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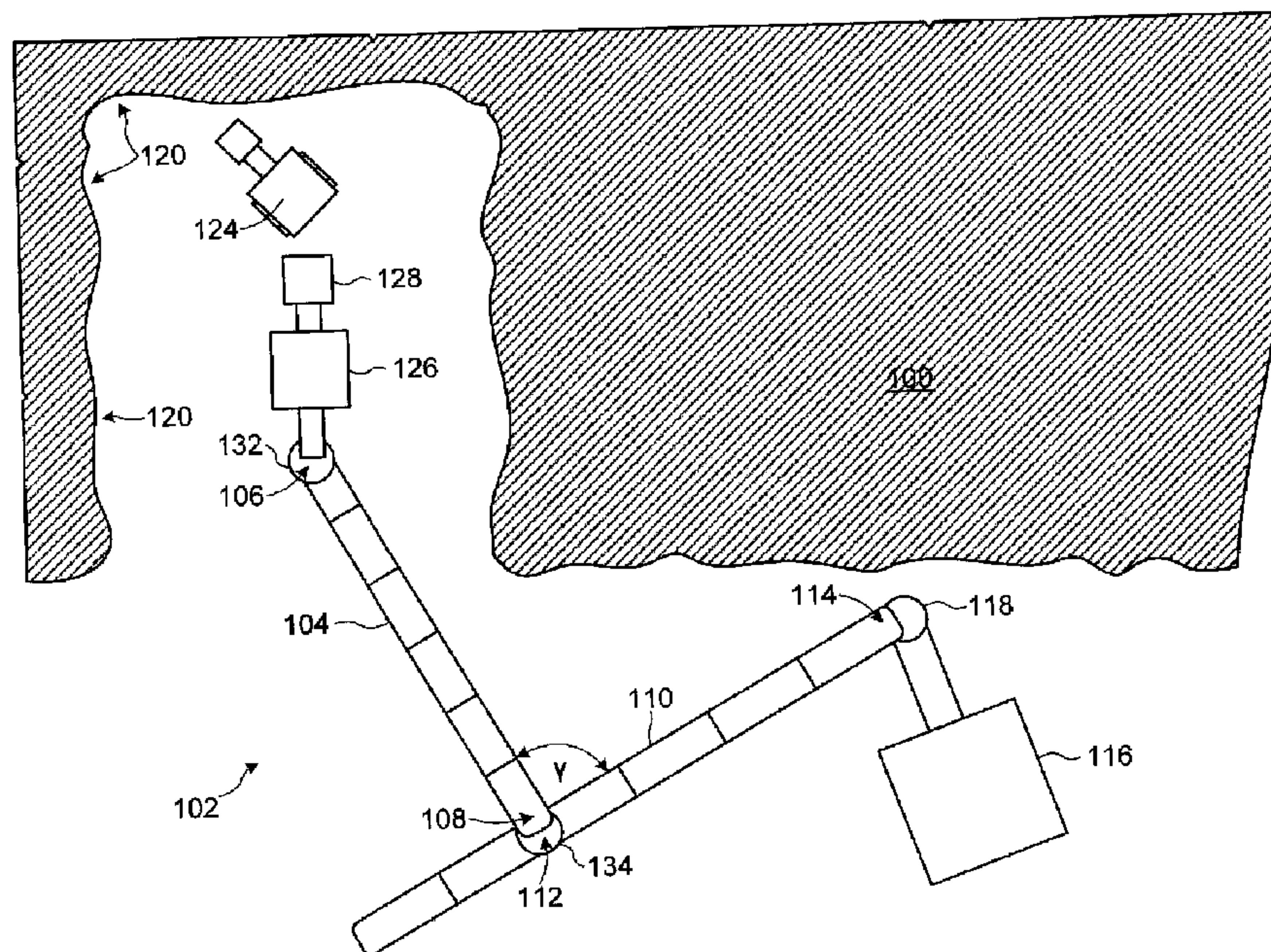
(72) Inventeurs/Inventors:
DIRK, TERRY, CA;
MACDOUGALL, PAUL FREDERICK, CA

(73) Propriétaire/Owner:
SUNCOR ENERGY INC., CA

(74) Agent: SMART & BIGGAR

(54) Titre : PROCEDE ET APPAREILLAGE DE TRAITEMENT DE L'ALIMENTATION DE MINERAL CALIBRE

(54) Title: METHOD AND APPARATUS FOR PROCESSING A SIZED ORE FEED



(57) Abrégé/Abstract:

A method and process line apparatus for processing a sized ore feed excavated from an ore deposit is disclosed. The method involves disposing a processing apparatus in a processing apparatus position relative to the ore deposit, and disposing a first mobile conveyor to receive a sized ore feed at a receiving location located along a length of the first mobile conveyor. The first mobile conveyor is operable to convey the sized ore from the receiving location to a discharge end of the first mobile conveyor. The method also involves disposing a second mobile conveyor to receive the sized ore from the discharge end of the first mobile conveyor at a transfer location along a length of the second mobile conveyor and to convey the sized ore from the transfer location to the processing apparatus. The first and second mobile conveyors are oriented at an operational angle between a length of the first mobile conveyor and a length of the second mobile conveyor. The method further involves moving at least one of the first and second mobile conveyors to vary at least one of the operational angle and the transfer location to permit successive portions of the ore deposit within operational reach of the receiving location to be received for conveying along the first and second mobile conveyors to the processing apparatus while the processing apparatus is located in the processing apparatus position.



