

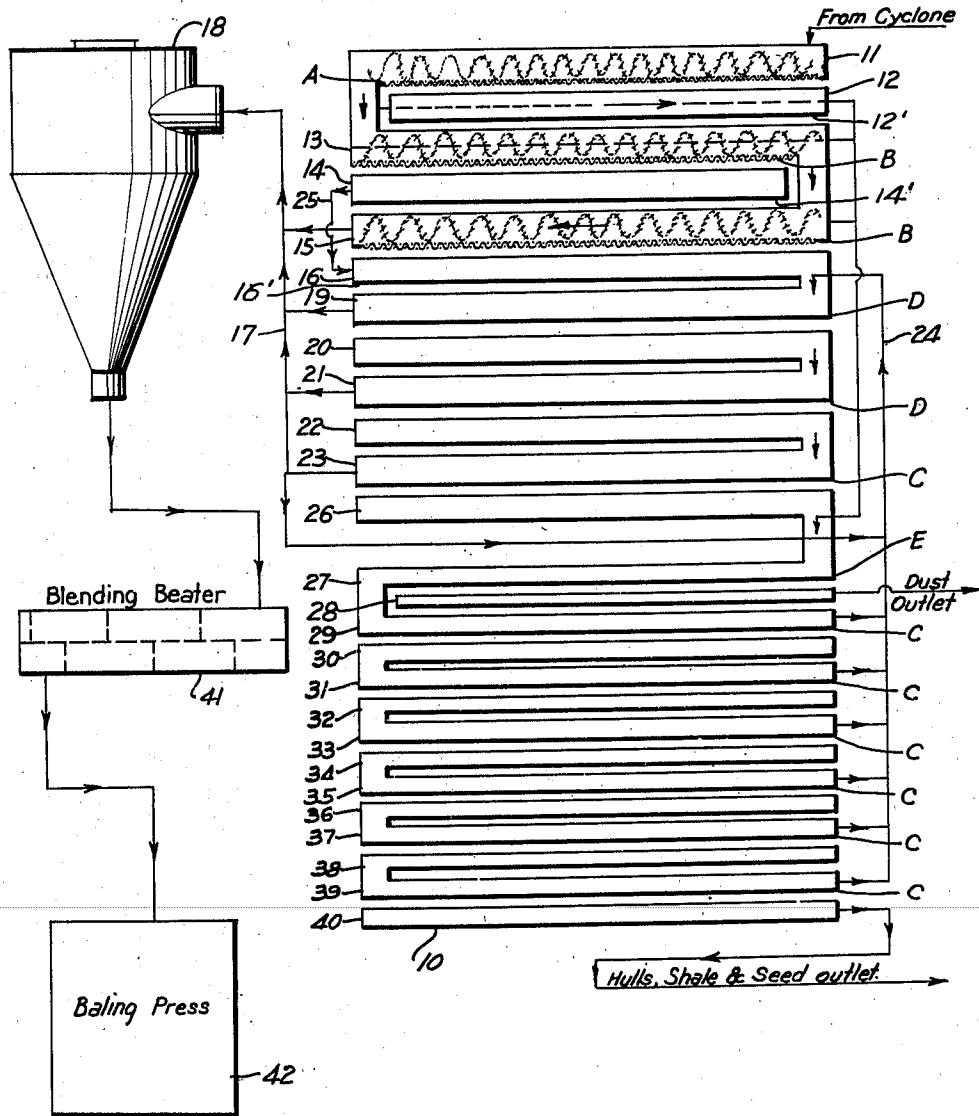
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SYSTEM OF PROCESSING LINT

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SYSTEM OF PROCESSING LINT

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This invention relates to new and useful improvements in systems of processing lint.

The usual procedure of producing clean lint commences with cleaning of the cotton seed. After the seed has been cleaned as thoroughly as the machine or apparatus used will permit, it is conveyed to the linters wherein a second cleaning operation in the form of moting takes place. The step of air separation is incidental to the transfer of the lint from the linters to the condenser or through the lint flue system. When the latter is used, an attempt to clean the lint through the adaptation of a beater or agitator is made. The lint is beaten or agitated above a perforated metallic plate or screen, the perforations of which are of sufficient size to accommodate dust and hull pepper but prevents the removal of the larger trash. The amount of extraneous or foreign matter, in the form of hull pepper or dirt, removed from the lint in this type of apparatus is limited by the loss of lint during the beating operation, which lint is unrecoverable in this process and the kind of foreign matter removed is limited to that appearing in a state of subdivision small enough to pass through the relatively fine perforations.

