 and cooperates with a plurality of pairs of fluted pressure rollers, indicated at 12, 12*a*; 13, 13*a*; and 14, 14*a*, respectively. The fluted rollers 12, 13, and 14 are the lower rollers while the fluted rollers 12*a*, 13*a*, and 14*a* are the upper rolers, with each upper roller overlying its respective lower roller in pressure engaging relation with respect to material passing therebetween. The roller 12 is provided with a shaft 15, upon which it is suitably secured, while the roller 12*a* has a shaft or axis 15*a* extending longitudinally therethrough. In like manner, the roller 13 is provided with shaft 16, roller 13*a* with shaft 16*a*, roller 14 with shaft 17, and roller 14*a* with shaft 17*a*. The respective rollers 12, 13, and 14, and 12*a*, 13*a*, and 14*a*, are driven by a gear train in a manner hereinafter more fully set out, and the shafts are suitably supported in the walls of the housing 10.

In order to increase or decrease pressure upon the rollers 12, 13, and 14, and 12*a*, 13*a*, and 14*a*, there is provided an adjustable pressure regulating means operating against each upper roller in any suitable manner and including a spring 18 carrying a plate 18*a* at its lower end which engages with roller 12*a*, said spring 18 and plate 18*a* being disposed with a depending casing 18*b* which is carried by a portion of the housing 10. A screw 18*c* threadedly engages through the housing 10 to contact a plate 18*d* disposed on the upper end of spring 18.

Each top roller 12*a*, 13*a*, and 14*a* is provided with an overlying adjustable pressure regulating means, such as just described, so that pressure on the rollers may be selectively increased or decreased, depending upon the material being processed, by turning the screw 18*c* in the proper direction.

Thus it can be seen that the retted or boiled coconut husks are introduced into chute 11 and propelled toward the fluted pair of rollers 12, 12*a* between which it passes. The husk next passes between rollers 13, 13*a* and 14, 14*a* where it enters a combing area in which is suitably disposed, within a housing 16*d*, a cylinder 18 which

rotates on a shaft 20 which is journaled in the walls of housing 10. The cylinder 19 is provided with spaced apart steel pins 21 mounted in spaced groups of four around the circumferential surface thereof. The cylinder 19 rotates at a high speed, e. g., 300 r. p. m.

The fiber is further combed against stationary pins 22 mounted on back 23 suitably secured to the inner surface of housing 19a.

The fiber is then brought to an area, generally indicated at 23a, disposed beneath the revolving cylinder 19 in which are mounted a worker 24 keyed to a shaft 25, and a doffer 26 keyed to a shaft 27, said shafts 25 and 27 being journaled in housing 10. The worker 24 is provided with pins 28 mounted in spaced apart relation around the outer circumferential surface thereof. The worker rotates at a speed of 25 r. p. m. and is driven by a gear train, as hereinafter explained.

The doffer 26 is provided with a plurality of pins 29 mounted in spaced apart relation around the outer circumferential surface thereof. The doffer rotates at a speed of 100 r. p. m. It is to be understood that the pins 28 of the worker 24 are sufficiently spaced with respect to the pins 29 of the doffer 26 so that the fiber can be carried therebetween.

The worker 24 and the doffer 26 are of the same size and are disposed side by side beneath the cylinder 19 to further act upon the fiber. The fiber dust is separated from the fiber at this point and drops through an opening or slots 30 into a suitable container. Better separation of the fiber dust is accomplished by having the worker and doffer rotate at relatively different speeds, the ratio as described being 1:4.

The fiber is carried past the worker and doffer area along a backing 31 and is thrown by centrifugal force to a saw-tooth conveyor, generally indicated at 32, leaving a substantial portion of fiber dust remaining behind to be recovered.

The saw-tooth conveyor 32 is provided with a plurality of stationary saw-tooth bars 33 and movable bars 34, each alternate bar being movable. The stationary bars 33 are suitably supported, as by cross pieces extending transversely of and anchored in the walls of housing 10, and the movable bars are each secured to a crank 35 at the lower ends thereof. Rotation of the crank 35 by motive power, hereinafter described, causes the saw-tooth bars 34 attached thereto to raise and push the fiber forward along the conveyor. The fiber is prevented from backward slipping by the stationary saw-tooth bars between the moving ones. At the upper end of the conveyor, the bars 34 are secured to a stay or support 36 which is slidable in slot 37 following the movement of the crank 35.

The bars 33 and 34 are about one-half inch apart, and the raising and dropping of the moving saw-tooth bars causes a jiggling of the mass of fiber so that further separation of coir dust is effected while the fiber is progressively moved along the conveyor.

As the fiber drops from the upper end of the saw-tooth conveyor 32, it passes between two fluted feed rollers 38 and 39 rotating on shafts 40 and 41, respectively, dropped onto a finishing cylinder 42.

The cylinder 42 is suitably mounted within the casing 19 and rotates on a shaft 43 journaled in the walls of casing 19. The cylinder 42 has a plurality of spaced apart steel pins 44 mounted on the circumferential surface thereof and revolves at a high speed, e. g., 300 r. p. m. Further combing of the fiber occurs as the fiber passes along the pins 45 mounted on the backing 46, from whence it is carried along a guide 47 made of half-inch mesh wire netting supported by a plurality of blocks 48 secured at spaced intervals to the inner surface of a housing 49 proportioned to receive the revolving cylinder 42 and provided with an opening through which the fiber is thrown by centrifugal force onto a conveyor 50 similar to conveyor 32 where it is taken away for drying, baling, or the like.