ABSTRACT

A method and process line apparatus for processing a sized ore feed excavated from an ore deposit is disclosed. The method involves disposing a processing apparatus in a processing apparatus position relative to the ore deposit, and disposing a first mobile conveyor to receive a sized ore feed at a receiving location located along a length of the first mobile conveyor. The first mobile conveyor is operable to convey the sized ore from the receiving location to a discharge end of the first mobile conveyor. The method also involves disposing a second mobile conveyor to receive the sized ore from the discharge end of the first mobile conveyor at a transfer location along a length of the second mobile conveyor and to convey the sized ore from the transfer location to the processing apparatus. The first and second mobile conveyors are oriented at an operational angle between a length of the first mobile conveyor and a length of the second mobile conveyor. The method further involves moving at least one of the first and second mobile conveyors to vary at least one of the operational angle and the transfer location to permit successive portions of the ore deposit within operational reach of the receiving location to be received for conveying along the first and second mobile conveyors to the processing apparatus while the processing apparatus is located in the processing apparatus position.

METHOD AND APPARATUS FOR PROCESSING A SIZED ORE FEED

BACKGROUND OF THE INVENTION

1. Field of Invention

5 This invention relates generally to mining and more particularly to processing a sized ore feed.

2. Description of Related Art

10 Surface mining operations are generally employed to excavate an ore deposit that is found near the surface. Such ore deposits are usually covered by an overburden of rock, soil, and/or plant matter, which may be removed prior to commencing mining operations. The remaining ore deposit may then be excavated and transported to a plant for processing to remove commercially useful products. For example, the ore deposit may comprise an oil sand
15 deposit from which hydrocarbon products may be extracted.

In the example of an oil sand ore deposit, such as the Northern Alberta Tar Sands, the ore deposit comprises about **70** to about **90** percent by weight of mineral solids including sand and clay, about **1** to about **10** percent by weight
20 of water, and a bitumen or oil film. The bitumen may be present in amounts ranging from a trace amount up to as much as **20** percent by weight. Consequently, since oil sand ore deposits comprises a relatively small percentage by weight of bitumen, it is generally more efficient and cost effective to at least partially separate the bitumen from the ore as soon as
25 possible after excavation, since significant energy costs are incurred in transporting the ore over long distances.

In commonly owned Canadian Patent Application CA **2,567,644**, a process line for mining an oil sands ore body is disclosed. The process line includes
30 an excavator for mining oil sands ore, a comminutor for receiving mined ore

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from the excavator and comminuting the mined ore to conveyable size and transferring the comminuted ore to a mobile conveyor for transporting the comminuted ore. The comminator supplies conveyable ore to the mobile conveyor, and the mobile conveyor is periodically moved in an arc about a discharge end to locate another portion of the ore body within operational reach of the mobile conveyor until substantially all of the ore body within operational reach of the conveyor has been mined. In one disclosed embodiment the ore is transported to a mobile slurry facility located proximate a mine face of an oil sand deposit. Operation of the disclosed process line requires that the overburden be removed, either prior to commencing excavation or as the conveyor advances in the operational arc. Following mining of the ore deposit, the slurry facility may be relocated to a subsequent mine face for excavation of a subsequent portion of the ore body. Accordingly, the disclosed process line facilitates successively mining generally circular sectors of the ore deposit.

SUMMARY OF THE INVENTION

In accordance with one aspect of the invention there is provided a method for processing a sized ore feed excavated from an ore deposit. The method involves disposing a processing apparatus in a processing apparatus position relative to the ore deposit, and disposing a first mobile conveyor to receive a sized ore feed at a receiving location located along a length of the first mobile conveyor. The first mobile conveyor is operable to convey the sized ore from the receiving location to a discharge end of the first mobile conveyor. The method also involves disposing a second mobile conveyor to receive the sized ore from the discharge end of the first mobile conveyor at a transfer location selected from a plurality of transfer locations available along a length of the second mobile conveyor and to convey the sized ore from the transfer location to the processing apparatus. The first and second mobile conveyors are oriented at an operational angle between the length of the first mobile conveyor and the length of the second mobile conveyor. The method further

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- involves moving at least one of the first and second mobile conveyors to vary at least one of the operational angle and the transfer location wherein moving the at least one of first and second mobile conveyors involves (a) in a first type of movement, causing the operational angle between the first and second mobile conveyors to be varied while the transfer location is maintained substantially constant, (b) in a second type of movement, causing the transfer location to be varied while the operational angle between the first and second mobile conveyors is maintained substantially constant, and (c) in a third type of movement, causing both the transfer location and the operational angle to be varied, to permit successive portions of the ore deposit within operational reach of the receiving location to be received for conveying along the first and second mobile conveyors to the processing apparatus while the processing apparatus is located in the processing apparatus position.
- 15 The ore deposit may include at least one portion within operational reach of the receiving location that is not to be excavated and moving at least one of the first and second mobile conveyors may involve varying at least one of the operational angle and the transfer location to move the receiving location around the at least one portion that is not to be excavated.
- 20 Receiving the sized ore feed at the receiving location may involve receiving the sized ore feed proximate at least one of a plurality of receiving locations along the length of the first mobile conveyor.
- 25 Receiving the sized ore feed at the at least one of the plurality of receiving locations may involve receiving the sized ore feed at a hopper mounted for movement on a track extending along at least a portion of the length of the first mobile conveyor.
- 30 Receiving the sized ore feed may involve receiving ore from an excavator and comminuting the ore to produce the sized ore feed.

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Receiving the ore from the excavator may involve receiving the ore in a load carrying container and transporting the ore to a comminutor for comminuting the ore.

5

Disposing the processing apparatus may involve disposing the processing apparatus at an angle to a mine face of the ore deposit to provide clearance between the second mobile conveyor and the processing apparatus when moving the second mobile conveyor.

10

In a first operational stage disposing the first mobile conveyor may involve disposing the first mobile conveyor to position the receiving location of the first mobile conveyor at a distal mine face location with respect to the processing apparatus position, disposing the second mobile conveyor may involve causing the second mobile conveyor to be disposed to discharge the sized ore into a feeder of the processing apparatus, and moving at least one of the first and second mobile conveyors may involve causing the second mobile conveyor to successively move toward the mine face about the feeder while causing the first mobile conveyor to progressively advance into the ore deposit while excavating a first portion of the ore deposit within operational reach of the receiving location.

