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Cleaning system with crop divider stroker array

Abstract

A cleaning system for an agricultural combine harvester includes a pan and a crop divider. The pan includes a stepped floor to receive crop material thereon and is arranged for fore-aft reciprocating movement to advance the crop material in a crop-processing direction. The crop divider is mounted with the pan for fore-aft reciprocating movement therewith and extends in a fore-aft manner and above the stepped floor to partition the crop material laterally. The crop divider includes a body and a periphery disposed about the body. The body includes a multi-dimensional, clustered array of crop strokers extending laterally to engage the crop material to advance the crop material in the crop-processing direction during fore-aft reciprocating movement of the pan.

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Background/Summary

TECHNICAL FIELD

(1) The present disclosure relates to a cleaning system for an agricultural combine harvester.

BACKGROUND

(2) An agricultural combine harvester intakes crop gathered from a field and processes the crop to separate grain from material other than grain (MOG). Combine harvesters have cleaning systems to separate grain from smaller pieces of MOG. Cleaning systems sometimes have crop dividers to partition crop materially laterally into bays.

SUMMARY

(3) According to an aspect of the present disclosure, there is disclosed a cleaning system for an agricultural combine harvester. The cleaning system includes a pan and a crop divider. The pan includes a stepped floor to receive crop material thereon and is arranged for fore-aft reciprocating movement to advance the crop material in a crop-processing direction. The crop divider is mounted with the pan for fore-aft reciprocating movement therewith and extends in a fore-aft manner and above the stepped floor to partition the crop material laterally. The crop divider includes a body and a periphery disposed about the body. The body includes a multi-dimensional, clustered array of crop strokers extending laterally to engage the crop material to advance the crop material in the crop-processing direction during fore-aft reciprocating movement of the pan.

(4) The above and other features will become apparent from the following description and accompanying drawings.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

(1) The detailed description of the drawings refers to the accompanying figures in which:

(2) FIG. **1** a diagrammatic side elevational view, with portions broken away, showing an agricultural combine harvester with various functional systems including a cleaning system underlying a threshing and separating system;

(3) FIG. **2** is a perspective view showing the cleaning system, the cleaning system including a front step pan (on the left) and a number of crop dividers partitioning the front step pan into bays with crop material;

(4) FIG. **3** is an enlarged perspective view showing the front step pan and the crop dividers mounted with the front step pan;

(5) FIG. **3**A is a side elevational view showing the front step pan and the crop dividers in a forwardmost position (in solid) and a rearwardmost position (in phantom);

(6) FIG. **4** is an exploded perspective view showing the front step pan and crop dividers;

(7) FIG. **5** is a sectional view taken along lines **5**-**5** of FIG. **3**;

(8) FIG. **6**, is an enlarged side elevational view, with portions broken away, showing a crop divider with an array of crop strokers configured as bumps;

(9) FIG. **6**A is an enlarged side elevational view of region A of FIG. **6**;

(10) FIG. **6**B is a sectional view taken along lines **6**B-**6**B of FIG. **6**;

(11) FIG. **7** is a perspective view, with portions broken away, showing a lateral side of the crop divider;

(12) FIG. **8** is a perspective view, with portions broken away, showing an opposite lateral side of the crop divider;

(13) FIG. **9** is a top plan view of the crop divider showing crop strokers projecting laterally from either lateral side of the crop divider; and

(14) FIG. **10** is a perspective view showing an intermediate crop divider with an array of crop strokers.

DETAILED DESCRIPTION

(15) Referring to FIG. **1**, an agricultural combine harvester **10** is configured to move in a forward or harvest direction of travel **12** over a field to harvest crop material from the field. The harvester

