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(54) SCREEN APPARATUS WITH MULTI-DISCHARGE

(57) The present invention provides a mobile multi-deck screening apparatus for screening a mixed material into three graded streams, the apparatus comprising two or more overlapping screening decks and at least three discharge conveyors, wherein one discharge con-

veyor is a switchable conveyor selectively switchable between an active state such that each discharge conveyor discharges one graded stream, to an inactive state such that one discharge conveyor discharges two graded streams.

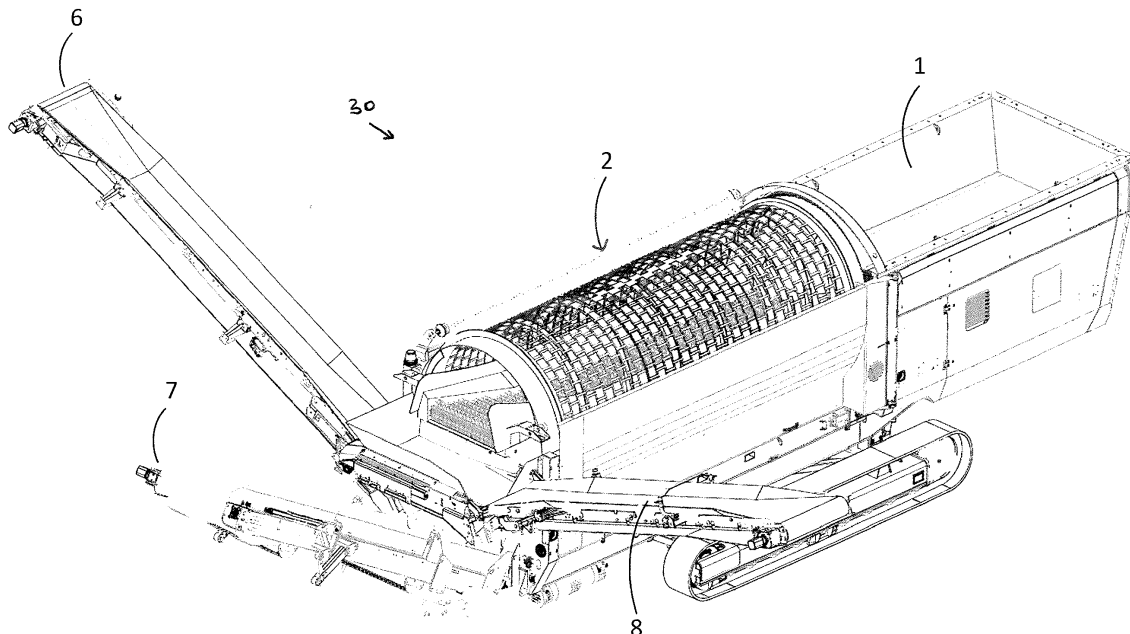


FIG. 1

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Description

FIELD OF THE INVENTION

[0001] The present invention relates to a mobile multi-deck screening apparatus for separating unconsolidated feed materials that contain a mixture of particle sizes into three graded streams of particle sizes, also referred to as fraction size, which can then be provided from the apparatus as two or three final discharge streams.

BACKGROUND

[0002] Quarries, building sites, waste processing facilities and composting facilities utilise various types of screening technologies. The chosen technology will depend on the application, feed material and the desired separation. Typically, screening machines start with a feed hopper or the like, a mechanical screen, and one or more conveyors to transfer the processed materials to a nearby location or to a secondary processing plant.

[0003] A mechanical screen separates material via liner, vibratory or rotary movement. This movement agitates and moves the feed material along a screening deck. Mechanical screens typically comprise of one or more decks. A deck is a frame or apparatus that holds the screen media. A multiple deck screen contains a series of screen decks, each containing a different media; and where one deck is placed above another. The media is the material or apparatus that defines the screen's apertures size. Screen media can be made from woven wire cloth, steel mesh, perforated steel plate, perforated synthetic mats, finger tines or rotating discs. A multi deck screen can separate feed material into two or more fractions.

[0004] A screening machine capable of producing two fraction sizes is commonly referred to as a two-way-split; these fractions are generally classified as 'oversized' and 'undersized'. A screening machine capable of producing three fractions is commonly referred to as a three-way-split; these fractions are classified as 'oversized', 'mid-sized', and 'undersized'.

[0005] These different splits can be provided by dedicated fixed machinery known in the art.

[0006] An integral and mobile apparatus capable of operating either as a two-way-split or as a three-way-split is advantageous in several circumstances, for example where the applications or the composition of feed material is variable, or where space is limited, or where the noise of two fixed machines is environmentally too much. This is particularly when processing waste material such as, construction and industrial waste (C&I), and Municipal solid waste (MSW).

SUMMARY OF THE INVENTION

[0007] The present invention details apparatus able to be configured to operate either as a two-way-split or as

a three-way split.

[0008] According to one aspect of the present invention, there is provided a mobile multi-deck screening apparatus for screening a mixed material into three graded streams, the apparatus comprising two or more overlapping screening decks and at least three discharge conveyors, wherein one discharge conveyor is a switchable conveyor selectively switchable between an active state such that each discharge conveyor discharges one graded stream, to an inactive state such that one discharge conveyor discharges two graded streams.

[0009] According to another aspect of the present invention, there is provided a method of switching the discharge of a mixed material graded into three graded streams, comprising at least the steps of:

providing a mobile multi-deck screening apparatus for screening the mixed material into three graded streams, the apparatus comprising two or more overlapping screening decks and at least three discharge conveyors, selectively switching one discharge conveyor between an active state such that each discharge conveyor can discharge one graded stream, to an inactive state such that one discharge conveyor can discharge two graded streams.

[0010] Advantageously, the present invention comprises; a discharge conveyor for collecting and discharging the oversized fraction, referred to as the oversize conveyor; a discharge conveyor for collecting and discharging the mid-sized fraction, referred to as the midsize conveyor; an internal conveyor for collecting the undersized fraction, referred to as the collection conveyor; and a discharge conveyor for discharging the undersized fractions, referred to as the undersize conveyor.

[0011] In one embodiment, the present invention describes how an oversize conveyor can be switched to divert the flow of oversized material to a midsize conveyor, allowing the midsize conveyor to function as a 'two in one' discharge conveyor. In this way, the midsize conveyor can be repurposed and used to collect and transfer the oversized and mid-sized material together as one fraction, thus making the oversize conveyor unrequired. With this configuration, the invention can produce oversized and undersized fractions only.

[0012] The invention also describes how an oversize conveyor can moved back into position to re-collect and transfer the oversized material, therefore allowing the screening machine to revert to providing oversized, mid-sized, and undersized fractions.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] The invention will be more clearly understood by the following descriptions of some embodiments thereof, given by way of example only, which reference to accompanying drawings, in which:

FIG. 1 is a perspective view of apparatus according to one embodiment of the present invention.

FIG. 2 is a side sectional view of Fig. 1.

FIG. 3 is a working illustration of a three-way split showing material.

FIG. 4 is a working illustration of a two-way split showing material.