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Disposing the second mobile conveyor to receive the sized ore from the discharge end of the first mobile conveyor may involve disposing the second mobile conveyor to receive the sized ore at a transfer location proximate an end of the second mobile conveyor that may be distally located with respect to the discharge end of the second mobile conveyor.

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In a second operational stage disposing the second mobile conveyor may involve causing the second mobile conveyor to be disposed generally parallel to the mine face, and moving the at least one of the first and second mobile

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5 conveyors may involve causing the first mobile conveyor to be laterally translated while successively moving the transfer location along the second mobile conveyor toward the feeder of the processing apparatus while maintaining the operational angle substantially constant to permit excavation of a second portion of the ore deposit within operational reach of the receiving location.

10 Maintaining the operational angle substantially constant may involve maintaining an operational angle of about 90 degrees.

15 In a third operational stage disposing the second mobile conveyor may involve causing the second mobile conveyor to be moved to position the transfer location on an opposite side of the feeder of the processing apparatus, and moving the at least one of the first and second mobile conveyors may involve moving the first mobile conveyor to place the discharge end of the first mobile conveyor at the transfer location, and causing the first mobile conveyor to be laterally translated while successively moving the transfer location along the second mobile conveyor away from the feeder of the processing apparatus while maintaining the operational angle substantially constant to permit excavation of a third portion of the ore deposit within operational reach of the receiving location.

25 In a fourth operational stage moving the at least one of the first and second mobile conveyors may involve causing the first and second mobile conveyors to be disposed at an operational angle of about 180 degrees such that the first and second mobile conveyors may be generally in-line with each other to permit excavation of distally located portions of the ore deposit within operational reach of the receiving location.

30 Moving at least one of the first and second mobile conveyors may involve moving both the first mobile conveyor and the second mobile conveyor while

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varying the operational angle to permit excavation along a generally linear mine face portion of the ore deposit.

5 The processing apparatus position may be a first processing apparatus position and the method may further involve, on completion of excavation of the successive portions of the ore deposit within operational reach of the receiving location, relocating the processing apparatus to a second processing apparatus position to permit excavation of further portions of the ore deposit while the processing apparatus may be located in the second
10 processing apparatus position.

The first type of movement may involve rotation of the first mobile conveyor generally about the transfer location, the second type of movement may involve lateral translation of the first mobile conveyor and the transfer location
15 along the second mobile conveyor, and the third type of movement may involve rotation of the first mobile conveyor generally about the transfer location combined with lateral translation of the first mobile conveyor and transfer location along the second mobile conveyor.

20 The first type of movement may involve rotation of the first mobile conveyor generally about the transfer location, the second type of movement may involve rotation of the transfer location generally about an ore-receiving intake of the processing apparatus, and the third type of movement may involve rotation of the first mobile conveyor generally about the transfer location
25 combined with rotation of the transfer location generally about the ore-receiving intake.

The method may further involve varying the operational angle at least between about 90 degrees and about 180 degrees.

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The processing apparatus may include an apparatus for producing a slurry.

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In accordance with another aspect of the invention, there is provided a method for processing a sized ore feed excavated from an ore deposit. The method involves disposing a processing apparatus in a first processing apparatus position relative to the ore deposit, and disposing a first mobile conveyor to receive a sized ore feed at a receiving location located along a length of the first mobile conveyor, the first mobile conveyor being operable to convey the sized ore from the receiving location to a discharge end of the first mobile conveyor. The method also involves disposing a second mobile conveyor to receive the sized ore from the discharge end of the first mobile conveyor at a transfer location disposed at one of a plurality of transfer locations available along a length of the second mobile conveyor and to convey the sized ore from the transfer location along the second mobile conveyor to a discharge end of the second mobile conveyor aligned to convey the sized ore to an intake of the processing apparatus, the first and second mobile conveyors being oriented at an operational angle between the length of the first mobile conveyor and the length of the second mobile conveyor, and excavating in a generally straight line along a generally linear mine face. Excavating involves advancing the receiving location along the generally straight line by a combination of (a) causing the second mobile conveyor and the transfer location to rotate generally about the intake of the processing apparatus while maintaining alignment of the discharge end of the second mobile conveyor with the intake, and (b) causing the first mobile conveyor to rotate about the transfer location on the second mobile conveyor to vary the operational angle while maintaining alignment of the discharge end of the first mobile conveyor with the transfer location on the second mobile conveyor, to permit successive portions of the ore deposit within operational reach of the receiving location as it advances along the generally linear mine face to be received for conveyance along the first and second mobile conveyors to the processing apparatus while the processing apparatus is located in the processing apparatus position.

5 The method may further involve, in response to a determination that at least a portion of a particular mine face portion should not be excavated, causing the second mobile conveyor to rotate about its discharge end away from the particular mine face, and causing the first mobile conveyor to move to follow the second mobile conveyor while causing the first mobile conveyor to rotate about the transfer location so as to: (i) decrease the operational angle sufficiently to permit the first mobile conveyor to clear the particular mine face, and (ii) place the first mobile conveyor into a position from which it can advance in cooperation with the second mobile conveyor to facilitate mining of a different mine face portion, spaced apart from the particular mine face portion.

15 The method may further involve temporarily suspending receiving of the sized ore while the first and second mobile conveyors are repositioning.

The method may further involve moving the receiving location along the different mine face portion in a second generally straight line, wherein the second generally straight line is not parallel to the second mobile mining conveyor.