The fiber, as it passes along the wire netting 47, further loses any remaining fiber dust, which dust may be collected in any manner as by having slots or openings in housing 49 through which the dust falls into suitable containers.

Referring now to Figure 1, it is pointed out that the power for driving the coconut husk defibering machine may be furnished from any source, as by motor or engine.

Power is transmitted to a pulley P secured to shaft 20 by a belt B from the motor which turns the cylinder or breaker card 19 and pinion 52 keyed to the end of shaft 20. Pinion 52 has 30 teeth which mesh with the teeth of the spur gear 53 to drive the same. The spur gear 53 has 140 teeth and is mounted for rotation on shaft 54 which is suitably supported on the housing 10. Two sprocket wheels 55, each having 8 teeth, are keyed to shaft 54 and rotate with spur gear 53. One of the sprocket wheels 55 is connected by a sprocket chain 56 to the doffer 26 and a sprocket wheel 57 secured to one end of crank 35 whereby the rotation of spur gear 53 drives the doffer 26 and operates the crank 35. A sprocket wheel 56a is keyed to the shaft 27 so that rotation of the sprocket wheel 56a will also rotate the doffer 26.

Another sprocket wheel 58 is secured to the opposite end of crank 35 which is connected by sprocket chain 59 to another sprocket wheel 60 which is secured to shaft 61 extending transversely through the housing 10 and supported thereby. Another sprocket wheel 62 is mounted on the opposite end of shaft 61 and engages a sprocket chain 63 which in turn engages another sprocket wheel 64 mounted on the end of shaft 40 of the feed roller 38. Feed roller 39 which rotates on shaft 41 is driven by frictional engagement with roller 38 as the fiber passes therebetween.

The other sprocket wheel 55 keyed to shaft 54 is connected by sprocket chain 65 to sprocket wheel 66 keyed to shaft 67. Also keyed to shaft 67 is a spur gear 68 engaging intermediate gear 69 mounted on shaft 69a which in turn engages spur gears 70 and 71 which mesh with gears 72 and 73, respectively. Gear 70 is keyed to shaft 15 and rotates fluted roller 12. Gear 72 is keyed to shaft 15a and rotates roller 12a. Spur gear 71 is keyed to shaft 16 and rotates roller 13. Spur gear 73 is keyed to shaft 16a and rotates roller 13a.

The spur gear 68 also engages another intermediate gear 74 mounted on shaft 74a. The gear 74 engages another spur gear 75 mounted on shaft 17 to rotate roller 14. The gear 75 in turn engages a spur gear 76 keyed to shaft 17a to rotate roller 14a.

A sprocket wheel 77 is also keyed to shaft 67 and is connected by means of a sprocket chain 78 to another sprocket wheel 79 keyed to shaft 25 of the worker 24.

A pulley 80 is keyed to shaft 20 of cylinder 19 and is connected by belt 81 to an equal sized pul-

ley 82 which is keyed to shaft 43 of cylinder 42. Cylinders 19 and 42 rotate at the same speed.

As pointed out before, the shaft 20 is suitably journaled for rotation and is illustrated as being rotatably mounted in member M. A loose pulley P^1 is also disposed on shaft 20. It is thought that a person skilled in this art can readily understand from the foregoing description of this invention that the shafts carrying the various gearing comprising the gear train imparting motion to related parts is all suitably mounted for rotation and supported in one way or another by the housing 10. The particular way the said shafts are mounted is not per se within the scope of this invention, and it is not thought necessary to particularize in relation thereto. The walls of housing 10, as well as the top, are of sufficient thickness and strength to support the various shafts upon which the gearing mechanism and cylinders rotate, said shafts being suitably journaled for rotation on said housing walls.

In operation, retted coconut husks, or any like material, are introduced into chute 11 and are propelled to and pass between fluted pairs of rollers 12, 12*a*; 13, 13*a*; and 14, 14*a*. Pressure upon any one or all of said pairs of rollers can be selectively increased or decreased by proper manual manipulation of screw 18c to regulate the tension of spring 18.

After the crushed coconut husks leave the crusher rollers, they pass a combing compartment 19*a* where they come in contact with steel pins 21 carried by cylinder 19 which is rotating at 300 r. p. m. to fiberize the husks. The husks pass downwardly along the pins 22, being continuously and rapidly combed by the pins 21. After the combed fibers leave the area of pins 22, they fall into the area 23*a* where the coir dust is separated from the fibers, said dust falling through small apertures which will not permit the passage of the fibers.

The worker 24 rotates at 25 r. p. m., and the doffer 26 rotates at 100 r. p. m. The fiber is thoroughly needled in area 23*a* by the cooperation of steel pins 28 carried by the worker and steel pins 29 carried by the doffer 26 so as to extract the coir dust from the coconut fibers.

The steel pins 21 on the cylinder 19 aid in moving the fiber along the member 31 to the opening in compartment 19*a* where it is thrown by centrifugal force onto the saw-tooth conveyor 32.

The fiber is progressively moved along the conveyor 32 by a series of steps imparted by the crank movement of some of the saw-tooth conveyor bars. The movement of the fiber along the conveyor 32 is such that the fiber is shaken up to enable a further removal of coir dust.

After the fiber leaves the conveyor 32, it falls on and passes between fluted rollers 38 and 39 into housing 49 where it is further combed in a manner similar to the prior combing in order to separate the remaining coir dust from the fibers. The dust falls through a screen 47 and is collected.

The fiber passes along screen 47 and is thrown onto conveyor 50 where it is transported to a further point for baling or the like.

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