FIG. 5 is an illustration showing movement of a discharge conveyor in a diagonal direction.

FIG. 6 is an illustration showing movement of a discharge conveyor in a vertical direction.

FIG. 7 is an illustration showing movement of a discharge conveyor in a horizontal direction.

DETAIL DESCRIPTION OF PREFERRED EMBODIMENTS

[0014] The present invention provides a mobile multi-deck screening apparatus for screening a mixed material into three graded streams, the apparatus comprising two or more overlapping screening decks and at least three discharge conveyors, wherein one discharge conveyor is a switchable conveyor selectively switchable between an active state such that each discharge conveyor discharges one graded stream, to an inactive state such that one discharge conveyor discharges two graded streams.

[0015] Optionally, the apparatus has a main chassis to support the two or more overlapping screening decks and the at least three discharge conveyors, and a tracked mobile chassis. The apparatus may further comprise one or more sub-frames, and provides an integral apparatus in operation. The apparatus may be mobile using wheels, tracks, and other such means, or combinations of same.

[0016] Optionally, the apparatus further comprises one or more internal conveyors to convey a graded stream to a discharge conveyor. The internal conveyors may be suited to collect a particular graded stream, such as the finest-graded stream, thereby acting as a collection station for such stream, which can then be conveyed to one end of the relevant discharge conveyor for discharge beyond the apparatus for further processing or stockpiling or the like.

[0017] In one embodiment of the present invention, the apparatus comprises;

- a first discharge conveyor for collecting and discharging a relative oversized fraction of the mixed material,
- a second discharge conveyor for collecting and discharging a relative midsized fraction of the mixed material,
- a first internal conveyor for collecting a relative undersized fraction of the mixed material, and
- a third discharge conveyor for discharging the undersized fraction collected by the internal conveyor.

[0018] In one embodiment of the present invention, the

switchable discharge conveyor is a first discharge conveyor for collecting and discharging a relative oversized fraction of the mixed material.

[0019] The terms oversized, midsized, and undersized are used herein in a relative sense to each other, and in a manner known in the art.

[0020] Optionally, the apparatus further comprises a stream-collecting station for one or more of the discharge conveyors, optionally all of the discharge conveyors. Each discharge conveyor may have the same or a different form, type, design or shape of stream-collecting station. A stream-collecting station may comprise any suitable form of collection chute, vessel, tray, bay, hopper or conveyor, able to collect the relevant graded stream discharged at the end of a screen, and to guide or transfer such material to one end of a discharge conveyor.

[0021] A stream-collecting station may only be the feed end of a discharge conveyor, or take the form of one or more walls, plates or baffles, designed at or near or around the feed end of a discharge conveyor.

[0022] In one embodiment of the present invention, there is a stream-collection station at or near the feed end of the switchable discharge conveyor, optionally formed as a tray.

[0023] Optionally, a stream-collection station is for collecting a relative oversized fraction of the mixed material.

[0024] Optionally, a stream-collecting station for the switchable discharge conveyor is located in its active state above another discharge conveyor.

[0025] Optionally, the stream-collecting station for the switchable discharge conveyor is not located in its inactive state above another discharge conveyor. Thus, the relevant graded stream provided at one end of a screen, and previously collected and transferred to the switchable discharge conveyor, is now provided to a feed end of another discharge conveyor. Most conveniently, this can be carried out with the aid of gravity, i.e. allowing such the discharged graded stream to fall by gravity directly towards the feed end of another discharge conveyor. This re-combines two graded streams from the apparatus, for subsequent discharge by one discharge conveyor.

[0026] Optionally, the stream-collecting station for the switchable discharge conveyor and the switchable discharge conveyor are moveable together between an active stream-collecting position to an inactive non-collecting position. For example, the stream collection station and switchable discharge conveyor may be secured together, or secured to a single frame or sub-frame to form an integral unit.

[0027] Optionally, the stream-collecting station for the switchable discharge conveyor and the switchable discharge conveyor are moveable relative to a ground surface in a direction relative to the apparatus comprising one or more of the group comprising: horizontal, vertical, lateral, or a combination of same. For example, the stream collecting station and switchable discharge conveyor could be moveable vertically relative to the remain-

der of the apparatus, such that the stream collecting station is no longer located at the same height relative to the discharge end of a screen, and is therefore no longer able to collect such discharge stream. Additionally or alternatively, the stream collecting station and switchable discharge conveyor could be translated horizontally away from a screen, to achieve the same non-collecting effect. In a further possible embodiment, the stream collecting station and switchable discharge conveyor are moveable diagonally away from the apparatus.

[0028] All such movement of the stream collecting station and switchable discharge conveyor could be based on a frame or sub-frame, which frame or sub-frame is moveable relative to the apparatus by one or more actuators, motors or other drives known in the art.

[0029] In an alternative or additional embodiment, the stream-collecting station for the switchable discharge conveyor is selectively switchable between discharging to the switchable discharge conveyor, and discharging to another discharge conveyor. For example, the stream collecting station for the switchable discharge conveyor may have one or more chutes, baffles, floors, walls or sides, able to collapse or move, thus changing the direction of the collection of the graded stream from the end of the relevant screen in a different direction than towards the feed end of the switchable discharge conveyor. The stream collecting station thus switches the direction of the graded stream to another discharge conveyor, typically including a vertical translation using gravity, for such graded stream to be re-combined with another graded stream, before co-discharge by another discharge conveyor.

[0030] Optionally, the switchable discharge conveyor is supported on a frame moveable relative to a frame supporting the two or more overlapping screening decks

[0031] Optionally, the switchable discharge conveyor is supported on a frame moveable relative to a frame supporting another discharge conveyor.

[0032] Optionally, each screen in the apparatus has a feed end and a discharge end. The two or more overlapping screening decks have the same or different material flow directions from an infeed hopper end to each relevant screen-discharge end. For example, a collection conveyor for the smallest discharge stream, such as the 'undersize' fraction, could be used to convey material back towards an infeed end. An undersized discharge conveyor could be positioned at the back of the screening apparatus, or underneath the feeder to the screening apparatus.

[0033] Optionally, the two or more overlapping screening decks have the same material flow direction from an infeed hopper end to the same or similar screen-discharge ends, and one end of each of the three graded discharge conveyors is located at or near such screening-discharge end or ends.

[0034] Each screen of the multi-deck may be the same or different, to achieve a vertical partial, substantial or full overlapping arrangement. Each screen can be either

vibrating, oscillating or rotating, (i.e. having a rotating drum or rotating disks). Each deck can be made of any of these type of screens. A two-deck arrangement generally has a 'top' deck and a 'bottom' screen. Non-limiting examples include: (1) a top deck vibrating screen and a bottom deck star screen; (2) a top deck disc screen and a bottom deck vibrating screen; (3) a top deck vibrating screen and a bottom deck rotating drum screen; (4) a top deck disc screen and a bottom deck rotating drum screen; and. (5) a top deck disc screen and a bottom deck disc screen. The skilled reader understands that other variants are possible to achieve a mobile multi-deck screening apparatus comprising two or more overlapping screening decks.