20 The processing apparatus may include a mobile slurry apparatus.

In accordance with another aspect of the invention, there is provided a method for processing a sized ore feed excavated from an ore deposit. The method involves disposing a processing apparatus in a processing apparatus position relative to the ore deposit, and disposing a first mobile conveyor to receive a sized ore feed at a receiving location located along a length of the first mobile conveyor, the first mobile conveyor being operable to convey the sized ore from the receiving location to a discharge end of the first mobile conveyor. The method also involves disposing a second mobile conveyor to receive the sized ore from the discharge end of the first mobile conveyor at a

transfer location along a length of the second mobile conveyor and to convey the sized ore from the transfer location to the processing apparatus, the first and second mobile conveyors being oriented at an operational angle between the length of the first mobile conveyor and the length of the second mobile conveyor, and moving the first mobile conveyor and the second mobile conveyor to vary the operational angle and the transfer location by (a) rotating the first mobile conveyor about the discharge end of the first mobile conveyor such that the operational angle between the first and second mobile conveyors is varied while the transfer location is maintained substantially constant, (b) rotating the second mobile conveyor generally about an ore-receiving intake of the processing apparatus such that the transfer location is moved in an arc while maintaining alignment of the second mobile conveyor with the ore-receiving intake of the processing apparatus, and (c) laterally translating the first mobile conveyor along the second mobile conveyor such that the transfer location along the second mobile conveyor is laterally translated while the operational angle between the first and second mobile conveyors is maintained substantially constant, to permit successive portions of the ore deposit within operational reach of the receiving location to be excavated and received for conveying along the first and second mobile conveyors to the processing apparatus while the processing apparatus is located in the processing apparatus position.

The ore deposit may include at least one portion within operational reach of the receiving location that is not to be excavated and wherein the method further comprises moving the first and second mobile conveyors to vary at least one of the operational angle and the transfer location to move the receiving location around the at least one portion that is not to be excavated.

The receiving location may include at least one of a plurality of receiving locations along the length of the first mobile conveyor.

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The method may further involve receiving the sized ore feed at a hopper mounted for movement on a track extending along at least a portion of the length of the first mobile conveyor.

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The method may further involve excavating ore from the ore deposit using an excavator, and receiving excavated ore from the excavator at a comminutor and comminuting the ore to produce the sized ore feed.

10 The method may further involve transporting the ore between the excavator and the comminutor using a plurality of load carrying containers.

Moving the first mobile conveyor and the second mobile conveyor to vary the operational angle and the transfer location may involve moving the receiving
15 location along a linear mine face in a generally straight line, wherein the generally straight line is not parallel to the second mobile mining conveyor.

The method may further involve, upon completion of excavation of the successive portions of the ore deposit within operational reach of the
20 receiving location while the processing apparatus is located in the processing apparatus position, relocating the processing apparatus to a subsequent processing apparatus position, and relocating the first and second mobile conveyors to cooperate to convey excavated ore to the subsequent processing apparatus position, to permit excavation of further portions of the
25 ore deposit within operational reach while the processing apparatus is located at the subsequent processing apparatus position.

The processing apparatus may include a mobile slurry apparatus.

30 In accordance with another aspect of the invention there is provided a process line apparatus for processing a sized ore feed excavated from an ore deposit.

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5 The apparatus includes a processing apparatus disposed in a processing
apparatus position relative to the ore deposit, and a first mobile conveyor
disposed to receive a sized ore feed at a receiving location located along a
length of the first mobile conveyor. The first mobile conveyor is operable to
10 convey the sized ore from the receiving location to a discharge end of the first
mobile conveyor. The apparatus also includes a second mobile conveyor
disposed to receive the sized ore from the discharge end of the first mobile
conveyor at a transfer location selected from a plurality of transfer locations
available along a length of the second mobile conveyor and to convey the
15 sized ore from the transfer location to the processing apparatus. The first and
second mobile conveyors are oriented at an operational angle between the
length of the first mobile conveyor and the length of the second mobile
conveyor. The apparatus also includes provisions for moving at least one of
the first and second mobile conveyors to vary at least one of the operational
20 angle and the transfer location, the provisions for moving further including
provisions for selectively causing (a) a first type of movement in which the
operational angle between the first and second mobile conveyors is varied
while the transfer location is maintained substantially constant, (b) a second
type of movement in which the transfer location is varied while the operational
25 angle between the first and second mobile conveyors is maintained
substantially constant, and (c) a third type of movement in which both the
transfer location and the operational angle are varied, to permit successive
portions of the ore deposit within operational reach of the receiving location to
be to be excavated and received for conveying along the first and second
mobile conveyors to the processing apparatus while the processing apparatus
is located in the processing apparatus position.

30 The ore deposit may include at least one portion within operational reach of
the receiving location that is not to be excavated and the provisions for
moving at least one of the first and second mobile conveyors may include
provisions for varying at least one of the operational angle and the transfer

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location to move the receiving location around the at least one portion that is not to be excavated.

5 The receiving location may include at least one of a plurality of receiving locations along the length of the first mobile conveyor.

10 The first mobile conveyor may be operably configured to receive the sized ore feed at a hopper mounted for movement on a track extending along at least a portion of the length of the first mobile conveyor.

The apparatus may include an excavator for excavating ore from the ore deposit, and a comminutor for receiving the excavated ore from the excavator and comminuting the ore to produce the sized ore feed.

15 The apparatus may include a load carrying container for transporting the ore between the excavator and the comminutor.

20 The processing apparatus may be disposed at an angle to a mine face of the ore deposit to provide clearance between the second mobile conveyor and the processing apparatus when moving the second mobile conveyor.

25 The first mobile conveyor and the second mobile conveyor each may include a plurality of conveyor sections, each conveyor section including provisions for moving the conveyor section, and alignment provisions for aligning the plurality of conveyor sections.

30 The provisions for moving at least one of the first and second mobile conveyors may include provisions for moving both the first mobile conveyor and the second mobile conveyor while varying the operational angle to permit excavation along a generally linear mine face portion of the ore deposit.

