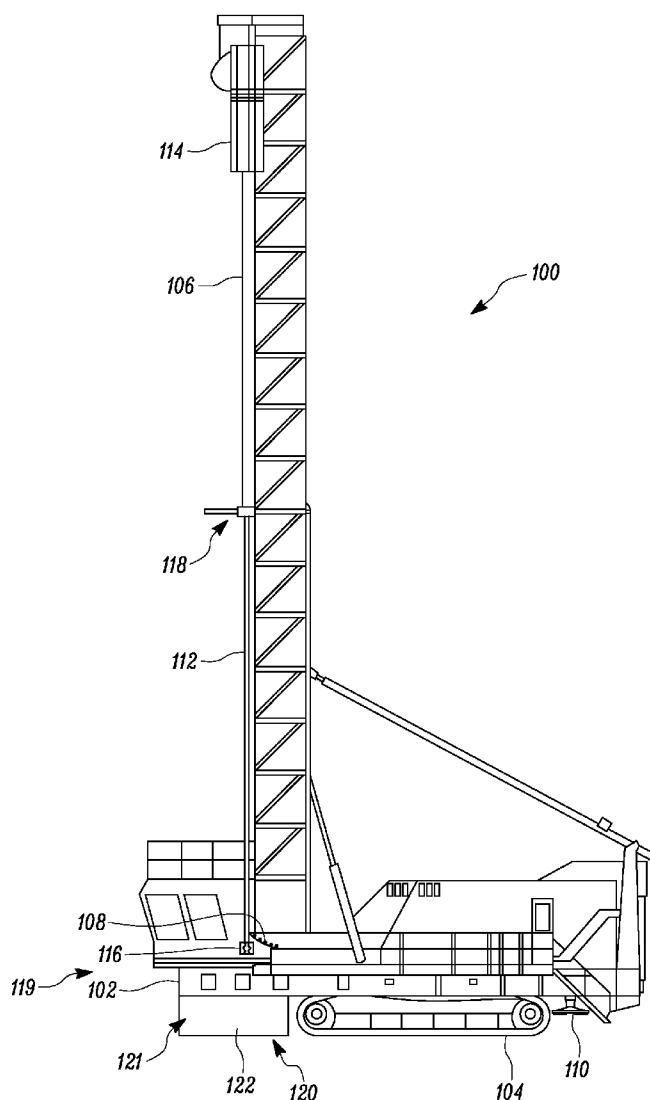




US 20150167991A1

(19) **United States**(12) **Patent Application Publication**
Muthukumar et al.(10) **Pub. No.: US 2015/0167991 A1**(43) **Pub. Date: Jun. 18, 2015**(54) **DUST CONTAINMENT ASSEMBLY**(71) Applicant: **Caterpillar Inc.**, Peoria, IL (US)(72) Inventors: **Ramshankar Muthukumar**, Chennai (IN); **Vikram Kumar R. Tallapalli**, Chittoor (IN); **Arulmanimurugan Mani**, Chennai (IN); **Rahman Jones**, McKinney, TX (US)(73) Assignee: **Caterpillar Inc.**, Peoria, IL (US)(21) Appl. No.: **14/633,142**(22) Filed: **Feb. 27, 2015****Publication Classification**(51) **Int. Cl.**
F24F 7/007 (2006.01)(52) **U.S. Cl.**CPC **F24F 7/007** (2013.01)(57) **ABSTRACT**

A dust containment assembly for a work machine includes a frame having an access opening. The dust containment assembly includes a curtain assembly having a first curtain member a second curtain member. The curtain assembly further includes a curtain track assembly including at least one reciprocating cylinder assembly and first and second guide members. The first guide member is attached to one of a first edge of the first curtain member and a first side edge of the second curtain member. The second guide member is attached to one of a second edge of the first curtain member and a second side edge of the second curtain member. The second curtain member is movable between a first closed position and a second open position along the first curtain member through the first and second guide members.