10 processes the crop, separating grain from residual crop material known as material other than grain or MOG (e.g., straw, stalks, cobs, leaves, chaff).
(16) In general, the harvester **10** may include front-end equipment **14** to cut, gather, and transport crop rearwardly (some front-end equipment **14** may not cut crop, as in the case of a belt pick-up unit), a feederhouse **16** to advance crop material received from the equipment **14** into the body of the harvester **10**, a threshing and separating system **18** to thresh crop material and separate grain from material other than grain (MOG), a cleaning system **20** (also known as a "cleaning shoe") to separate grain from chaff and other MOG, a clean grain elevator (not shown) to elevate clean grain to a storage bin **22**, an unloader **24** to unload clean grain from the storage bin **22** to another location, and a residue system **26** to process and distribute crop residue back onto the field. A person can control the harvester **10** from an operator's station **28** of the harvester **10**. The harvester **10** may be configured in a wide variety of ways.
(17) The threshing and separating system **18** includes an axial rotor and a concave assembly. The rotor and the concave assembly cooperate to provide the threshing and separating system with a front threshing zone for threshing grain and a rear separating zone for separating threshed grain from MOG. In some examples, the threshing and separating system **18** includes a second rotor (not shown) and a second concave assembly (not shown), which cooperate to provide the threshing and separating system **18** with a second front threshing zone and a second rear separating zone. In such a case, the rotors are similar to one another in structure and function, and the concave assemblies are similar to one another in structure and function. The threshing and separating system **18** may be configured in a wide variety of ways.
(18) Referring to FIG. **2**, the cleaning system **20** includes a front step pan **30** (which may also be referred to as a preparation pan), an inclined front chaffer **32** (which may also be referred to as a sieve), a lower step pan (not shown), a chaffer **36** (which may also be referred to as a sieve), a sieve **38**, a return pan **40**, and a fan assembly **42** (e.g., including four fans). The lower step pan is mounted with the chaffer **36** so as to be positioned in front of the chaffer **36** and below the front chaffer **32**. The front step pan **30**, the front chaffer **32**, the lower step pan, the chaffer **36**, the sieve **38**, and the return pan **40** are arranged for fore-aft reciprocating movement in a fore-aft dimension **44** of the combine harvester **10** to process and advance crop material.
(19) A drive mechanism **45** imparts the fore-aft reciprocating movement. The drive mechanism **45** includes a rotary drive **45-1** and a linkage including a first drive link **45-2**, a second drive link **45-3**, a front rocker link **45-4**, a pan link **45-5**, a chaffer link **45-6**, a rear rocker link **45-7**, and a number of support links **45-8**. The linkage is positioned on the left side of the combine harvester **10**. The rotary drive **45-1** is rotated by a belt-driven pulley **45-9** positioned on the right side of the combine harvester **10**. The first and second drive links **45-2**, **45-3** are coupled eccentrically to the rotary drive **45-1** such that rotation of the rotary drive **45-1** imparts a reciprocating motion to the first and second drive links **45-2**, **45-3**. The first drive link **45-2** is coupled to the front rocker link **45-4** which is coupled at a first end to the sieve **38** to reciprocate the sieve **38** and at an opposite second end to the pan link **45-5** that reciprocates the front step pan **30** and the front chaffer **32**. As such, the sieve **38** reciprocates in a manner opposite to the pan **30** and the front chaffer **32**. The second drive link **45-3** is coupled to the chaffer link **45-6** which is coupled to the chaffer **36** to reciprocate the chaffer **36**. The rear rocker link **45-7** is coupled at a first end to the chaffer **36** and at an opposite second end to the return pan **40** to reciprocate the return pan **40** in a manner opposite to the chaffer **36** in response to reciprocation of the chaffer **36**. The support links **45-8** support the front step pan **30**, the front chaffer **32**, the lower step pan, the chaffer **36**, the sieve **38**, and the return pan **40** on the support structure **29** of the combine harvester **10**. A similar linkage is positioned on the right side of the combine harvester.
(20) The front step pan **30**, the front chaffer **32**, the lower step pan, and the chaffer **36** reciprocate in phase as a first unit. The sieve **38** and the return pan **40** reciprocate in phase as a second unit. The first and second units reciprocate 180 degrees out of phase with one another. The fore-aft