[0035] In one embodiment of the present invention, the two or more overlapping screening decks comprise a rotary drum screen and a disc screen. Optionally, the disc screen is wholly, substantially or partly located within the rotary drum screen.

[0036] The term 'disc screen' is used herein to include screens comprising a series of spaced rotating drums or rollers or shafts, arranged in a generally linear direction, with defined openings thereinbetween to provide the screening.

[0037] A disc screen may be arranged to angle or incline (relative to a ground surface), or to have one or more differently angled or inclined portions.

[0038] One disc screen comprises a series of shafts, optionally with a rough or roughened surface, with defined openings or spacings thereinbetween. Various other disc or star screens are known in the art, typically having a series of shafts on which rotating star or disc type wheels or other shapes are mounted. The spacing between the shafts and the wheels determines the respective openings in the screen. Separation is achieved by rotating the shafts simultaneously in the same direction to agitate and move material across the top of the shafts, discs or wheels, and so along the screen's surface. Those items, parts or particles of the material that are smaller than the openings fall through the openings, while those parts, etc. greater than the apertures continue to move along the screening surface until it exits the screen.

[0039] Disc screens are particularly suited for screening damp and bulk materials, and are particularly useful for screening biomass as they provide good agitation, which is necessary for separating the particles that tend to knit together.

[0040] Optionally, a disc screen comprises a series of discs mounted on driven shafts. The disc could have a shape selected from the group comprising: a polygon, circular, egg, ovoid or a star shape. Optionally, the disc screen comprises two or more disc screens in series, extending at least partially along the length of the rotary drum screen.

[0041] Optionally, a disc screen is mounted on a disc frame, and the disc frame securable to another screen.

[0042] Rotary drum screens are known in the art, and generally comprise a rotating mechanical screen able to

separate a variety of materials into different particle sizes. The screen has a perforated cylindrical drum with various aperture sizes, rotated on or by a frame, and with a feed or input end, and a discharge or output end. Separation is achieved by rotating the drum to agitate and move the material along the drum's screening surface. Typically a rotary drum screen comprises a cylindrical drum, rotated on or by a frame, optionally at least partly in an outer housing. A disc frame may be secured to each end of the frame or housing, and extend through the drum.

[0043] Optionally, a disc frame includes a disc drive mechanism to drive the shafts and discs. The mechanism is typically a series of drive chains and cogs, able to transfer power from a motor or the like on the apparatus to the relevant shafts to drive all the discs. Such mechanisms are known in the art, and can be protected by the disc frame in use.

[0044] Where a disc screen is wholly, substantially or partly located within a rotary drum screen, the disc screen may extend beyond one or both ends of the rotary drum screen, or start within one or both ends of the rotary drum screen, or a combination of same.

[0045] Optionally, a disc screen has a feed end located within the feed end of a rotary drum screen. Optionally, the disc screen has a discharge end beyond the discharge end of a rotary drum screen.

[0046] Optionally, the a frame provides side walls to the disc screen, to retain material on the disc screen that is not sized to pass through its apertures until reaching the discharge end of the disc screen.

[0047] A disc screen may have any suitable configuration relative to the rotary drum screen. Where a rotary drum screen has a longitudinal centre line along its drum length, a disc screen may wholly or substantially be positioned in line with such longitudinal centre line, optionally above or below the longitudinal centre line, and optionally being wholly, substantially or partly inclined relative to the longitudinal centre line.

[0048] Those items, parts or particles of the mixed material that are smaller than the openings in a first screen, fall through the openings, while those parts, etc. of the mixed material greater than the apertures continue to move along the screening surface until it exits the screen, and provide a first graded stream, which can be termed the 'oversized stream'.

[0049] The material that passes through the openings in the first screen falls by gravity into a second screen below or surrounding the first screen.

[0050] Those items or parts or particles of the mixed material smaller than the apertures of the second screen pass through the screen to provide a second graded stream, which can be termed an 'undersized stream'. Those particles, etc. of the mixed material bigger than the apertures in the second stream (but smaller than the apertures in the first screen), which can be termed a 'mid-sized stream', continue to move along the second screening surface until they exit the screen at the discharge end as a third graded stream.

[0051] Depending on the desired separation, the apertures in the second screen can vary in sizes and shape. Apparatus containing drum screens, commonly referred to as 'trommels', are known in the art in the pre-treatment of mixed commercial and municipal wastes; as well as for screening materials such as soil, biomass, ores, rock, sand, and aggregates.

[0052] Preferably, the multi-deck screening part of the present invention can be provided as an integrated rotary or trommel screen or unit, and a disc screen unit or assembly.

[0053] The present invention also provides a method of switching the discharge of a mixed material graded into three graded streams, comprising at least the steps of:

providing a mobile multi-deck screening apparatus for screening the mixed material into three graded streams, the apparatus comprising two or more overlapping screening decks and three discharge conveyors,

selectively switching one discharge conveyor between an active state such that each discharge conveyor can discharge one graded stream, to an inactive state such that one discharge conveyor can discharge two graded streams.

[0054] The invention can also be described as having an infeed and a discharge; with the infeed describing the input of material to be processed; with the infeed describing the screen end adjacent to the feeder; with the discharge describing the material exiting the screen for collection and transfer away from the apparatus by the discharge conveyors.

[0055] The mixed material to be screened by the present invention may comprise any mixture, including materials from quarries, building sites, waste processing facilities and composting facilities, including but not limited to feed materials that contain high volumes of damp, bulky and/or non-uniform constituents such as biomass, plastic, textiles, newspaper, and cardboard. This includes waste materials such as, construction and industrial waste (C&I), constructions and demolition waste (C&D), biomass, and Municipal solid waste (MSW).

[0056] Optionally, the apparatus is for screening a mixed material into more three graded streams, by additional processing or screening or separation, prior to conveyance away from the apparatus.

[0057] Optionally, the apparatus further comprises a feed hopper for the mixed material, further optionally an integral feeder hopper, next to or otherwise near the feed end of one screen of the multi-decks.

[0058] The term 'discharge' is used herein to describe the material provided by the apparatus as a graded stream, typically for subsequent collection and stockpiling for further use or processing.

[0059] Referring to the drawings, FIG. 1 is a perspective view of an example of a mobile multi-deck screening

apparatus 30 for screening a mixed material into three graded streams, the apparatus comprising two or more overlapping screening decks 2 and at least three discharge conveyors, 6, 7, 8, wherein one discharge conveyor is a switchable conveyor 8 selectively switchable between an active state to an inactive state.

[0060] FIG. 2 is a sectional view of the apparatus 30 of FIG. 1. The apparatus 30 comprises of a feeder 1; overlapping screening decks 2 comprising two decks, an upper deck 3 being a disc screen, and lower deck 4 formed by a trommel or drum that extends wholly or substantially around the upper deck 3, and which rotates in a manner known in the art; a collection conveyor 16, positioned directly underneath the bottom of the lower deck 4; an undersize discharge conveyor 6; a midsize discharge conveyor 7 (or two-in-one discharge conveyor 17 as discussed hereinafter); and an oversize conveyor 8 as a switchable discharge conveyor.