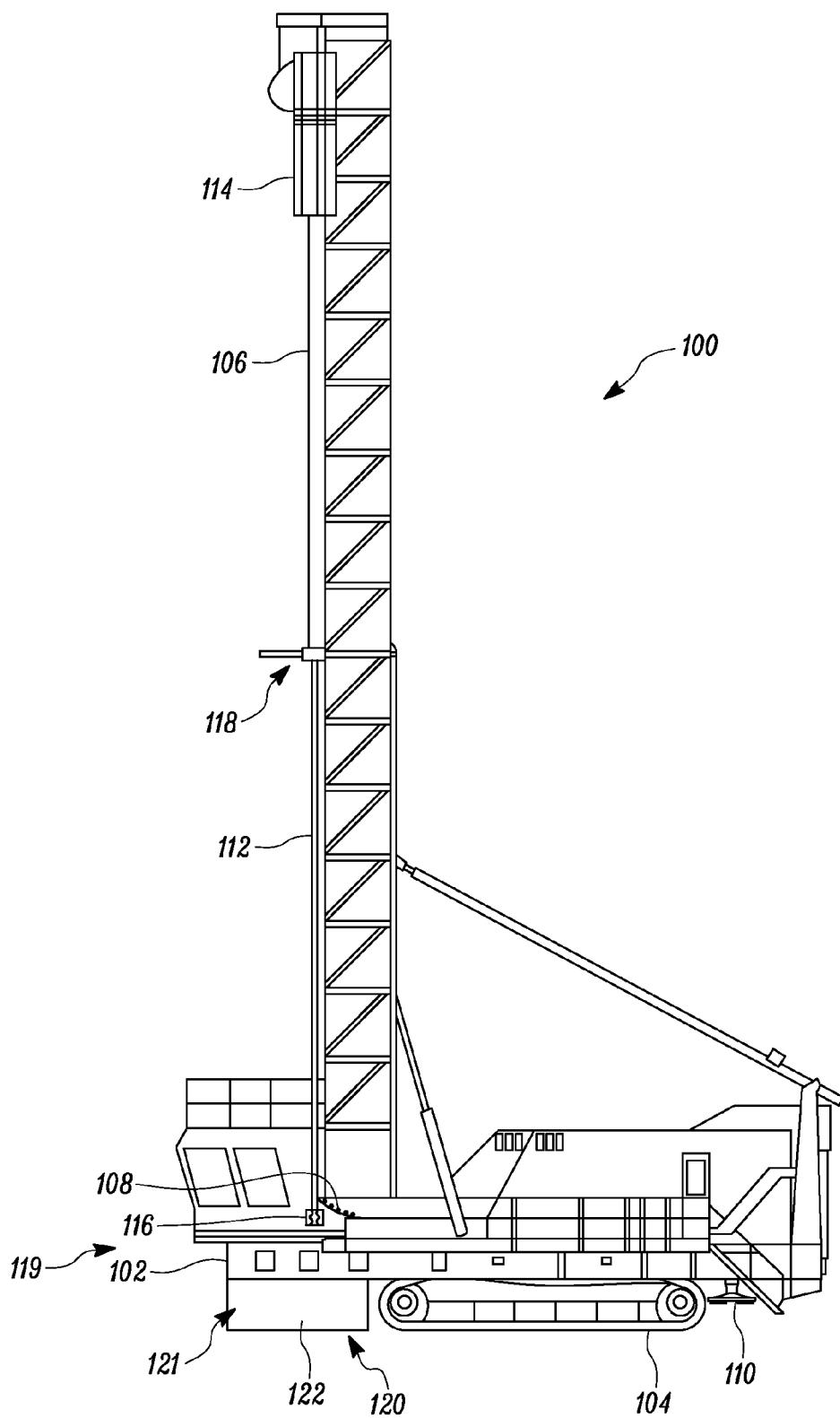


FIG. 1

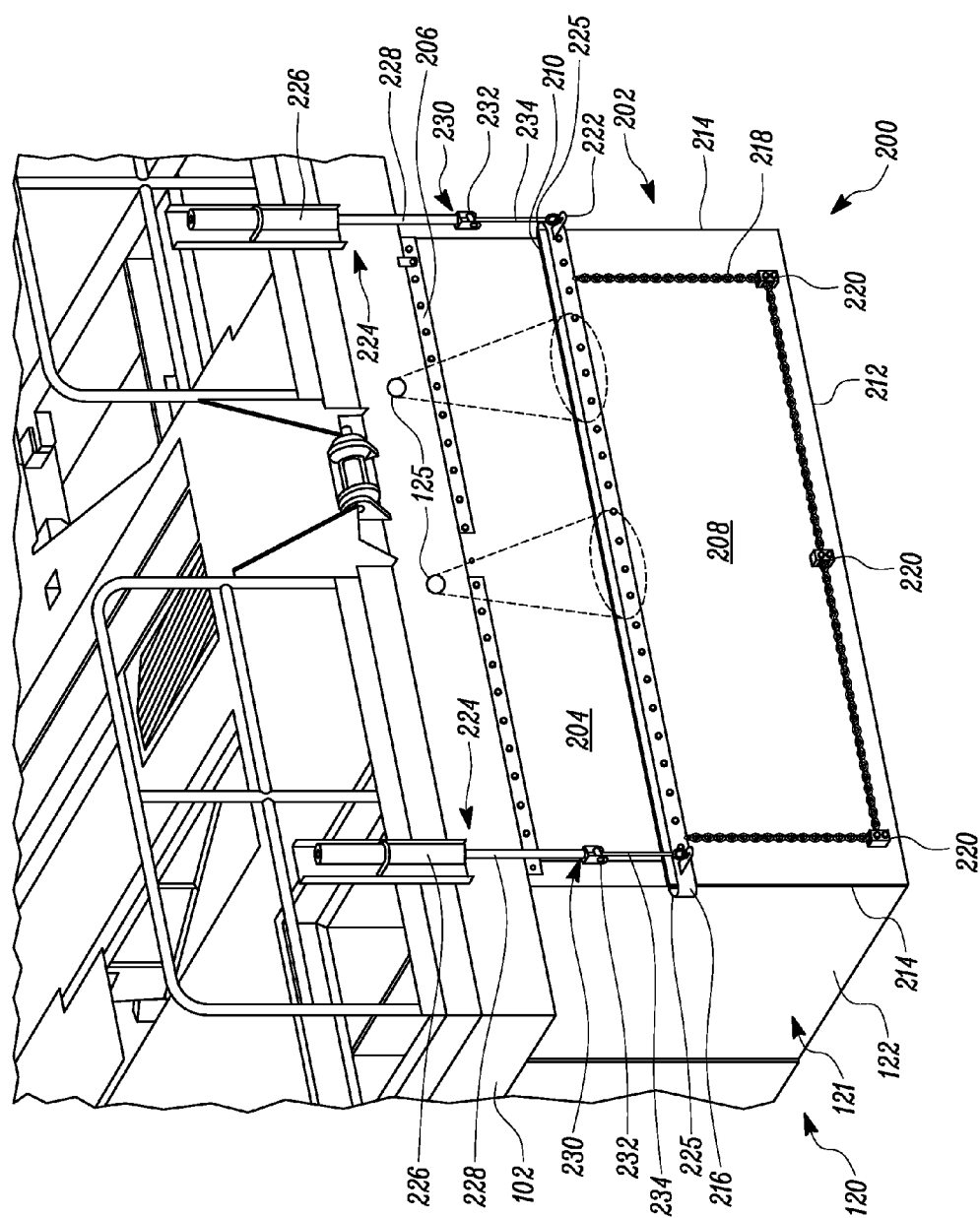


FIG. 2

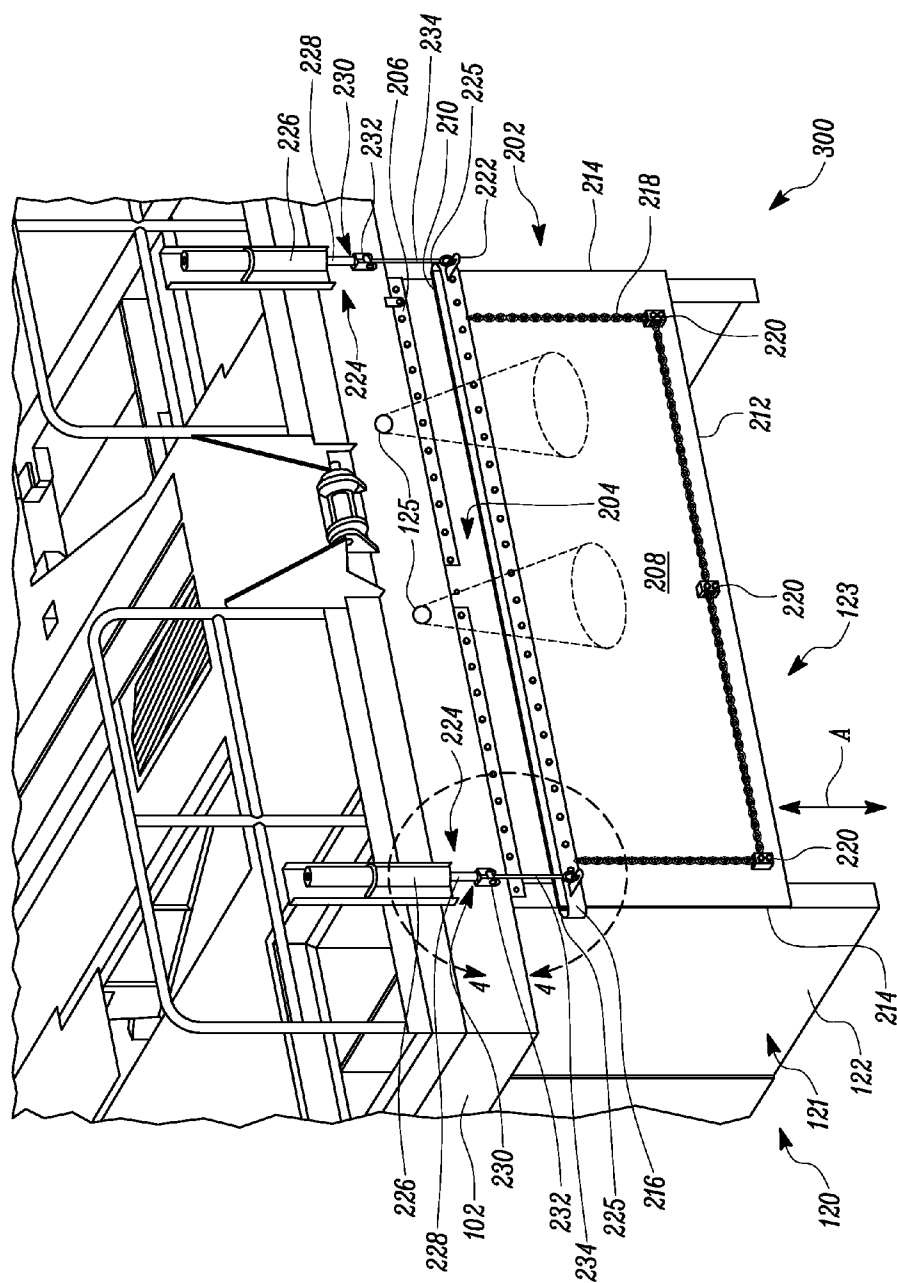


FIG. 3

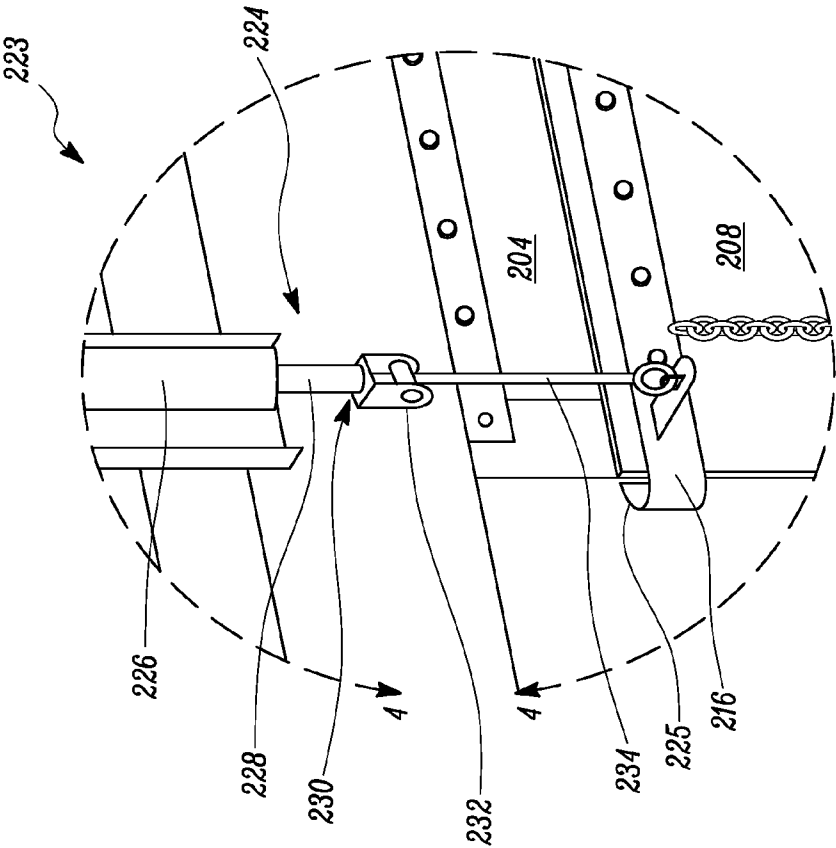


FIG. 4

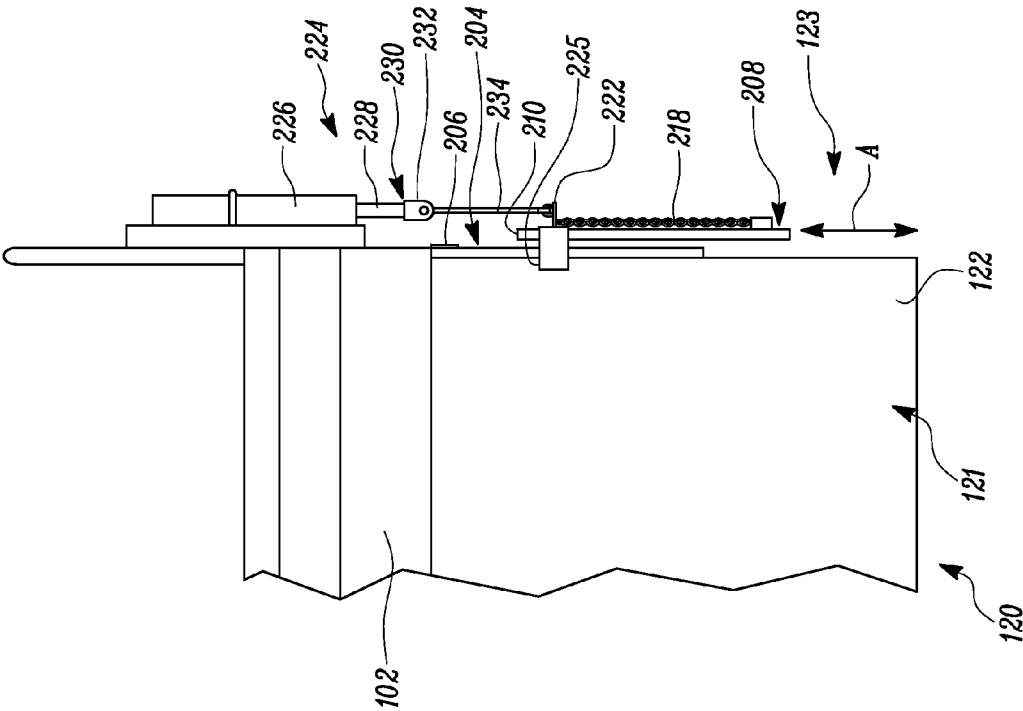


FIG. 5

DUST CONTAINMENT ASSEMBLY

TECHNICAL FIELD

[0001] The present disclosure relates to a curtain assembly for a work machine, and more particularly to a dust curtain for a drilling machine.

BACKGROUND

[0002] In machines such as a rotary drilling machine, once a drilling operation is completed, the machine moves to a new location. An area around a hole drilled by the machine is covered on all four sides, of which three sides are enclosed by portions of a frame of the machine and the fourth side is selectively enclosed by a dust curtain of the machine which is located at a rear end of the machine. The dust curtain is moveable, and can be raised during movement of the machine, so that heaps of the drilled material surrounding the hole does not fall back into the hole, as the machine moves past the hole.

[0003] The dust curtains are generally provided with a hinge joint at a top of the dust curtain, such that the dust curtain can pivotally flap open and lift by a certain height. This lifting operation is performed by hydraulic cylinders that are attached to the dust curtain. However, when the dust curtain is in the open position, machine sensors mounted in proximity to the dust curtain located at the rear end of the machine, are obstructed due to the pivotal lifting of the dust curtain.