It is therefore, one object of the invention to provide an improved method or system of treating or cleaning lint to produce a cleaner and higher grade lint than has been heretofore possible and to remove some of the limitations of lint cut, thereby recovering a greater quantity from a given amount of seed.

Another object of the invention is to provide an improved system of processing lint wherein the entire amount of lint cut by the cotton linter, including motes, or any portion of the cut desired, may be incorporated in the production of clean lint, whereby the production and handling of motes as a separate and lower grade commodity is eliminated.

An important object of the invention is to provide an improved system of processing lint whereby the lint may be classified so that any desired grade or combination of grades may be produced, depending upon market conditions and the particular use to which the lint is to be put.

A further object of the invention is to provide an improved system of processing lint wherein the entire cleaning operation is performed by a single unitary mechanical apparatus irrespective of previous cleaning, moting, grading or separating operations, the entire cleaning operation being accomplished by a process of agitation, screening, and air separation which removes the

hull pepper, dust, whole seed, hulls and shale intermingled with the same.

A particular object of the invention is to provide a system of processing lint whereby an exceptionally high quality of lint is produced independent of the mechanical condition of the apparatus and the skill with which said apparatus is operated, whereby the human element is eliminated or reduced to a minimum and the necessity or desirability of maintaining the apparatus in excellent mechanical condition is obviated.

Still another object of the invention is to provide an improved system of processing lint wherein the amount of lint produced from a given amount of cotton seed is unlimited by the cleanliness of the seed or by the cleanliness of the lint as cut from the seed, the processing of the lint producing clean lint from substantially totally delinted seed, said processing also removing the foreign matter carried by said lint.

A further object of the invention is to create a cleaning system which is capable of removing the type of impurities now eliminated by moting, thereby creating a new linting condition which allows for lower brush speeds, which in turn results in a saving of power both in the linter and in the lint flue system.

The system may be carried out by any suitable means, devices or apparatuses; however, we have shown in the accompanying drawing, a diagrammatical illustration of apparatus for performing the system of processing, which is described in the following specification and to which reference is made herein.

The system of processing lint includes conveying the cotton lint and motes by any suitable means such as, a suction duct or conduit, from a cyclone (not shown) to the upper end of a separating, agitating or beating apparatus 10. The air carried by the lint and motes is removed therefrom by the cyclone (not shown), whereby no separation in the form of moting or delinting is necessarily preformed prior to the introduction of the lint into the apparatus 10. Consequently, the lint, in addition to the motes, will contain a large quantity of extraneous or foreign matter in the form of whole seed, dust, hulls, hull pepper and shale, which matter must be separated or cleaned from the lint.

The lint is first introduced into an agitator or beater 11 for the purpose of removing a portion of the dust and hull pepper therefrom so that the lint may be cleaned more thoroughly and rapidly. This first step of introducing the lint into an

agitator or beater is optional with the operator and it has been found that the system will work equally as well without this first step. The agitator is shown as a horizontal screw-conveyor of the type known as a cut flight conveyor and is disposed longitudinally above a perforated trough or bottom which is shown as a screen A or may, if desired, be a perforate plate. The conveyor consists of a plurality of paddles or prongs mounted upon a rotatable shaft in spiraled convolutions but may be in any desired form. The screen A may be constructed of any suitable material such as, hardware cloth, and a mesh of one-eighth of an inch has given satisfactory results. The size of the perforations is sufficient to accommodate or permit the passage therethrough of the dust and hull pepper, but is insufficient to permit the passage of the larger foreign or extraneous matter. The lint will be tumbled and beaten by the agitator 11 against the fine mesh screen, whereby the majority of the dust and hull pepper will fall or be sifted through the perforations of said screen.

This fine extraneous matter will have particles of lint mixed therewith and the mixture will be caught and carried off by a screw-conveyor or similar means 12 in a direction opposite to the direction of travel of the agitator 11. It is noted that the conveyor 12 is provided with a solid bottom 13 so that no shifting or separation takes place therealong, and that, any means of conveyance might be utilized. The sifted matter is reintroduced into the apparatus 13 as will be hereinafter fully explained. The lint together with the extraneous matter which is too large to pass through the screen A will travel forwardly to the end of the agitator 11 from which it will fall into a second agitator or beater 13. It is also noted that this fine trash is removed in order that the load on the lower agitators will be reduced, whereby it is possible to produce a cleaner lint.