[0061] FIG. 3 illustrates a material flow direction 9 in a three-way-split configuration. In this illustration, feed material 10 enters the overlapping screening decks 2 to an upper deck 3 via the feeder 1, typically having a feed conveyor 1a. As the feed material 10 flows along the upper screen deck 3, midsize and undersized particles 11 pass through the screen's apertures and onto the deck below 4. The oversized particles 13 exit the upper screen deck 3 at a discharge end 12 towards a first collection station 32, optionally being a tray or bay or even a hopper, from which the oversize conveyor 8 collects and discharges the oversized particles 13 for further processing or stockpiling.

[0062] Meanwhile, the lower screening deck 4 separates the undersized particles 14 from the midsize particles 15; here, the undersized particles 14 pass through the lower screen deck 4 apertures and onto the internal collection conveyor 16 below as a second collection station. The collection conveyor 16 transfers the undersized particles 14 to the undersize conveyor 6, for subsequent discharge.

[0063] Meanwhile, the midsize particles 15 exit the screens 2 at a discharge end to a third collection station 34, where the midsize conveyor 7 collects and discharges the midsize particles 15.

[0064] FIG. 4 illustrates the material flow 9 in a two-way-split configuration, i.e without the involvement or use of the oversize conveyor 8. In FIG. 4, the feed material 10 enters the screen decks 2 via the feeder 1 in the same way as FIG 3. As the feed material 10 flows along the upper screen deck 3, midsize and undersized particles 11 pass through the screen's apertures and onto the screening deck below 4. The lower screening deck 4 separates the undersize 14 particles from the midsize particles 15; here, the undersize particles 14 pass through the lower screen deck 4 apertures and onto the collection conveyor 16 below. The collection conveyor 16 transfers the undersized particles 14 to the undersize discharge conveyor 6, which is subsequently discharged. The midsize particles 15 exit the screen at the discharge end.

[0065] The oversize particles 13 exit the upper screen 3 at the same discharge end 12. But the apparatus 30 diverts the flow 19 of oversized particles 13 towards the stream-collection station 34 of the midsize conveyor 7 for re-combining with the midsize particles 15. This can be achieved by repositioning the oversized conveyor 8 (not shown in FIG 4), as illustrated in FIG.s 5-7, allowing the apparatus 30 to change between a two or three-way split configuration, as illustrated in FIGS. 3 and 4. The oversized conveyor 8 is thus a switchable discharge conveyor 8.

[0066] Meanwhile, the midsize conveyor 7 becomes a two-in-one discharge conveyor 17 able to collect and discharge both the oversized 13 and midsize 15 particles as one single fraction 18.

[0067] FIGS. 5, 6 and 7 illustrate three different types of movement that will allow the oversize conveyor 8 and stream-collection station 32 to be repositioned away from the stream of oversize particles 19. FIG. 5 illustrates the movement in a diagonal direction 21. FIG. 6 illustrates the movement in a vertical direction 22. FIG. 8 illustrates the movement in a horizontal 23 direction.

[0068] Thus, when the apparatus 30 is operating in a three-way-split configuration, the oversize conveyor 8 and stream-collection station 32 are positioned directly next to the discharge end 12 of the upper screen 3, allowing the oversize conveyor 8 to collect and discharge the oversize particles 13 as a separate fraction, as illustrated in FIG. 3.

[0069] And when the apparatus 30 is operating in a two-way-split configuration, the oversize conveyor 8 and stream-collection station 32 are positioned away from the discharge end 12 of the upper screen 3, and away from the flow of material 19, as illustrated in FIGS. 5, 6 and 7. As a result, the oversized particles 13 divert towards 19 the midsize conveyor 7, effectively making the oversize conveyor 8 inactive. The midsize conveyor 7 is thus repurposed, as in, the purpose of the midsize conveyor 7 is now to collect and discharges the oversize 13 and midsize 15 particles together as one distinct fraction 18. Thus, the midsize conveyor 7 is re-designated, and is referred to as the two-in-one conveyor 17.

[0070] The present invention provides an integral and mobile apparatus capable of operating either as a two-way-split or as a three-way-split for three different grade streams of a mixed feed material.

Claims

1. A mobile multi-deck screening apparatus for screening a mixed material into three graded streams, the apparatus comprising two or more overlapping screening decks and at least three discharge conveyors, wherein one discharge conveyor is a switchable conveyor selectively switchable between an active state such that each discharge conveyor discharges one graded stream, to an inactive state such

that one discharge conveyor discharges two graded streams.

2. Apparatus as claimed in claim 1 having a main chassis to support the two or more overlapping screening decks and the at least three discharge conveyors, and a tracked mobile chassis. 5
3. Apparatus as claimed in any one of the preceding claims further comprising one or more internal conveyors to convey a graded stream to a discharge conveyor. 10
4. Apparatus as claimed any one of the preceding claims comprising: 15
 - a first discharge conveyor for collecting and discharging a relative oversized fraction of the mixed material,
 - a second discharge conveyor for collecting and discharging a relative midsized fraction of the mixed material, 20
 - a first internal conveyor for collecting a relative undersized fraction of the mixed material, and
 - a third discharge conveyor for discharging the undersized fraction collected by the internal conveyor. 25
5. Apparatus as claimed in any one of the preceding claims comprising a stream-collecting station for the switchable discharge conveyor, located in its active state above another discharge conveyor. 30
6. Apparatus as claimed in claim 5 wherein the stream-collecting station is not located in its inactive state another discharge conveyor. 35
7. Apparatus as claimed in claim 5 or claim 6 wherein the stream-collecting station and the switchable discharge conveyor are moveable together between an active stream-collecting position to an inactive non-collecting position. 40
8. Apparatus as claimed in claim 7 wherein the stream-collecting station and the switchable discharge conveyor are moveable relative to a ground surface in a direction relative to the apparatus comprising one or more of the group comprising: horizontal, vertical, lateral, or a combination of same. 45
9. Apparatus as claimed in claim 5 wherein the stream-collecting station for the switchable discharge conveyor is selectively switchable between discharging to the switchable discharge conveyor, and discharging to another discharge conveyor. 50
10. Apparatus as claimed in any one of the preceding claims wherein the switchable discharge conveyor 55

is supported on a frame moveable relative to a frame supporting the two or more overlapping screening decks

11. Apparatus as claimed in any one of the preceding claims wherein the switchable discharge conveyor is supported on a frame moveable relative to a frame supporting another discharge conveyor.
12. Apparatus as claimed in any one of the preceding claims wherein the two or more overlapping screening decks have the same material flow direction from an infeed hopper end to a screening-discharge end, and wherein one end of each of the three graded discharge conveyors is located at or near the screening-discharge end.
13. Apparatus as claimed in any one of the preceding claims wherein the two or more overlapping screening decks comprise a rotary drum screen and a disc screen.
14. Apparatus as claimed in claim 13 wherein the disc screen is wholly, substantially or partly located within the rotary drum screen.
15. A method of switching the discharge of a mixed material graded into three graded streams, comprising at least the steps of:
 - providing a mobile multi-deck screening apparatus for screening the mixed material into three graded streams, the apparatus comprising two or more overlapping screening decks and three discharge conveyors,
 - selectively switching one discharge conveyor between an active state such that each discharge conveyor can discharge one graded stream, to an inactive state such that one discharge conveyor can discharge two graded streams.