[0004] U.S. Pat. No. 4,521,232, hereinafter referred to as the '232 patent, relates to an improved system for conveying and collecting airborne particulate matter and is particularly adapted to be used in conjunction with earth drilling equipment for handling both the fine and coarse drill cuttings discharged from the drill hole. The '232 patent describes one way hinged type doors configured to discharge particulate matter from the earth drilling equipment during a drilling operation. However, the '232 patent does not describe any sliding type curtain assembly that can be selectively opened during operation or positioning of the earth drilling equipment.

SUMMARY OF THE DISCLOSURE

[0005] In one aspect of the present disclosure, a dust containment assembly for a work machine is disclosed. The dust containment assembly for covering an auger unit of a work machine includes a frame enclosing the auger unit and having an access opening. The dust containment assembly further includes a curtain assembly including a first curtain member attached to the frame. The first curtain member includes a first edge and a second edge positioned relative to the frame to cover a portion of the access opening. The curtain assembly further includes a second curtain member having first and second side edges, a leading edge and a trailing edge. The curtain assembly further includes a curtain track assembly. The curtain track assembly includes at least one reciprocating cylinder assembly and first and second guide members, the first guide member being attached to one of the first edge of the first curtain member and the first side edge of the second curtain member, the second guide member being attached to one of the second edge of the first curtain member and the second side edge of the second curtain member. The second curtain member is movable between a first closed position and a second open position through movement of the at least

one reciprocating cylinder assembly. The first and second side edges of the second curtain member being respectively guided along the first and second edges of the first curtain member through the first and second guide members.

[0006] Other features and aspects of this disclosure will be apparent from the following description and the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] FIG. 1 is a side view of an exemplary work machine, according to one embodiment of the present disclosure;

[0008] FIG. 2 is a perspective view of a rear portion of the work machine of FIG. 1 having a bottom curtain in a first closed position, according to one embodiment of the present disclosure;

[0009] FIG. 3 is another perspective view of the rear portion of the work machine having the bottom curtain in a second open position, according to one embodiment of the present disclosure;

[0010] FIG. 4 is a perspective view of an encircled portion 4-4 of FIG. 3; and

[0011] FIG. 5 is side view of the work machine of FIG. 3, according to one embodiment of the present disclosure.

DETAILED DESCRIPTION

[0012] Reference will now be made in detail to specific aspects or features, examples of which are illustrated in the accompanying drawings. Wherever possible, corresponding or similar reference numbers will be used throughout the drawings to refer to the same or corresponding parts.

[0013] FIG. 1 illustrates a side elevation view of an exemplary work machine 100 embodied as a blast hole drill machine herein. The work machine 100 includes a chassis 102 supported on a transport mechanism, such as, crawler tracks 104 as illustrated in the accompanying figures. The work machine 100 further includes a mast 106 mounted on the chassis 102 and supported about a pivot 108. During a drilling operation, the work machine 100 is supported on jacks 110. The work machine 100 uses long straight sections of drill pipes 112 which are connected to a work head 114, to operate a work tool 116 and perform the drilling operation. The work tool 116 may be a drill bit or a bore bit. The work head 114 may be a rotary drill head. The work head 114 is mounted on the mast 106 and is configured to travel up and down the mast 106 using a cable feed system 118. The work machine 100 further includes a plurality of sensors 125 (see FIGS. 2 and 3) disposed on the chassis 102. The sensors 125 are configured to monitor parameters associated with operation of the work machine 100. These parameters may include fleet monitoring; worksite monitoring; hazard monitoring like accidents, collisions etc.; geotechnical investigations etc.

[0014] The work machine 100 also includes a dust containment assembly 120 provided below the chassis 102, at a rear portion 119 of the work machine 100. The dust containment assembly 120 can be defined as a frame 121 enclosed between one or more walls 122 and a curtain assembly 202 for covering an auger unit like the work tool 116 (as seen clearly in FIGS. 2 and 3), inside which a drilling operation may be conducted by the work machine 100. The drilling operation is performed by lowering down of the work tool 116 into the dust containment assembly 120 over the mast 106 by the work

head 114. The dust containment assembly 120 further includes an access opening 123 (see FIG. 3) seen from the rear portion 119.