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In accordance with another aspect of the invention there is provided a process line apparatus for processing a sized ore feed excavated from an ore deposit. The apparatus includes a processing apparatus disposed in a processing apparatus position relative to the ore deposit, and a first mobile conveyor disposed to receive a sized ore feed at a receiving location located along a length of the first mobile conveyor, the first mobile conveyor being operable to convey the sized ore from the receiving location to a discharge end of the first mobile conveyor. The apparatus also includes a second mobile conveyor disposed to receive the sized ore from the discharge end of the first mobile conveyor at a transfer location selected from a plurality of transfer locations available along a length of the second mobile conveyor and to convey the sized ore from the transfer location to the processing apparatus. The first and second mobile conveyors are oriented at an operational angle between the length of the first mobile conveyor and the length of the second mobile conveyor, and the first mobile conveyor and the second mobile conveyor are operably configured to move to vary at least one of the operational angle and the transfer location by (a) rotating the first mobile conveyor about the discharge end of the first mobile conveyor such that the operational angle between the first and second mobile conveyors is varied while the transfer location is maintained substantially constant, (b) rotating the second mobile conveyor generally about an ore-receiving intake of the processing apparatus such that the transfer location is moved in an arc while maintaining alignment of the second mobile conveyor with the ore-receiving intake of the processing apparatus, and c) laterally translating the first mobile conveyor along the second mobile conveyor such that the transfer location along the second mobile conveyor is laterally translated while the operational angle between the first and second mobile conveyors is maintained substantially constant, to permit successive portions of the ore deposit within operational reach of the receiving location to be excavated and received for conveying along the first and second mobile conveyors to the processing apparatus while the processing apparatus is located in the processing apparatus position.

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5 The ore deposit may include at least one portion within operational reach of the receiving location that is not to be excavated and the first and second mobile conveyors may be operably configured to vary at least one of the operational angle and the transfer location to move the receiving location around the at least one portion that is not to be excavated.

10 The receiving location may include at least one of a plurality of receiving locations along the length of the first mobile conveyor.

The first mobile conveyor may be operably configured to receive the sized ore feed at a hopper mounted for movement on a track extending along at least a portion of the length of the first mobile conveyor.

15 The apparatus may include an excavator for excavating ore from the ore deposit, and a comminutor for receiving the excavated ore from the excavator and comminuting the ore to produce the sized ore feed.

20 The apparatus may include a load carrying container for transporting the ore between the excavator and the comminutor.

25 In accordance with another aspect of the invention, there is provided a method for processing an ore feed excavated from an ore deposit. The method involves disposing a processing apparatus in a processing apparatus position relative to the ore deposit, and disposing a first conveyor to receive a sized ore feed at a first receiving location located along a length of the first conveyor, the first conveyor being operable to convey the sized ore from the first receiving location to a discharge end of the first conveyor, the first conveyor comprising a plurality of first conveyor sections each having
30 respective moving provisions for moving the respective first conveyor section in response to control signals. The method also involves disposing a second

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conveyor to receive the sized ore from the discharge end of the first conveyor at a transfer location disposed at a first position along a length of the second conveyor and to convey the sized ore from the transfer location to the processing apparatus, the first and second conveyors being oriented at an operational angle between the length of the first conveyor and the length of the second conveyor, and moving the first conveyor relative to the second conveyor by activating the moving means on the first conveyor to: (a) vary the operational angle between the length of the first conveyor and the length of the second conveyor, and (b) move the transfer location from the first position to a second position along the length of the second conveyor, to permit successive portions of the ore deposit within operational reach of the first receiving location to be received for conveying along the first and second conveyors to the processing apparatus while the processing apparatus is located in the processing apparatus position.

The method may further involve receiving the sized ore feed at the first receiving location located along the length of the first conveyor, and receiving a further sized ore feed at a second receiving location, spaced apart from the first receiving location on the first conveyor, the first conveyor being operable to convey sized ore from the first and second receiving locations to the discharge end of the first conveyor.

The method may further involve disposing a first excavator and first comminutor within operational reach of the first receiving location to provide the sized ore feed to the first receiving location and disposing a second excavator and second comminutor within operational reach of the second receiving location to provide the further sized ore feed to the second receiving location.

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The method may further involve simultaneously receiving the sized ore feed at the first receiving location and the further sized ore feed at the second receiving location on the first conveyor.

- 5 The first and second receiving locations may involve first and second movable hoppers, respectively.

10 The ore deposit may include a portion within operational reach of the first receiving location that is not to be excavated and wherein moving the first conveyor involves varying at least one of the operational angle and the transfer location to move the first receiving location around the portion that is not to be excavated.

15 Receiving the sized ore feed may involve receiving ore from an excavator and comminuting the ore to produce the sized ore feed.

20 The method may further involve moving the second conveyor to a new location to provide access to a new section of the ore deposit, and varying at least one of the operational angle and the transfer point to put the receiving location of the first conveyor within operational reach of successive portions of the new section of the ore deposit.

25 The second conveyor may include a second conveyor moving provisions for moving the second conveyor to the new location.

30 The method may further involve varying the operational angle at least between about **90** degrees and about **180** degrees while maintaining operational alignment between the first conveyor and the second conveyor at the transfer point.

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5 The method may further involve, in response to a determination that at least a portion of a particular mine face portion should not be excavated: repositioning the second conveyor to rotate generally about its discharge end away from the particular mine face, and repositioning the first conveyor to
10 move to generally follow the second conveyor and to rotate generally about the transfer location so as to: (i) decrease the operational angle sufficiently to permit the first conveyor to clear the particular mine face, and (ii) place the first conveyor into a position from which it can cooperate with the second conveyor to facilitate mining of a different mine face portion, spaced apart
15 from the particular mine face portion.

The method may further involve temporarily suspending receiving of the sized ore while the first and second conveyors are repositioning.

15 The processing apparatus may include a mobile slurry apparatus.

The method may further involve relocating the processing apparatus to a second processing apparatus position to permit excavation of further portions of the ore deposit while the processing apparatus is located in the second
20 processing apparatus position.

The method may further involve relocating the first and second conveyors and relocating an excavator and comminutor to cooperate with the first and second conveyors and the processing apparatus to excavate the further
25 portions of the ore deposit.

The processing apparatus position may be initially disposed proximate an unexcavated mine face of the ore deposit.

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The method may further involve disposing the processing apparatus an angle to the mine face of the ore deposit to provide clearance between the second conveyor and the processing apparatus when moving the second conveyor.