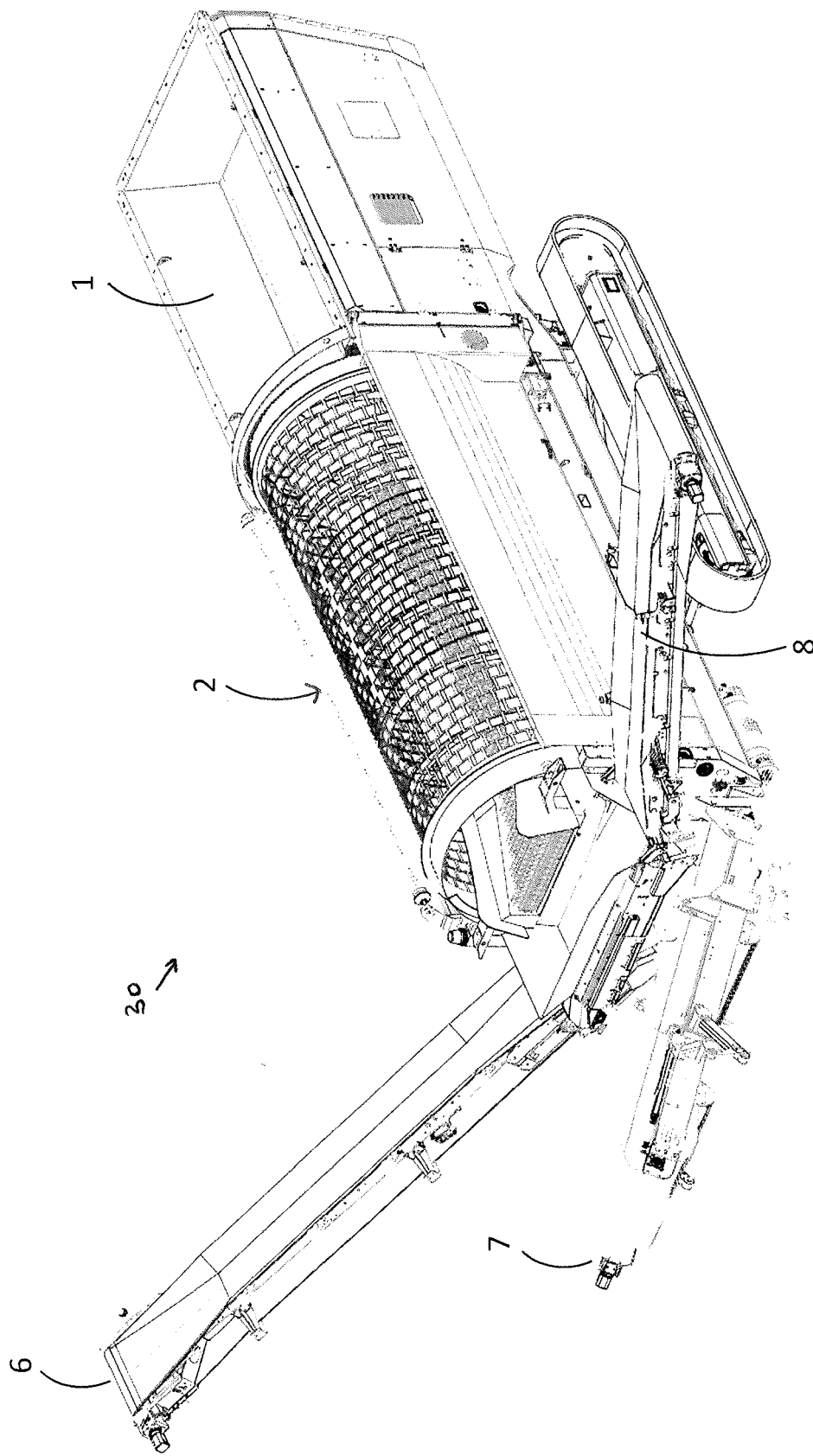


FIG. 1

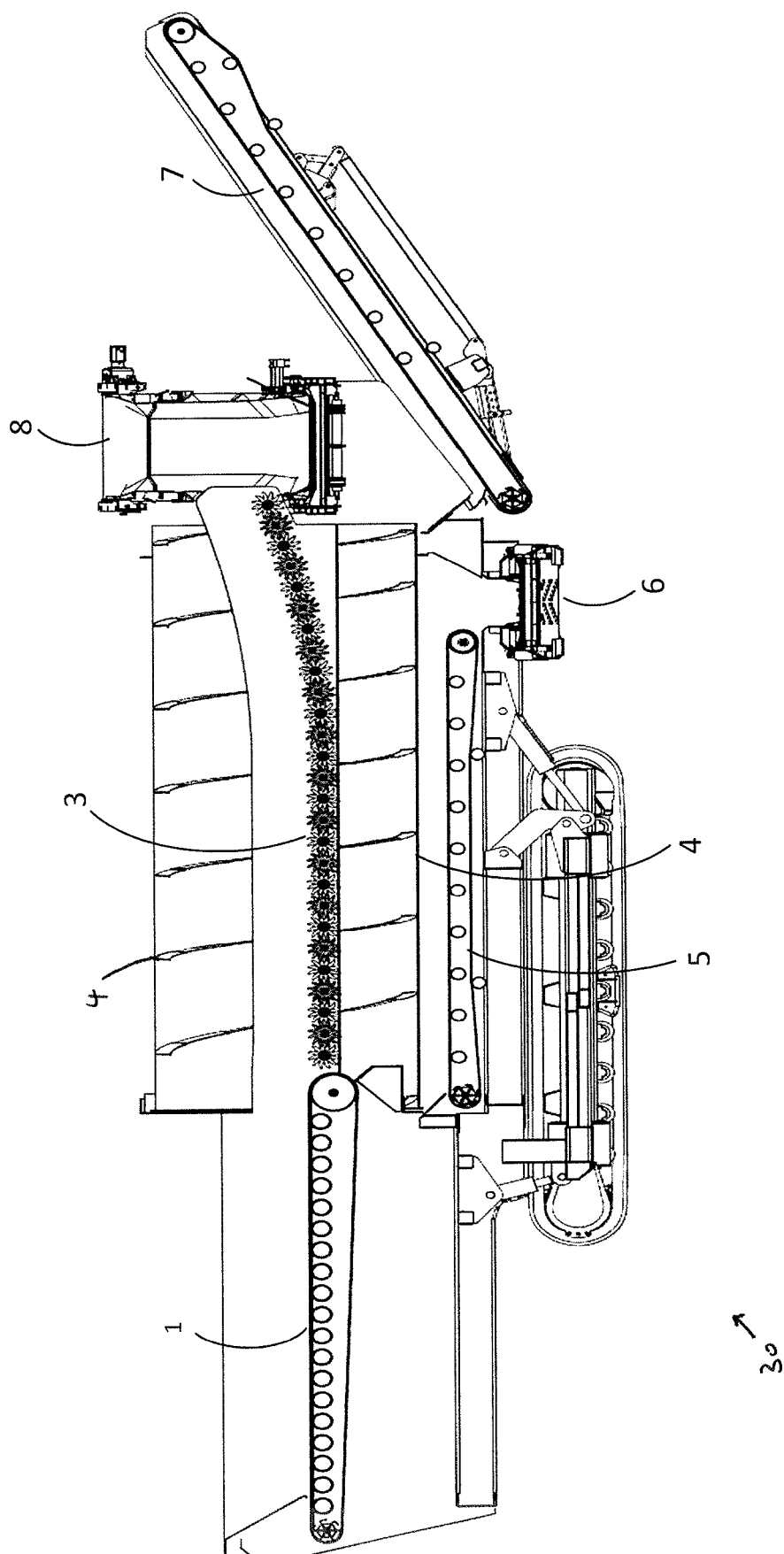


FIG. 2

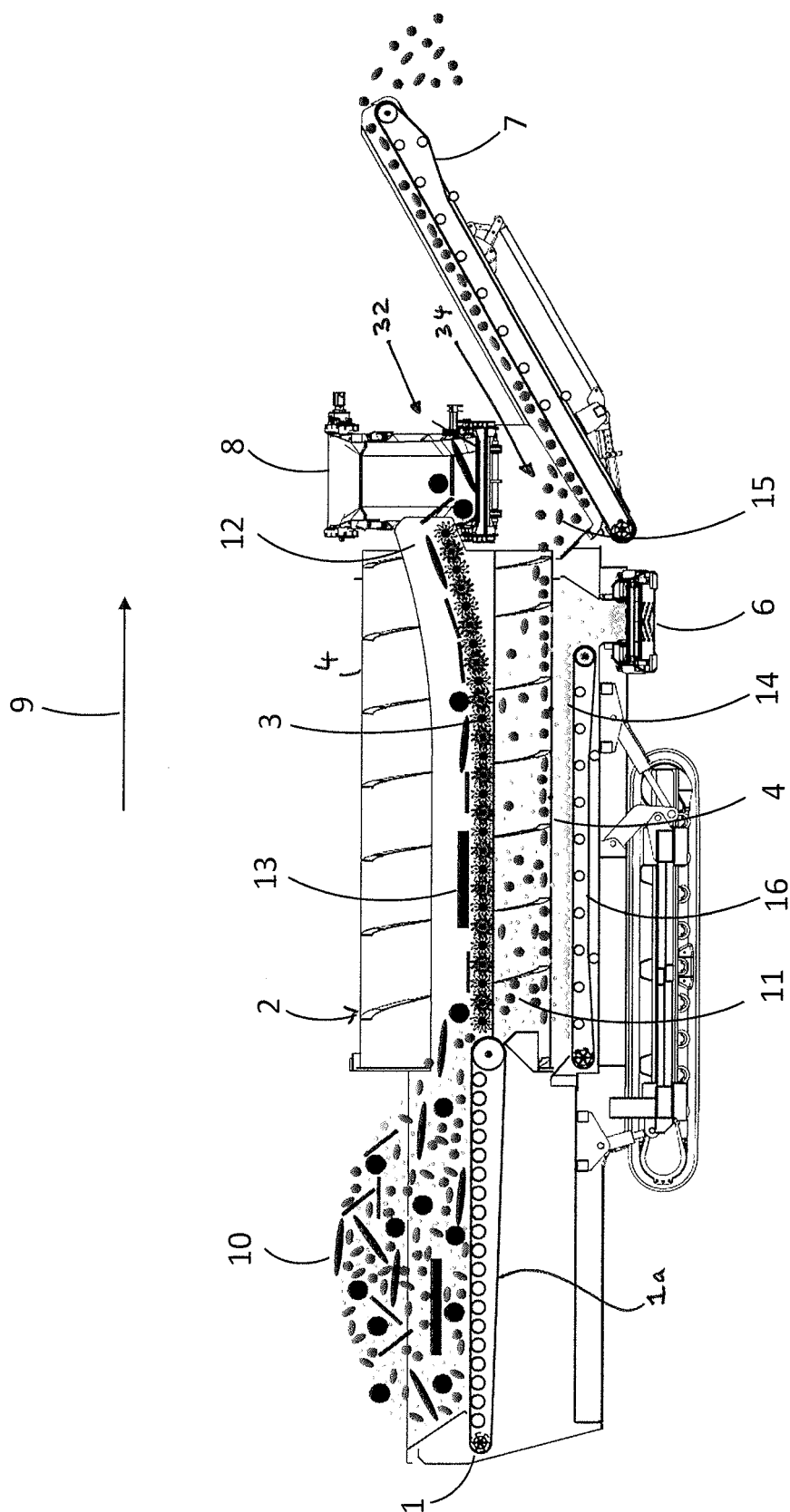


FIG. 3

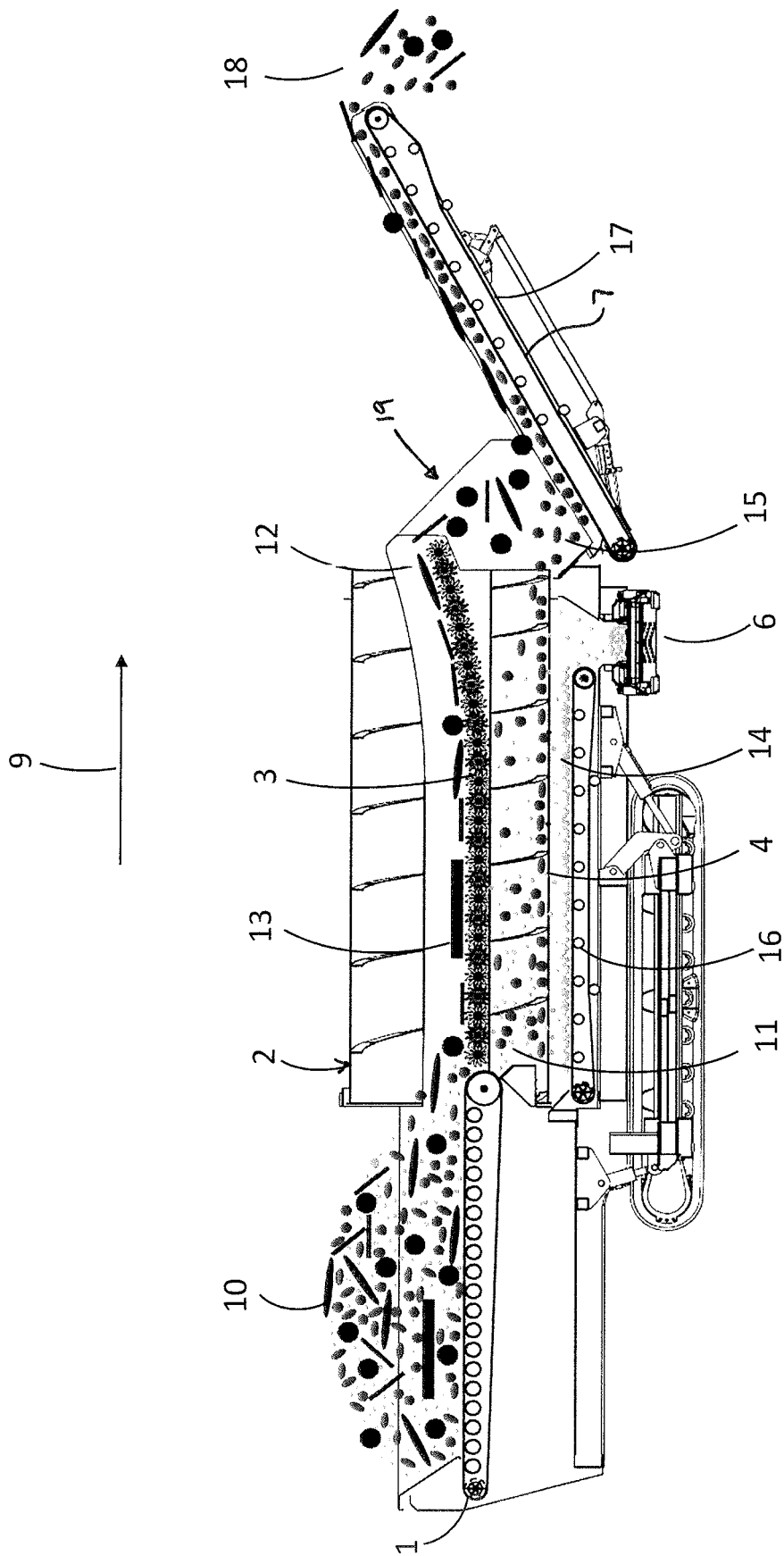


FIG. 4

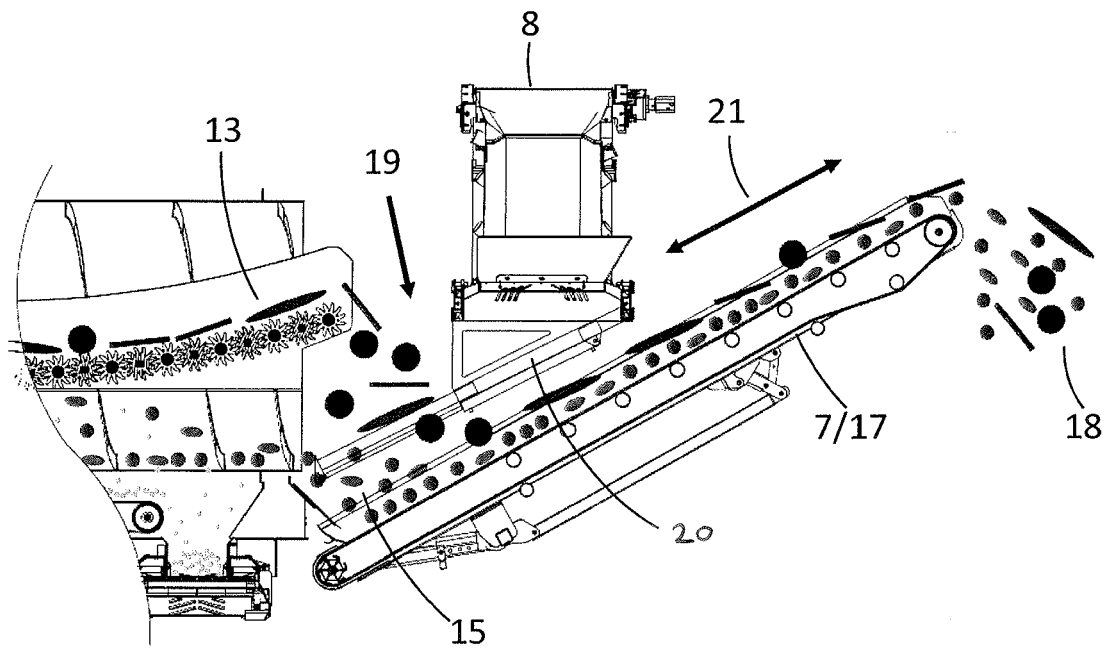


FIG. 5

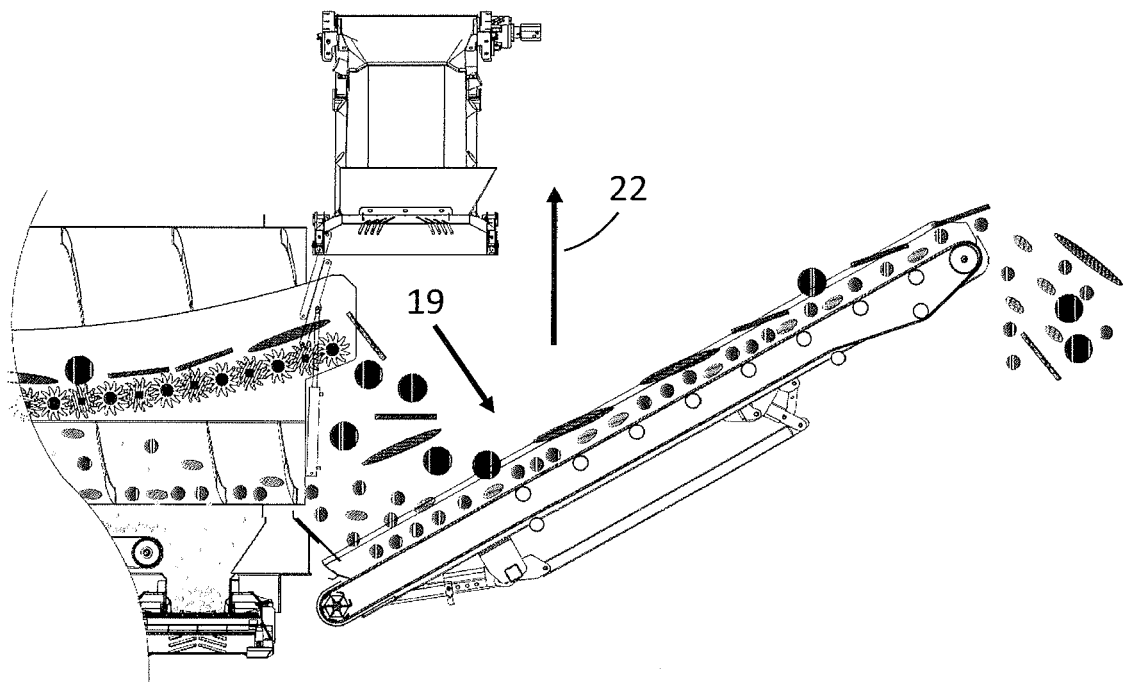


FIG. 6

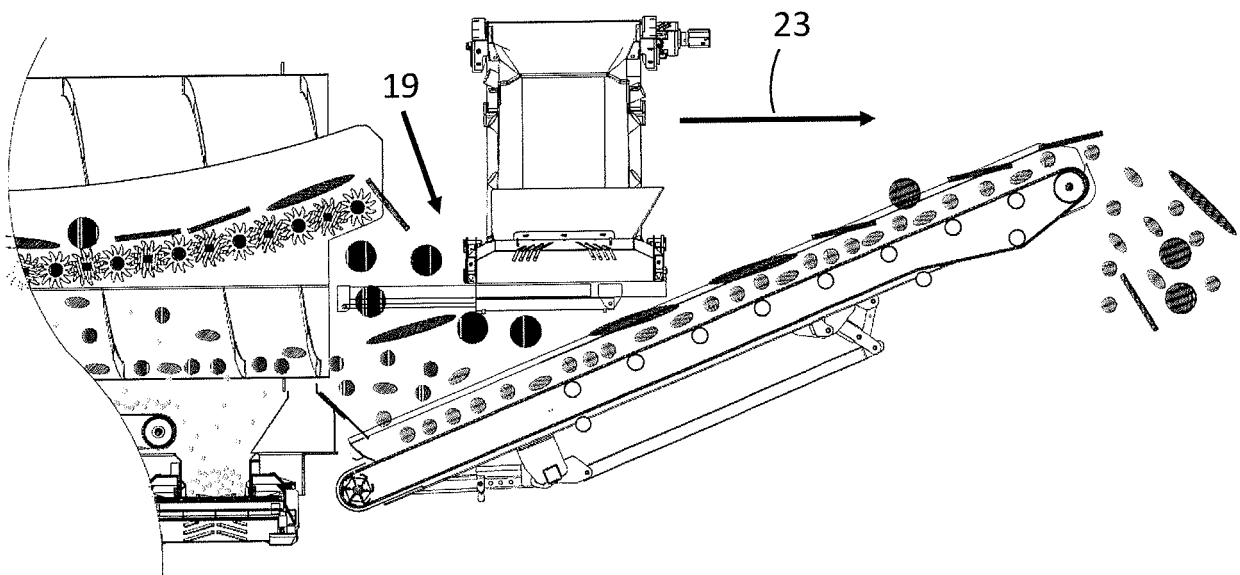


FIG. 7



EUROPEAN SEARCH REPORT

 Application Number
 EP 21 16 2486

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	GB 2 309 923 A (ERIN INTELLECTUAL PROPERTY LIM [IE]) 13 August 1997 (1997-08-13)	1-3,5,6,10,11,15	INV. B07B1/00 B07B1/15 B07B1/22 B07B13/16
Y	* page 18, line 17 - page 21, line 21; figures 9-10 * * page 25, line 20 - page 27, line 24; figures 12-16 *	4,12-14	
X	EP 3 482 836 A1 (SANDVIK INTELLECTUAL PROPERTY [SE]) 15 May 2019 (2019-05-15)	1-3,5,6,10,11,15	
Y	* paragraph [0044] - paragraph [0046]; figures 2,4,5,6 *	12-14	
X	WO 2013/131145 A1 (AAA SCREENS PTY LTD [AU]) 12 September 2013 (2013-09-12)	1-4,9-12,15	