This second agitator includes a cut flight conveyor, similar to the first one, mounted above a screen or perforate plate B which forms a perforated trough or bottom for said conveyor to work in. The mesh of the screen B is of sufficient size to permit the passage therethrough on the large form of foreign matter encountered. A mesh of one-half an inch has been found satisfactory. The lint is tumbled and beaten against the screen B, whereby some of the lint is separated from the extraneous or foreign matter and is matted or balled to a certain extent. The greater part of the extraneous matter together with a part of the lint will be sifted through the perforations of the screen B so that it may be carried off by a screw-conveyor 14, having a solid bottom 14', or by other suitable means. This sifted matter is also returned to the apparatus 10 as will be hereinafter explained.

The matted or balled lint and the unscreened foreign matter is dropped into a third agitator or beater 15, identical to the agitator 13 and having the same type of screw-conveyor and bottom screen B. The agitator 15 forms a continuation of the agitator 13 and merely continues the beating or tumbling action of the same, whereby a further separation or screening process is performed. A screw-conveyor or other suitable means 16, having a solid bottom 16', is disposed beneath the third agitator so as to catch and carry away the matter sifted through the screen B. It is pointed out that substantially all of the foreign matter and some of the lint will

pass through the perforations of the screen, whereby the matted lint remaining thereabove will be substantially free from said foreign matter when it reaches the far end of the agitator 15.

The substantially clean lint will be discharged from the far end of the agitator into a duct or conduit 17 having an air stream or blast passing upwardly therethrough. The velocity of the air stream may be regulated so that it will have sufficient force to pick up the clean lint but insufficient force to pick up any of the heavy foreign matter that may be discharged into the duct 17. This foreign matter will be carried away by a separate duct or may be allowed to fall to the floor as desired. It is pointed out that a large quantity of lint will be separated from the foreign matter during the tumbling or beating action of the agitator 15 so that the clean lint may be carried upwardly by the air stream to a cyclone 18 where the air will be removed or separated from said lint.

It is noted that the rate of passage or travel of the lint over each screen or perforate plate may be regulated by the number of prongs or paddles carried by each cut flight conveyor and the pitch or inclination of the same and the speed of rotation thereof. Obviously, a few paddles or prongs having only a small degree of pitch or inclination will reduce the rate of passage or travel of the lint and will increase the amount of beating or tumbling by the agitator. Thus, the amount of beating or tumbling not only controls the passage of the lint over and through the screen but also controls the type and amount of air currents induced thereby.

The sifted foreign matter and lint is discharged from the conveyors 14 and 15 into a fourth agitator or beater 19 mounted above a screen D. A five-sixteenths of an inch mesh screen has been found to be satisfactory. Here, the beating or tumbling action is repeated with the foreign matter and part of the lint being sifted through the screen and the clean lint being discharged into the duct 17. The sifted lint and foreign matter is received and discharged by a solid bottom conveyor 20 into a fifth agitator or beater 21, identical to the fourth agitator. The clean lint is conveyed to the duct 17, while the foreign matter and dirty lint is caught by a solid bottom conveyor 22 which discharges the mixture into a sixth agitator 23 having a screen C. A mesh of one-fourth of an inch has given satisfactory results. The clean, matted lint discharged from the agitator 23 is conveyed by suitable means to a duct 24, similar to the duct 17, having an air stream passing upwardly therethrough, whereby said lint is picked up and reintroduced into the fourth agitator 19. The lint and extraneous matter is discharged from the screw-conveyor 14 into a suitable conduit 25 where it is picked up by the conveyor 16 and discharged into the agitator 19. Thus, the lint from the sixth agitating stage is mixed with the discharge of the second conveyor and the same is recleaned by further tumbling or beating. It is noted that either, or both, of these steps are optional and may be eliminated, if desired.

A solid bottom screw-conveyor 26 receives the sifted lint and foreign matter and discharges the same into the seventh agitator 27 having its foraminous bottom formed by a screen E. A mesh of one thirty-second of an inch has been found to be satisfactory. The fine dust and hull pepper discharged from the screw-conveyor 12 is reintroduced into the apparatus at this point where

it will be mixed with the lint and matter discharged from the conveyor 25. Obviously, only the finest particles of the extraneous matter will be sifted through the exceptionally fine screen E, and these impurities will be in the form of dust and hull pepper. The reason for returning this fine extraneous matter to the apparatus is to remove the lint mixed therewith. It is pointed out that very little lint will pass through the screen E, and that, this sifted matter may be disposed of by a screw-conveyor 28 or in any other convenient way.