reciprocating movement of the first and second units is relative to the support structure **29**. It is to be appreciated that the front step pan **30**, the front chaffer **32**, the lower step pan, the chaffer **36**, the sieve **38**, and the return pan **40** may be driven for reciprocating movement in any suitable manner.
(21) The front step pan **30** is positioned under a front portion of the threshing and separating system **18** to receive crop material on a stepped floor **46** of the pan **30**. The pan **30** is configured for fore-aft reciprocating movement in the fore-aft dimension **44** to advance crop material in a crop-processing direction **46** toward the front chaffer **32**. The crop-processing direction **46** is rearward with respect to the front step pan **30**.
(22) The return pan **40** is positioned under a rear portion the threshing and separating system **18** to receive crop material on a stepped floor of the return pan **40**. Tailings may also be routed back to the return pan **40** for further processing by the cleaning system **20**.
(23) The pan **30** is configured for fore-aft reciprocating movement in the fore-aft dimension **44** to advance crop mat in a crop-processing direction toward the front chaffer **32**. The crop-processing direction is forward with respect to the return pan **40**.
(24) Crop material may pass rearwardly from the front chaffer **32** to the chaffer **36**. Grain and MOG may pass through the front chaffer **32** to the lower pan **34** and the chaffer **36**. Grain and smaller pieces of MOG received from the front chaffer **32** and lower pan **34** may pass through the chaffer **32** to the sieve **38**, which further filters for grain. The fan assembly **42** blows air rearwardly through and across the chaffers **32**, **36** and sieve **38** to advance MOG to the residue system **26** for discharge from the combine harvester **10**.
(25) Referring to FIGS. **3-5**, the cleaning system **20** includes one or more crop dividers **50**. For example, there are five crop dividers **50**. It is to be appreciated that there could be any suitable number of crop dividers **50**.
(26) The crop dividers **50** are mounted with the pan **30** for fore-aft reciprocating movement therewith. In such a case, the pan **30** and the crop dividers **50** mounted therewith have a forwardmost position and a rearwardmost position, which is rearward and may be somewhat upward from the forwardmost position (FIG. **3**A). The crop dividers **50** partition the pan **30** into crop-receiving bays **52** (e.g., six bays).
(27) Each crop divider **50** extends in a fore-aft manner in the fore-aft dimension **44** and above the stepped floor **46** of the pan **30** to partition the crop material laterally to inhibit lateral movement of crop material to one lateral side of the pan **30** or the other to foster lateral distribution of crop material in the cleaning system for cleaning effectiveness. The crop divider **50** partitions the pan **30** into laterally adjacent bays **52**. A divider extension **54** may be mounted (e.g., bolted) to the crop divider **50** along a top edge **56** of the crop divider **50**, as shown, for example, with respect to two crop dividers **50**.
(28) The crop divider **50** includes a panel **58**, an attachment flange **60**, and an attachment tab **62**. The attachment flange **60** is coupled to and extends along a bottom edge **64** of the panel **58**. The attachment flange **60** is coupled to the floor **46** and an underlying sub-structure **67** of the pan **30** with fasteners. Such fasteners may include, for example, hex flange bolts (e.g., six hex flange bolts) threaded to corresponding rivet nuts (e.g., six rivet nuts) and a hex flange bolt (e.g., third hex flange bolt from front of pan **30**) received by a washer and threaded to a nut. The attachment tab **62** is coupled to a front edge **66** of the panel **58**. The attachment tab **62** is coupled to a front wall **68** of the pan **30** with a fastener. Such fastener may include, for example, a hex flange bolt threaded to corresponding rivet nut. For ease of illustration, threads are not shown, and the rivet nuts are shown in their uncompressed state. The presence of threads and rivet nut compression for locking in place are to be understood. The crop divider **50** is configured, for example, as a formed piece of sheet metal (e.g., stamped sheet metal), although it may be configured in a wide variety of ways.
(29) Referring to FIGS. **5-9**, the panel **58** includes a body **70** and a periphery **72** disposed about the body **70**. The periphery **72** includes the top edge **56**, the bottom edge **64**, the front edge **66**, and a rear edge **74**. The edges **56**, **64**, **66**, **74** cooperate to provide the periphery **72**.