Y	* paragraph [0208] - paragraph [0216]; figures 33-36,43 *	4,13,14	
X	EP 1 136 130 A2 (HAJEK OTHMAR ING [AT]) 26 September 2001 (2001-09-26)	1,2,5,6,9,12,15	TECHNICAL FIELDS SEARCHED (IPC) B07B
Y	* paragraph [0055] - paragraph [0066]; figures 1,6,7 *		
E	EP 3 799 967 A1 (KLEEMANN GMBH) 7 April 2021 (2021-04-07)	1-4,10,11,15	
X	US 2008/041984 A1 (SAUSER EDWIN [US] ET AL) 21 February 2008 (2008-02-21)	1-6,9-12,15	
Y	* paragraph [0111] - paragraph [0114]; figures 26-29 *	12-14	
E	WO 2021/123502 A1 (METSO MINERALS INC [FI]) 24 June 2021 (2021-06-24)	1-6,9-12,15	
	* page 6, line 23 - page 8, line 9; figures 1,3,4,6 *		
		-/--	
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 12 August 2021	Examiner Cassiat, Clément
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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EUROPEAN SEARCH REPORT

Application Number
EP 21 16 2486

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25

30

35

40

45

2

50

55

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	US 5 361 909 A (GEMMER BRADLEY K [CA]) 8 November 1994 (1994-11-08) * column 6, line 65 - line 67; figures 1,2,6 * -----	13,14	
			TECHNICAL FIELDS SEARCHED (IPC)
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 12 August 2021	Examiner Cassiat, Clément
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 21 16 2486

5

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

12-08-2021

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15

20

25

30

35

40

45

50

55

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB 2309923 A	13-08-1997	GB 2309923 A	13-08-1997
		IE S74896 B2	13-08-1997
		IE 970078 A1	23-08-2000
EP 3482836 A1	15-05-2019	AU 2018363808 A1	07-05-2020
		BR 112020009272 A2	27-10-2020
		CA 3080921 A1	16-05-2019
		CL 2020001216 A1	18-12-2020
		CN 111344071 A	26-06-2020
		EP 3482836 A1	15-05-2019
		PL 3482836 T3	16-11-2020
		US 2021069750 A1	11-03-2021