5 In accordance with another aspect of the invention, there is provided a method for processing an ore feed excavated from an ore deposit. The method involves disposing a processing apparatus in a first processing apparatus position relative to the ore deposit, and disposing a first conveyor to receive a sized ore feed at a first receiving location located along a length of
10 the first conveyor, the first conveyor being operable to convey the sized ore from the first receiving location to a discharge end of the first conveyor, the first conveyor having at least a first set of moving provisions for moving the first conveyor in response to control signals. The method also involves disposing a second conveyor to receive the sized ore from the discharge end
15 of the first conveyor at a transfer location disposed along a length of the second conveyor and to convey the sized ore from the transfer location along the second conveyor to a discharge end of the second conveyor aligned to convey the sized ore to an intake of the processing apparatus, the first and second conveyors being oriented at an operational angle between the length
20 of the first conveyor and the length of the second conveyor, and facilitating excavation in a generally straight line along a generally linear mine face by a combination of varying the operational angle and by translating the transfer location along the length of the second conveyor, to permit successive portions of the ore deposit within operational reach of the first receiving
25 location as it advances along the generally linear mine face to be received for conveyance along the first and second conveyors to the processing apparatus while the processing apparatus is located in the processing apparatus position.

30 In accordance with another aspect of the invention, there is provided a method for processing an ore feed excavated from an ore deposit. The

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method involves disposing a processing apparatus in a processing apparatus position relative to the ore deposit, and disposing a first conveyor to receive a first sized ore feed at a first receiving location located along a length of the first conveyor, the first conveyor being operable to convey sized ore from the first receiving location to a discharge end of the first conveyor, the first conveyor having at least a first set of moving means for moving the first conveyor in response to control signals. The method also involves disposing a second conveyor to receive the sized ore from the discharge end of the first conveyor at a transfer location along a length of the second conveyor and to convey the sized ore from the transfer location to the processing apparatus, the first and second conveyors being oriented at an operational angle between the length of the first conveyor and the length of the second conveyor, and facilitating excavation of successive portions of the ore deposit by moving the first conveyor, including: (a) rotating the first conveyor about the discharge end of the first conveyor such that the operational angle between the first and second conveyors is varied, and (b) translating the first conveyor along the second conveyor such that the transfer location along the second conveyor is translated, to permit successive portions of the ore deposit within operational reach of the first conveyor to be excavated and received for conveying along the first and second conveyors to the processing apparatus while the processing apparatus is located in the processing apparatus position.

The method may further involve receiving the first sized ore feed at the first receiving location, and simultaneously receiving a second sized ore feed at a second receiving location, spaced apart from the first receiving location, the first conveyor conveying sized ore from the first and second receiving locations to the discharge end of the first conveyor.

In accordance with another aspect of the invention, there is provided a method for processing a sized ore feed excavated from an ore deposit. The

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method involves disposing a processing apparatus in a processing apparatus position relative to the ore deposit and disposing a first mobile conveyor to receive a sized ore feed at a receiving location located along a length of the first mobile conveyor, the first mobile conveyor being operable to convey the sized ore from the receiving location to a discharge end of the first mobile conveyor. The method also involves disposing a second mobile conveyor to receive the sized ore from the discharge end of the first mobile conveyor at a transfer location along a length of the second mobile conveyor and to convey the sized ore from the transfer location to the processing apparatus, the first and second mobile conveyors being oriented at an operational angle between the length of the first mobile conveyor and the length of the second mobile conveyor. The method also involves moving at least one of the first and second mobile conveyors to vary at least one of the operational angle and the transfer location to permit successive portions of the ore deposit within operational reach of the receiving location to be received for conveying along the first and second mobile conveyors to the processing apparatus while the processing apparatus is located in the processing apparatus position. Receiving the sized ore feed at the receiving location involves receiving the sized ore feed proximate at least one of a plurality of receiving locations along the length of the first mobile conveyor.

Receiving the sized ore feed at the at least one of the plurality of receiving locations may involve receiving the sized ore feed at a hopper mounted for movement on a track extending along at least a portion of the length of the first mobile conveyor.

In accordance with another aspect of the invention, there is provided a method for processing a sized ore feed excavated from an ore deposit. The method involves disposing a processing apparatus in a processing apparatus position relative to the ore deposit, and disposing a first mobile conveyor to receive a sized ore feed at a receiving location located along a length of the

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first mobile conveyor, the first mobile conveyor being operable to convey the sized ore from the receiving location to a discharge end of the first mobile conveyor. The method also involves disposing a second mobile conveyor to receive the sized ore from the discharge end of the first mobile conveyor at a transfer location along a length of the second mobile conveyor and to convey the sized ore from the transfer location to the processing apparatus, the first and second mobile conveyors being oriented at an operational angle between the length of the first mobile conveyor and the length of the second mobile conveyor, and moving at least one of the first and second mobile conveyors to vary at least one of the operational angle and the transfer location to permit successive portions of the ore deposit within operational reach of the receiving location to be received for conveying along the first and second mobile conveyors to the processing apparatus while the processing apparatus is located in the processing apparatus position. In a first operational stage disposing the first mobile conveyor involves disposing the first mobile conveyor to position the receiving location of the first mobile conveyor at a distal mine face location with respect to the processing apparatus position, and disposing the second mobile conveyor involves causing the second mobile conveyor to be disposed to discharge the sized ore into a feeder of the processing apparatus. Moving at least one of the first and second mobile conveyors involves causing the second mobile conveyor to successively move toward the mine face about the feeder while causing the first mobile conveyor to progressively advance into the ore deposit while excavating a first portion of the ore deposit within operational reach of the receiving location. In a second operational stage disposing the second mobile conveyor involves causing the second mobile conveyor to be disposed generally parallel to the mine face. Moving the at least one of the first and second mobile conveyors involves causing the first mobile conveyor to be laterally translated while successively moving the transfer location along the second mobile conveyor toward the feeder of the processing apparatus while maintaining the

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operational angle substantially constant to permit excavation of a second portion of the ore deposit within operational reach of the receiving location.