[0015] FIG. 2 illustrates a perspective view of the rear portion 119 of the work machine 100. As mentioned earlier, the dust containment assembly 120 is provided below the chassis 102, at the rear portion 119 of the work machine 100. The dust containment assembly 120 further includes the curtain assembly 202. The curtain assembly 202 has a split curtain design including a first curtain member 204 and a second curtain member 208, such that the first and second curtain members 204, 208 are individual and separate units forming the curtain assembly 202. The first curtain member 204 includes a first edge 205, a top edge 206 fixedly attached to the chassis 102 of the work machine 100, and a second edge 207. The top edge 206 may be attached to the chassis 102 using state of the art attachment methods, such as mechanical fastening, adhesive bonding etc. The first edge 205 and the second edge 207 are positioned relative to the frame 121 to cover a portion of the access opening 123.

[0016] The second curtain member 208 includes a trailing edge 210, a leading edge 212, and first and second side edges 214. The trailing edge 210 of the second curtain member 208 is lengthwise provided with a reinforcing bar 216. The second curtain member 208 further includes a reinforcing chain 218 provided along length of the leading edge 212 and the first and second side edges 214. The reinforcing chain 218 is secured to the second curtain member 208 through holding elements 220. The reinforcing bar 216 and the reinforcing chain 218 provide structural strength to the second curtain member 208.

[0017] The second curtain member 208 further includes protruding edges 222 extending angularly from two extremities of the reinforcing bar 216 respectively. Referring to FIG. 3, by applying an external lifting force in an upward direction on the protruding edges 222 provided on the trailing edge 210 of the second curtain member 208, the second curtain member 208 is configured to move upwards relative to the first curtain member 204 and overlap thereon.

[0018] The dust containment assembly 120 further includes a curtain track assembly 223. The curtain track assembly 223 includes at least one reciprocating cylinder assembly 224 is disposed on the chassis 102 of the work machine 100 and is attached to the trailing edge 210 of the second curtain member 208. As clearly shown in FIG. 4, the curtain track assembly 223 further includes first and second guide members 225. In an embodiment, the first and second guide members 225 are U shaped ends extending from the reinforcing bar 216 and are attached to the first and second side edges 214 of the second curtain member 208. The extension of the first and second guide members 225 is such that they enclose the first edge 205 and the second edge 207 of the first curtain member 204 (see FIG. 5).

[0019] Referring to FIGS. 2, 3 and 5, the reciprocating cylinder assembly 224 includes hydraulic actuators 226 attached to the chassis 102 of the work machine 100 and also attached to the protruding edges 222 of the second curtain member 208. Based on the movement of the hydraulic actuators 226 of the reciprocating cylinder assembly 224, the second curtain member 208 is configured to move with respect to the first curtain member 204. It will be apparent to one of ordinary skill in the art that the reciprocating cylinder assembly 224 may alternatively be operated pneumatically or mechanically, based on the system requirements.

[0020] The hydraulic actuators 226 include hydraulic arms 228 configured to extend and retract therefrom. The hydraulic arms 228 include hooks 232 at ends 230 of the hydraulic arms 228. The hooks 232 of the hydraulic arms 228 are connected to the protruding edges 222 disposed on the second curtain member 208 via connectors 234. The hydraulic actuators 226 are configured to raise and lower the second curtain member 208 about the protruding edges 222 provided on the trailing edge 210, such that the second curtain member 208 overlaps on or extend below the first curtain member 204 respectively, based on the retraction and the extension of the hydraulic arms 228. The second curtain member 208 is selectively moveable between a first closed position 200 (see FIG. 2) corresponding to the work tool 116 operation procedure, such that the work tool 116 is performing a drilling operation. The second curtain member 208 can be moved to a second open position 300 (see FIG. 3) corresponding to the work tool 116 positioning procedure, such that the work tool 116 is being raised after completion of the drilling operation. The second curtain member 208 is movable between the first closed position 200 and the second open position 300 through movement of the reciprocating cylinder assembly 224. During movement of the second curtain member 208 between the first closed position 200 and the second open position 300, the second curtain member 208 is guided along the first and second edges 205, 207 of the first curtain member 204 through the first and second guide members 225 (see FIGS. 4 and 5).