(30) The body **70** includes a multi-dimensional, clustered array **76** of crop strokers **78** extending laterally to engage crop material to advance the crop material in the crop-processing direction **48** (e.g., rearward) during fore-aft reciprocating movement of the pan **30**. The array **76** includes a first array **76-1** of crop strokers on a first lateral side **80-1** of the body **70** and a second array **76-2** of crop strokers on an opposite second lateral side **80-2** of the body **70**.
(31) Each array **76-1**, **76-2** is itself a multi-dimensional, clustered array of crop strokers. The first array **76-1** is positioned on the first lateral side **80-1** and extends laterally to engage crop material in a first bay **52** of the bays **52** to advance the crop material present in that bay **52** in the crop-processing direction **48** during fore-aft reciprocating movement of the pan **30**. The second array **76-2** is positioned on the second lateral side **80-2** and extends laterally to engage crop material in a second bay **52** of the bays **52** to advance the crop material present in that bay **52** in the crop-processing direction **48** during fore-aft reciprocating movement of the pan **30**.
(32) The crop strokers **78** of the array **76** are clustered together to promote the crop-advancing effectiveness of the array **76**. The crop divider **50** includes an upstream half **82-1** and a downstream half **82-2** downstream of the upstream half **82-1** in the crop-processing direction **48**. The crop strokers **78** are clustered, for example, in the downstream half **82-1**.
(33) The crop divider **50** has an X dimension, a Y dimension, and a Z dimension. The X dimension is parallel to the floor **46** in the direction of the length of the crop divider **50**. The Y dimension is orthogonal to the floor **46** in an upward direction. The Z dimension is orthogonal to the X and Y dimensions in a direction of the thickness of the crop divider **50**. The floor **46** has steps **84** with a step height **8** in the Y dimension.
(34) The body **70** of the crop divider **50** includes an upper zone **88-1** and a lower zone **88-2**. The upper zone **88-1** is textured with the array **76** of crop strokers **78** and is defined by the extent of the array **76**. The lower zone **88-2** is positioned between the upper zone **88-1**, more particularly the array **76**, and the stepped floor **46**, and is devoid of the array **76**. The upper zone **88-1** is rougher than the lower zone **88-2** to promote engagement between the crop divider **50** and the crop material to advance the crop material during the crop-advancement stroke (rearward stroke) of the pan **30**, which stroke is generally rearward and upward. The lower zone **88-2** presents less friction than the upper zone **88-1** so as to reduce engagement between the crop divider **50** and the crop material during the return stroke (forward stroke) of the pan **30**, which stroke is generally forward and downward. The lower zone **88-2** is defined in the X dimension by a length **90** of the array **76** and in the Y dimension by a distance **92** between the attachment flange **60** and the array **76**. The distance **92** is at least two times the step height **86**. A portion of the distance **92** is a distance **92***a* defined in the Y dimension between the steps **84** of the stepped floor **46** and the array **76**. The distance **92***a* is greater than or equal to the value of the step height **86**.
(35) The array **76** increases in height **94** in the Y dimension from the stepped floor **46** as the array **76** extends in the crop-processing direction **48**, to further promote engagement between the crop divider **50** and the crop material to advance crop material during the crop-advancement stroke of the pan **30**. The crop divider **50** includes an expansion zone **96** in which the top edge **56** increases in height **94** in the Y dimension from the stepped floor **46** as the crop divider **50** extends in the crop-processing direction **48**. The expansion zone **94** includes at least most of the array **76**.
(36) The array **76** is arranged multi-dimensionally. For example, the crop strokers **78** are arranged relative to one another in at least two orthogonal reference dimensions, e.g., dimensions X and Y. The array **76** includes rows (R1, R2, . . . Rn) of crop strokers **78** and columns (C1, C2, . . . Cn) of crop strokers **78**. The rows may be arranged in the X dimension, and the columns may be arranged in the Y dimension. The crop strokers **78** of each row are positioned at regular intervals (e.g., equal intervals), and the crop strokers **78** of each column are positioned at regular intervals (e.g., equal intervals).
(37) The crop strokers **78** are clustered in proximity to one another to maximize the rough surface area. Immediately adjacent rows of crop strokers **78** are alternatingly staggered relative to one

another, and immediately adjacent columns of crop strokers **78** are alternatingly staggered relative to one another. Such staggering accommodates more crop strokers **78** in a given surface area, thereby maximizing the rough surface area. In other embodiments, immediately adjacent rows may not be staggered, and immediately adjacent columns may not be staggered.