5 Maintaining the operational angle substantially constant may involve maintaining an operational angle of about **90** degrees.

10 In a third operational stage disposing the second mobile conveyor may involve causing the second mobile conveyor to be moved to position the transfer location on an opposite side of the feeder of the processing apparatus. Moving the at least one of the first and second mobile conveyors may involve moving the first mobile conveyor to place the discharge end of the first mobile conveyor at the transfer location, and causing the first mobile conveyor to be laterally translated while successively moving the transfer location along the second mobile conveyor away from the feeder of the processing apparatus while maintaining the operational angle substantially constant to permit excavation of a third portion of the ore deposit within operational reach of the receiving location.

20 In a fourth operational stage moving the at least one of the first and second mobile conveyors may involve causing the first and second mobile conveyors to be disposed at an operational angle of about **180** degrees such that the first and second mobile conveyors are generally in-line with each other to permit excavation of distally located portions of the ore deposit within operational reach of the receiving location.

25 In accordance with another aspect of the invention, there is provided a process line apparatus for processing sized ore excavated from a bitumen containing ore deposit. The apparatus includes a processing apparatus disposed in a processing apparatus position relative to the ore deposit, and a first mobile conveyor disposed to receive a sized ore feed at a receiving location located along a length of the first mobile conveyor, the first mobile

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conveyor being operable to convey the sized ore from the receiving location to a discharge end of the first mobile conveyor. The apparatus also includes a second mobile conveyor disposed to receive the sized ore from the discharge end of the first mobile conveyor at a transfer location along a length of the second mobile conveyor and to convey the sized ore from the transfer location to the processing apparatus, the first and second mobile conveyors being oriented at an operational angle between the length of the first mobile conveyor and the length of said second mobile conveyor, and provisions for moving at least one of the first and second mobile conveyors to vary at least one of the operational angle and the transfer location to permit successive portions of the ore deposit within operational reach of the receiving location to be received for conveying along the first and second mobile conveyors to the processing apparatus while the processing apparatus is located in the processing apparatus position. The receiving location includes at least one of a plurality of receiving locations along the length of the first mobile conveyor.

The first mobile conveyor may be operably configured to receive the sized ore feed at a hopper mounted for movement on a track extending along at least a portion of the length of the first mobile conveyor.

In accordance with another aspect of the invention, there is provided a process line apparatus for processing sized ore excavated from a bitumen containing ore deposit. The apparatus includes a processing apparatus disposed in a processing apparatus position relative to the ore deposit, and a first mobile conveyor disposed to receive a sized ore feed at a receiving location located along a length of the first mobile conveyor, the first mobile conveyor being operable to convey the sized ore from the receiving location to a discharge end of the first mobile conveyor. The apparatus also includes a second mobile conveyor disposed to receive the sized ore from the discharge end of the first mobile conveyor at a transfer location along a length of the second mobile conveyor and to convey the sized ore from the transfer

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location to the processing apparatus, the first and second mobile conveyors being oriented at an operational angle between the length of the first mobile conveyor and the length of the second mobile conveyor, and the first mobile conveyor and the second mobile conveyor being operably configured to move to vary at least one of the operational angle and the transfer location to permit successive portions of the ore deposit within operational reach of the receiving location to be excavated and received for conveying along the first and second mobile conveyors to said processing apparatus while the processing apparatus is located in the processing apparatus position. The receiving location includes at least one of a plurality of receiving locations along the length of the first mobile conveyor.

The first mobile conveyor may be operably configured to receive the sized ore feed at a hopper mounted for movement on a track extending along at least a portion of the length of the first mobile conveyor.

Other aspects and features of the present invention will become apparent to those ordinarily skilled in the art upon review of the following description of specific embodiments of the invention in conjunction with the accompanying figures.

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BRIEF DESCRIPTION OF THE DRAWINGS

In drawings which illustrate embodiments of the invention,

5 **Figure 1** is a plan view of a process line apparatus for processing sized ore in accordance with a first embodiment of the invention;

Figure 2 is a schematic view of a mine site;

10 **Figure 3** is a side view of a mobile conveyor used in the process line apparatus shown in **Figure 1**;

Figure 4 is a side view of an exemplary processing apparatus used in the process line apparatus shown in **Figure 1**;

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Figure 5 is a side view of an excavator and a comminutor used in the process line apparatus shown in **Figure 1**; and

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Figure 6 – 12 are a series of plan views of operational stages during excavation an ore deposit; and

5 Figure 13 is a plan view of an operational stage during excavating an ore deposit in accordance with an alternative embodiment of the invention.

DETAILED DESCRIPTION

Process line

10 Referring to Figure 1, a process line apparatus for processing sized ore excavated from an ore deposit 100 is shown generally at 102. The apparatus 102 includes a processing apparatus 116 located in a processing apparatus position relative to the ore deposit 100.

15 The apparatus 102 also includes a first mobile conveyor 104 disposed to receive a sized ore feed at a receiving location 106 located along a length of the first mobile conveyor. The first mobile conveyor 104 is operable to convey the sized ore from the receiving location 106 to a discharge end 108 of the first mobile conveyor.

20 The apparatus 102 further includes a second mobile conveyor 110 disposed to receive the sized ore from the discharge end 108 of the first mobile conveyor 104 at a transfer location 112 along a length of the second mobile conveyor. The second mobile conveyor 110 conveys the sized ore from the
25 transfer location 112 to the processing apparatus 116.

30 The first and second mobile conveyors 104 and 110 are oriented at an operational angle γ between the length of the first mobile conveyor and the length of the second mobile conveyor. The first mobile conveyor 104 and the second mobile conveyor 108 are also operably configured to move to vary the operational angle γ and/or the transfer location 112 to permit successive

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portions of the ore deposit within operational reach of the receiving location to be to be excavated and received for conveying along the first and second mobile conveyors to the processing apparatus **116**.