The larger extraneous or foreign matter and the lint is discharged from the agitator 27 into an eighth agitator 29 having its perforated bottom or trough formed by the screen C. The matted lint is discharged into the duct 24, whereby the lint is picked up by the air stream therein and the heavy extraneous matter is dropped to the floor. The unmatted lint and foreign matter is shifted through the screen C and is carried by a conveyor 30 to a ninth agitator 31, identical to the agitator 29 and also having its bottom or trough formed by the screen C. The matted lint is discharged from said agitator into the duct 24, while the lint and the foreign matter sifted through the screen is conducted by a screw-conveyor 32 to a tenth agitator 33 which is similar to the agitators 29 and 31. The only difference between the three agitators is that the number of paddles or prongs on the cut flight conveyors and the inclination or pitch of the same is adjustable so as to accommodate the decreasing volume of lint. This increase in number and pitch is desirable because less lint is handled by the lower stages, as has been heretofore set forth, and it is not necessary to beat or tumble said lint for an equal period of time.

Since the remaining beaters or agitators 35, 37 and 39 and solid bottom screw-conveyors 34, 36, 38 and 40, as shown in the accompanying diagrammatical view of the apparatus, are identical to the upper agitators 29, 31 and 33 and the conveyors 28, 30 and 32, it is thought unnecessary to set forth the same in detail. It is manifest that more or less agitators might be utilized in carrying out the invention according to the condition of the lint and the amount of extraneous or foreign matter mixed therewith. All of these agitators may be connected to the duct 24, whereby the lint produced or recovered by said agitators may be re-introduced into the fourth agitator 19 or at any other desirable point for the purpose of blending or recleaning. It is pointed out that this re-introduction of the lint from the lower agitators may be varied or entirely eliminated, if desired.

The large extraneous matter such as, shale, hulls and seed will pass entirely through the apparatus and will finally be received by the screw-conveyor 40 from which the same will be readily discharged and disposed of. It has been stated hereinbefore that the lint recovered or retained by the third, fourth and fifth agitators 15, 19 and 21, respectively, is discharged into the duct 17, whereby the lint is picked up by the air stream therein and the heavy extraneous matter is permitted to fall to the floor or is disposed of otherwise. However, it is pointed out that these lint discharges or recoveries may be conducted thereto, or if desired one or more of the discharges may be mixed with one or more of the lower grades of lint produced. Of course, the types of grades of lint produced may be varied, as desired, in accordance with the market demand or the

particular use for which the lint is furnished. The grades of lint produced depend upon the number of agitators employed and the amount of blending of the different grades.

After the cyclone 18 has removed or separated the air from the cleaned lint, the latter is conveyed to a mechanical blender 41, or other suitable means, wherein said lint is combined in a uniform mixture composed of fractions having different colors and staples. It is well known that the color of the lint changes with the length of the staple, and that the short staple close to the seed is naturally darker in color than the longer staple which might be still adhering to the seed. The recombining of the lint may be accomplished by passing a portion or all of the lint to the final blender or by re-introducing the recoveries or products of the lower agitators back into the upper agitators and thereby combine the blending operation with the additional cleaning to increase the efficiency and decrease the size of the apparatus. The blended or mixed lint may then be conveyed to a baling press 42 or other suitable collecting and binding means as shown in the accompanying drawing.

This system of processing lint is based upon the idea of utilizing a single unitary apparatus which is capable of performing the entire cleaning operation independent and irrespective of what precedes its performance in the form of seed cleaning, moting or other attempt at grading or separation. This apparatus accomplishes the desired result by a process of beating, agitation and air separation, whereby the extraneous or foreign matter mixed with the lint is removed. It is noted that highly undesirable shale, whole seed, large particles of hull, leaf and stem trash are substantially removed by this system, which removal has heretofore been unheard of and thought to be impossible.

The system has its foundation in three principles, namely, agitation or beating of the lint over a screen of desirable mesh, air separation and the regulation of or controlled agitation. The beating or agitation of the lint, or the major portion thereof, is performed above and in conjunction with screens or perforate plates having perforations of sufficient size to permit the passage therethrough of the large type of foreign or extraneous matter mixed with the lint. At the same time the separation of the lint from these impurities and the retention of the lint by the screens depends upon the matting effect of said lint which occurs during the agitation thereof and also partially, but not necessarily, upon a diminution of the mesh of the screens as the agitation progresses.