(38) Each crop stroker **78** has a maximum size **97**. In the illustrated embodiment, the crop stroker **78** is round, in which case, the maximum size **97** is the diameter of the crop stroker **78**. Immediately adjacent crop strokers **78** are spaced apart from one another by an offset that is less than the maximum size **97**. For example, immediately adjacent crop strokers **78** of each diagonal D of crop strokers **78** are spaced apart from one another by a first offset **98** that is less than the maximum size **97**. Immediately adjacent crop strokers **78** of each row are spaced apart from one another by a second offset **99**, and immediately adjacent crop strokers **78** of each column are spaced apart from one another by the second offset **99**. The second offset **99** is less than the maximum size **97**, although the second offset **99** may be larger than the first offset **98** due to the staggering of rows and columns. It is to be appreciated that the crop strokers **78** may be non-round.

(39) Each crop stroker **78** may include a crop stroker **78-1** and a crop stroker **78-2**. In such a case, the crop stroker **78-1** is positioned on one of the lateral sides **80-1**, **80-2**, and the crop stroker **78-2** is positioned on the other of the lateral sides **80-1**, **80-2**.

(40) The crop stroker **78-1** is a first type of crop stroker, and the crop stroker **78-2** is a second type of crop stroker. The first type of crop stroker **78-1** and the second type of crop stroker **78-2** are different from one another. For example, the first type of crop stroker **78-1** and the second type of crop stroker **78-2** may be oppositely sensed. The first and second types may be inversely related to one another such that the crop stroker **78-1** and the crop stroker **78-2** are configured in a laterally inverse relationship to one another.

(41) The first type of crop stroker **78-1** may be a lateral peak, and the second type of crop stroker **78-2** may be a lateral valley. Each lateral peak may be configured, for example, as a laterally projecting bump, and each lateral valley may be configured, for example, as a laterally recessed dimple. The crop strokers **78-1**, **78-2** may be formed without lateral through-holes, although, it is to be appreciated that a laterally projecting bump or a laterally recessed dimple of the crop strokers **78-1**, **78-2** could have a small through-hole.

(42) In the illustrated embodiment, each crop stroker **78** includes a crop stroker **78-1** in the form of a lateral peak configured, for example, as a laterally projecting bump on the first lateral side **80-1** or the second lateral side **80-2** and a corresponding inversely related crop stroker **78-2** in the form of a lateral valley configured, for example, as a laterally recessed dimple on the other of the first lateral side **80-1** or the second lateral side **80-2**. In other embodiments, the body **70** may be perforated such that the crop strokers **78** may be configured as holes extending laterally through the body **70**.

(43) Each array **76-1**, **76-2** may include crop strokers **78-1** of the first type and crop strokers **78-2** of the second type, to enhance the roughness of the array **76-1**, **76-2**. The crop strokers **78-1** and the crop strokers **78-2** extend in laterally opposite directions such that the crop strokers **78-1** project laterally into the respective bay **52** and the crop strokers **78-2** are recessed laterally from the respective bay **52**. Each array **76-1**, **76-2** may thus include crop strokers **78-1** in the form of lateral peaks configured, for example, as laterally projecting bumps and crop strokers **78-2** in the form of valleys configured, for example, as laterally recessed dimples, with the laterally projecting bumps and the laterally recessed dimples extending in laterally opposite directions.

(44) With respect to each array **76-1**, **76-2**, the rows of crop strokers include alternating rows of oppositely sensed crop strokers **78-1**, **78-2**, and the columns of crop strokers comprise alternating columns of oppositely sensed crop strokers **78-1**, **78-2**. The crop strokers of the rows and the crop strokers of the columns include crop strokers **78-1** in the form of peaks configured, for example, as laterally-projecting bumps and crop strokers **78-2** in the form of valleys configured, for example, as laterally recessed dimples. The row pattern alternates between a row of crop strokers **78-1** and a

row of crop strokers **78-2**. For example, with respect to array **76-1**, row R1 has crop strokers **78-2**, row R2 has crop strokers **78-1**, row R3 has crop strokers **78-2**, and row R4 has crop strokers **78-1**. Similarly, the column pattern alternates between a column of crop strokers **78-1** and a column of crop strokers **78-2**. For example, with respect to array **76-1**, column C1 has crop strokers **78-2**, column C2 has crop strokers **78-1**, column C3 has crop strokers **78-2**, and column C4 has crop strokers **78-1**. Such pattern of alternating rows of oppositely sensed crop strokers and alternating columns of oppositely sensed crop strokers enhance the surface area roughness of the upper zone **88-1** of each array **76-1**, **76-2**.