[0021] As shown in FIG. 2, the second curtain member 208 is lowered down to the first closed position 200 through the extension of the hydraulic arms 228. During the drilling operation, there may be instances of spreading of dust and other earthy materials. The first closed position 200 of the second curtain member 208 of the curtain assembly 202, and the walls 122 of the dust containment assembly 120 may minimize or eliminate spreading of the dust and other earthy materials during the drilling operation.

[0022] Further, as the work machine 100 completes the drilling portion on the ground surface, a hole is created on the ground surface with a probable heap of sand or mud or other earthy material accumulated surrounding the hole. In order to perform another drilling operation at some other portion of ground surface, the work machine 100 is moved to a new location on the worksite, so as to re-position the work tool 116 for a new operation. As the work machine 100 moves to the new position, there is a probability that during movement of the work machine 100, the heap accumulated around the hole may fall back into the hole, thereby blocking the drilled hole and leading to inefficiency. To avoid this, the second curtain member 208 of the curtain assembly 202 is moved to the second open position 300 (see FIG. 3).

[0023] Referring to FIG. 3, the second curtain member 208 of the curtain assembly 202 may be raised to move upwards and overlap on the first curtain member 204, based on the retraction of the hydraulic arms 228. In an embodiment, the second curtain member 208 of the curtain assembly 202 is raised to a suitable height, for example two (2) feet, so as to avoid contact with the heap, and prevent or minimize fall back of the sand or the mud back into the drilled hole. The accompanying figure shows the second curtain member 208 rose by the height "A". Based on further retraction of the hydraulic arms 228, the second curtain member 208 may be raised still further to overlap with the first curtain member 204.

INDUSTRIAL APPLICABILITY

[0024] The industrial applicability of the dust containment assembly 120 described herein will be readily appreciated from the foregoing discussion. As described earlier the second curtain member 208 is moved to the first closed position 200 during the drilling operation. Such first closed position 200 of the second curtain member 208 prevents or minimizes the spreading of the sand, mud or other earthy material during the drilling operation. Further, the second curtain member 208 is capable of being moved to the second open position 300 by the hydraulic actuators 226 in view of movement of the work machine 100; for conducting another drilling procedure. Such second open position 300 of the second curtain member 208 avoids or minimizes falling back of the heap into the drilled hole during movement of the work machine 100.

[0025] Further, as described earlier the second curtain member 208 is independently operated in a parallel and overlapping orientation about the first and second guide members 225 corresponding to the first curtain member 204, as against an angular orientation about hinge joints having probability of hindering an operating region (illustrated as a cone in FIGS. 2 and 3) of the sensors 125. The sensors 125 are configured to monitor parameters associated with operation of the work machine 100. These parameters may include fleet monitoring; worksite monitoring; hazard monitoring like accidents, collisions etc.; geotechnical investigations etc. and monitoring of said parameters may require unobstructed operating region associated with the sensors 125. The curtain assembly 202 provides for the parallel and overlapping relationship between the first curtain member 204 and the second curtain member 208 that does not obstruct the operating region of the sensors 125, enabling the sensors 125 to monitor the earlier mentioned parameters, thereby increasing the overall utility and efficiency of the work machine 100.

[0026] While aspects of the present disclosure have been particularly shown and described with reference to the embodiments above, it will be understood by those skilled in

the art that various additional embodiments may be contemplated by the modification of the disclosed machines, systems and methods without departing from the spirit and scope of what is disclosed. Such embodiments should be understood to fall within the scope of the present disclosure as determined based upon the claims and any equivalents thereof.

What is claimed is:

1. A dust containment assembly for covering an auger unit of a work machine the dust containment assembly comprising:

a frame structured and arranged to enclose the auger unit and having an access opening;

a curtain assembly including:

a first curtain member being attached to the frame, the first curtain member having a first edge and a second edge, the first edge and the second edge being positioned relative to the frame to cover a portion of the access opening; and a second curtain member having first and second side edges, a leading edge and a trailing edge; and

a curtain track assembly including at least one reciprocating cylinder assembly and first and second guide members, the first guide member being attached to one of the first edge of the first curtain member and the first side edge of the second curtain member, the second guide member being attached to one of the second edge of the first curtain member and the second side edge of the second curtain member,

wherein the second curtain member is movable between a first closed position and a second open position through movement of the at least one reciprocating cylinder assembly,

wherein the first and second side edges of the second curtain member being respectively guided along the first and second edges of the first curtain member through the first and second guide members.

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