As the tumbled lint is discharged from the end of the agitators, it is picked up by an air stream which has been regulated so that its velocity will be sufficient to raise the lint but will be insufficient to lift the heavy impurities that may be present, as is clearly set out hereinbefore. The amount of agitation or beating and the quantity of lint passing through each screen bears a definite relationship to the rate of passage or travel of said lint over each screen, and therefore, to the quantity of lint retained by said screen. As has been heretofore stated, this relationship may be varied and controlled by the adjustment of the paddles or prongs of each cut flight conveyor or the speed of rotation thereof, whereby the passage of the lint above and through each screen is determined both by the mechanical set-

ting of said paddles or prongs and the type of air currents induced thereby.

In using this system of processing lint, it has been found to have certain advantages over the systems and apparatuses now in use. In the first place, there is a saving of power as compared with the standard lint flue systems in that the transmission of the lint from the linter may be accomplished by the use of a fan and a cyclone, thereby eliminating the usual condenser and its recognized resistance. The system is so efficient that it is no longer necessary to perform the usual separation step, called moting, and if desired all of the motes produced by the linter may be combined with the lint, thereby eliminating a secondary product and the necessity for using mote beating machines. Another advantage is that the recovery may be graded and classified according to staple. The lint discharged from the various agitators may be combined in any conceivable combination to produce lint of predetermined grade or multiple of grades. This grading of the lint may be carried to such an extent as to produce the equivalent of first cut lint with the remaining portion equaling second cut lint, thereby making it possible to eliminate second cut linters. With this type of system it has been found that the necessity for moting in the linter can be eliminated. In the usual cotton linter the saws are turned at a high speed so that motes are thrown clear of the lint and, of course, by this high speed some of the lint is also thrown off of the saws and is carried along with the motes, whereby the lint carried by the motes is lost. The motes, together with the lint, is carried into this system, thereby eliminating the moting in the linter. It is sometimes desirable to cut closer to the seeds and with this type of system it is possible to place more saws in the linter and also to place them closer together, because this system receives the cut seeds as well as the lint.

A survey of the present production or recovery of lint by other methods indicates that by using this new system, it is possible to produce a lint, either in part or by combining all of the lint produced, having a higher degree of purity. For example, it is possible to produce second cut lint with as high a cellulose content as first cut lint or cotton, while the combination of all the fractions of lint recovered by this system shows a higher cellulose content than exhibited by other methods or processes now in use. Thus, it is possible to produce a greater yield of lint having a higher quality than has heretofore been pos-

sible. It is noted that an agitator or beater, having a fine mesh screen bottom, may be installed in the apparatus at any stage of the processing of the lint for the purpose of removing a large percentage of the fine dust and hull pepper, thereby lightening the load upon the apparatus. However, this removal of the fine extraneous matter is optional and may be eliminated, if desired. Another advantage of the system is that due to the high efficiency of the cleaning operation, a large quantity of clean lint may be produced from a unit weight of seed than with existing systems. Manifestly, this system of processing lint may be accomplished by any suitable means and is not limited to the apparatus set out hereinbefore.

What we claim and desire to secure by Letters Patent is:

1. The system of processing cotton lint which includes, successive agitating and tumbling steps over foraminous surfaces, whereby extraneous matter and shorter cotton lint are sifted out and the longer lint is retained, returning the extraneous matter and shorter lint to the agitating and tumbling steps for the purpose of re-cleaning the same, discharging the clean lint into a stream of air of such force so as to pick up and convey the clean lint but insufficient to pick up heavier foreign matter and then re-introducing the clean lint back into the system for further cleaning and also blending to combine the same in a uniform mixture.

2. The system of processing cotton lint of the type wherein the lint and extraneous matter are not ground, the improvement which includes conducting the lint and extraneous matter through successive agitating, tumbling and sifting steps, whereby progressively smaller particles of extraneous matter with shorter lint are separated at each successive step from the lint being cleaned, discharging the cleaned lint into an air stream from said steps and carrying it off therefrom, separating the cleaned lint from the air stream, continuing processing of the shorter lint and extraneous matter sifted from the preceding steps through additional agitating, tumbling and sifting steps, discharging and carrying off clean lint from the last-named steps by means of an air stream, and combining the said last-named clean lint with the clean lint from the first-named steps.

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