(45) The crop strokers of each diagonal D alternate between the crop stroker **78-1** and the crop stroker **78-2**. For example, diagonal D1 of array **76-1** includes in sequence stroker **78-2**, stroker **78-1**, stroker **78-2**, stroker **78-1**, and stroker **78-2**. Such an arrangement enhances the surface area roughness of the upper zone **88-1**.

(46) The array **76** may be stamped into the body **70**. In such a case, the pattern of the array **76-1** and the pattern of the array **76-2** are laterally inversely related to one another, such that the crop strokers of the first array **76-1** and the crop strokers of the second array **76-2** are configured in a laterally inverse relationship to one another.

(47) It is to be appreciated that the arrays **76-1**, **76-2** may be manufactured by any suitable method and not necessarily by a stamping operation (e.g., molding, casting, forming, forging, bending, machining, additive process, from two separate pieces of sheet metal or other parts joined together, to name but a few other methods). In such a case, the first array **76-1** and the second array **76-2** may be configured in a manner distinct from one another such that they are not necessarily inversely related, in which case their patterns may be the same or different. For example, in some embodiments, it may be that the crop divider **50** has a single array of crop strokers on only one lateral side and not the other lateral side. It is to be appreciated that one or both arrays **76-1**, **76-2** may have crop strokers of a single type or more than two types.

(48) In some embodiments, the crop divider **50** may include an attachment (not shown) coupled to the panel **58**. The attachment may include one or both of the arrays **76-1**, **76-2**. The attachment may be configured, for example, as an over-the-top cover on the panel **58**. The attachment may be coupled to the panel **58** in a wide variety of ways (e.g., riveted, pinned, or bolted). The attachment may be made from a wide variety of materials (e.g., ultra-high molecular weight polyethylene).

(49) An intermediate crop divider **150** may be mounted with the **30** for fore-aft reciprocating movement therewith. The crop divider **150** may be positioned, for example, between a pair of crop dividers **50**, or between a crop divider **50** and a side edge of the pan **30**. The crop divider **150** extends in a fore-aft manner and above the stepped floor **46** to partition crop material laterally.

(50) The crop divider **150** includes a panel **158** and a pair of legs **159** mounted to the stepped floor **46** and supporting the panel **158** above the stepped floor **46**. The panel **158** includes a body **170** and a periphery **172** disposed about the body **170**. The body **170** includes a multi-dimensional, clustered array **176** of crop strokers **178** extending laterally to engage crop material to advance the crop material in the crop-processing direction **48** during fore-aft reciprocating movement of the pan **30**. The crop divider **150** is shorter in length than the crop dividers, and positioned closer to the rear of the pan **30** than the front.

(51) The array **176** includes a first array **176-1** on a first lateral side **180-1** of the body **170** and a second array (not shown) on an opposite second lateral side (not shown) of the body **170**. The first and second arrays are inversely related to one another.

(52) The crop strokers **178** are similar in structure and function as the crop strokers **78**. Each crop stroker **178** includes a crop stroker **178-1** and a crop stroker **178-2** laterally inverse to the crop stroker **178-1**. The crop stroker **178-1** is configured, for example, as a laterally projecting bump, and the crop stroker **178-2** is configured, for example, as a corresponding laterally recessed dimple. In other embodiments, the body **170** may be perforated such that the crop strokers **178** may be configured as holes extending laterally through the body **170**.

(53) In the array **176** and each array **176-1**, **176-2**, the crop strokers **178** are arranged multi-dimensionally. For example, the crop strokers **178** are arranged in rows and columns. The rows alternate between rows of crop strokers **178-1** and rows of crop strokers **178-2**. Similarly, the columns alternate between columns of crop strokers **178-1** and columns of crop strokers **180-2**. As such, each diagonal sequentially alternates between crop strokers **178-1** and crop strokers **178-2**.
(54) Rows and columns are staggered. For example, immediately adjacent rows are staggered relative to one another, and immediately adjacent columns are staggered relative to one another.
(55) In some embodiments, the crop divider **150** may include an attachment (not shown) coupled to the panel **158**. The attachment may include one or both of the arrays **176-1**, **176-2**. The attachment may be configured, for example, as an over-the-top cover on the panel **158**. The attachment may be coupled to the panel **158** in a wide variety of ways (e.g., riveted, pinned, or bolted). The attachment may be made from a wide variety of materials (e.g., ultra-high molecular weight polyethylene).
(56) In some embodiments, the crop divider **50** and/or the intermediate crop divider **150** may be applied to the return pan **40**.
(57) While the above describes example embodiments of the present disclosure, these descriptions should not be viewed in a limiting sense. Rather, other variations and modifications can be made without departing from the scope and spirit of the present disclosure as defined in the appended claims.