		WO 2019092243 A1	16-05-2019
WO 2013131145 A1	12-09-2013	AU 2013230694 A1	30-10-2014
		AU 2018202149 A1	19-04-2018
		CA 2903563 A1	12-09-2013
		CA 3074971 A1	12-09-2013
		EP 2822707 A1	14-01-2015
		US 2015027932 A1	29-01-2015
		US 2018065153 A1	08-03-2018
		WO 2013131145 A1	12-09-2013
EP 1136130 A2	26-09-2001	AT 4116 U1	26-02-2001
		AT 392952 T	15-05-2008
		EP 1136130 A2	26-09-2001
EP 3799967 A1	07-04-2021	CN 112604939 A	06-04-2021
		DE 102019126778 A1	08-04-2021
		EP 3799967 A1	07-04-2021
		US 2021101181 A1	08-04-2021
US 2008041984 A1	21-02-2008	CA 2592698 A1	22-12-2007
		CA 2856144 A1	22-12-2007
		US 2008041984 A1	21-02-2008
		US 2012175287 A1	12-07-2012
		US 2013284834 A1	31-10-2013
		US 2015182971 A1	02-07-2015
		US 2018154368 A1	07-06-2018
		US 2021016970 A1	21-01-2021
WO 2021123502 A1	24-06-2021	NONE	
US 5361909 A	08-11-1994	CA 2094518 A1	22-10-1994
		US 5361909 A	08-11-1994

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82