Claims

1. A cleaning system for an agricultural combine harvester, the cleaning system comprising: a pan comprising a stepped floor to receive crop material thereon, the pan arranged for fore-aft reciprocating movement to advance the crop material in a crop-processing direction, and a crop divider mounted with the pan for fore-aft reciprocating movement therewith, the crop divider extending in a fore-aft manner and above the stepped floor to partition the crop material laterally, the crop divider comprising a body and a periphery disposed about the body, the body comprising a multi-dimensional, clustered array of crop strokers extending laterally to engage the crop material to advance the crop material in the crop-processing direction during fore-aft reciprocating movement of the pan.
2. The cleaning system of claim 1, wherein the array of crop strokers comprises crop strokers of a first type and crop strokers of a second type.
3. The cleaning system of claim 2, wherein the first type is a lateral peak, and the second type is a lateral valley.
4. The cleaning system of claim 2, wherein the first type comprises laterally projecting bumps, and the second type comprises laterally recessed dimples.
5. The cleaning system of claim 1, wherein the array comprises rows of crop strokers and columns of crop strokers.
6. The cleaning system of claim 5, wherein the crop strokers of each row are positioned at regular intervals, and the crop strokers of each column are positioned at regular intervals.
7. The cleaning system of claim 5, wherein the rows of crop strokers comprise alternating rows of oppositely sensed crop strokers, and the columns of crop strokers comprise alternating columns of oppositely sensed crop strokers.
8. The cleaning system of claim 7, wherein the alternating rows are alternatingly staggered relative to one another, and the alternating columns are alternatingly staggered relative to one another.
9. The cleaning system of claim 5, wherein the rows are alternatingly staggered relative to one another, and the columns are alternatingly staggered relative to one another.
10. The cleaning system of claim 9, wherein the crop strokers of the rows and the crop strokers of the columns comprise laterally-projecting bumps and laterally recessed dimples.
11. The cleaning system of claim 1, wherein the body comprises a first lateral side and an opposite

second lateral side, and each crop stroker provides a laterally projecting bump on the first lateral side or the second lateral side and an inversely related laterally recessed dimple on the other of the first lateral side or the second lateral side.

12. The cleaning system of claim 1, wherein the crop divider partitions the pan into a first bay and a second bay, the body comprises a first lateral side and an opposite second lateral side, the array is positioned on the first lateral side and extends laterally to engage crop material in the first bay, the body comprises a multi-dimensional, clustered second array of crop strokers positioned on the second lateral side and extends laterally to engage crop material in the second bay, and each of the array and the second array comprises rows and columns of laterally projecting bumps and laterally recessed dimples.

13. The cleaning system of claim 1, wherein the array of crop strokers comprises laterally projecting bumps.

14. The cleaning system of claim 1, wherein each crop stroker of the array of crop strokers has a maximum size, and immediately adjacent crop strokers are spaced apart from one another by an offset less than the maximum size.

15. The cleaning system of claim 1, wherein the crop divider has an X dimension parallel to the stepped floor and a Y dimension orthogonal to the stepped floor, the stepped floor has a step height in the Y dimension, the body of the crop divider comprises an upper zone with the array of crop strokers and a lower zone defined in the X dimension by a length of the array of crop strokers and in the Y dimension by at least a distance between the stepped floor and the array, and the distance is greater than or equal to a value of the step height.

16. The cleaning system of claim 1, wherein the crop divider comprises an upstream half and a downstream half downstream of the upstream half in the crop-processing direction, and the downstream half comprises the array of crop strokers.

17. The cleaning system of claim 1, wherein the crop divider has a Y dimension orthogonal to the stepped floor, and the array of crop strokers increases in height in the Y dimension from the stepped floor as the array extends in the crop-processing direction.