5 In the embodiment shown in Figure **1** the receiving location **106** comprises a hopper **132** for receiving the sized ore feed from the comminutor **126** and the transfer location **112** comprises a hopper **134** for receiving sized ore from the discharge end **108** of the first mobile conveyor.

10 In the embodiment shown, the apparatus **102** also includes an excavator **124** for excavating the ore from the mine face **120**, and a comminutor **126** for producing the sized ore feed. The comminutor **126** generally crushes larger chunks of the excavated ore to produce an ore feed having a maximum portion size that is conveyable by the first and second mobile conveyors **104**
15 and **110**.

In one embodiment the ore deposit **100** comprises a bituminous ore, having a substantial portion of mineral solids such as sand and clay, water, and a bitumen and/or oil film. Bituminous ore may comprise up to about **20** percent
20 bitumen by weight, and processing the ore involves separating the bitumen from the sand, clay, water and other trace constituents. Processing of bituminous ore may involve a plurality of processing steps such as producing a bitumen ore slurry. In other embodiments the ore deposit **100** may comprise other minerals and/or constituents that are to be extracted from ore
25 excavated during in an open pit or strip mining operation, for example. Alternatively, the process line apparatus **102** may be used to remove an overburden layer overlying an ore deposit.

Referring to Figure **2**, a schematic view of a mine site in accordance with one
30 embodiment of the invention is shown generally at **150**. The mine site **150** has boundaries **152** beyond which it is not permitted or not desired to

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excavate the ore deposit. In this embodiment, the processing apparatus **116** is initially located at a first processing apparatus position **154** for excavating a first ore section **156** of the ore deposit in mine site **150**. When the first section **156** has been excavated, the processing apparatus **116** is relocated to a second processing apparatus position **158** for mining a second section **160** of the ore deposit. Subsequent sections **164**, **168**, and **172** are then excavated by relocating the processing apparatus **116** to respective processing apparatus positions **162**, **166**, and **170**. Each subsequent processing apparatus position **154**, **158**, **162**, **166**, and **170** provides access to a section of the ore deposit such that the entire ore deposit between the boundaries **152** of the mine site **150** may be excavated and processed. Each time the processing apparatus is relocated, the first and second mobile conveyors **104** and **110**, the comminutor **126**, and the excavator **124** are also moved to excavate subsequent sections **160**, **164**, **168**, and **172**. In this embodiment the sections **156**, **160**, **164**, **168**, and **172** are generally of rectangular shape but in other embodiments the sections may be otherwise shaped or irregularly shaped. As described later herein, the sections **156**, **160**, **164**, **168**, and **172** may also include some portions (not shown in Figure 2) that comprise low grade ore or obstacles that it is not desired to excavate.

First and second mobile conveyors

Referring to Figure 3, an exemplary mobile conveyor in accordance with one embodiment of the invention is shown at **200**. The mobile conveyor **200** includes a plurality of conveyor sections, including a first conveyor section **202**, a plurality of intermediate conveyor sections **204** and **206**, and a discharge conveyor section **208**. The conveyor sections **202** – **208** are connected together end-to-end by pivot joints (not shown) and the sections support a continuous conveyor belt **210** for conveying the sized ore along the mobile conveyor **200**.

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Each conveyor section **202 – 208** includes at least one support **212** having crawler tracks **214** for moving the conveyor section. In this embodiment dual tracks **214** are provided facilitating movement of the conveyor sections in both transverse and longitudinal directions. The dual tracks **114** have the advantage of providing additional stability when it is desired to move the mobile conveyor **200** in the longitudinal direction.

In general the supports **212** and/or crawler tracks **214** may be independently height adjustable to accommodate changes in terrain height between conveyor sections **202 - 208**. In the embodiment shown each conveyor section **202 – 208** includes an alignment gauge **216** for producing an alignment signal representing a misalignment condition between adjacent conveyor sections. The alignment gauge **216** produces signals representing lateral and/or height misalignment conditions between adjacent conveyor sections. The alignment gauge **216** may include a string pot (otherwise known as a cable extension transducer), for example.

The mobile conveyor **200** also includes a hopper **218**, which may act as the receiving location **106**, for example. The hopper **218** may be mounted for movement along a track (not shown) extending at least partway along the length of the mobile conveyor **200**, to permit the receiving location **106** to be successively disposed at different locations along the mobile conveyor as required. Alternatively the conveyor **200** may be configured to provide a plurality of spaced apart locations at which the hopper may be located. In other embodiments, an additional hopper (not shown) may be included to permit sized ore to be simultaneously receiving at more than one receiving location.

In this embodiment the discharge conveyor section **208** includes an upwardly inclined conveyor portion **220** that acts as the discharge end **108**. The discharge conveyor section **208** also includes an alignment sensor **222** that

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produces a signal for monitoring a location of the discharge end **108** with respect to a receiving location (such as a hopper **224** located on another conveyor section **168**). The alignment sensor **222** produces a feedback signal for controlling the movement of the crawler tracks **214** on the discharge conveyor section **208** by monitoring the relative location of the discharge end **108** with respect to the hopper **224**. The alignment sensor **222** may be an optical sensor, for example.

Generally, the mobile conveyor **200** also includes a controller (not shown) for activating the crawler tracks **214** in response to the alignment signals produced by the alignment gauges **216** and the feedback signal produced by the alignment sensor **222**. In operation, the controller produces control signals for driving the crawler tracks **214** and the supports **212** to maintain the conveyor sections **202 – 208** in a generally straight line condition with the discharge end **108** aligned over the hopper **224**. The mobile conveyor **200** may be moved about the discharge end **108** by moving the first conveyor section **202**, thereby causing the conveyor sections **204, 206** and **208** to subsequently move to maintain the conveyor **200** in a straight line. Should the conveyor be required to move over uneven terrain, the controller may also produce height adjustment signals in response to the alignment signals produced by the alignment gauges **216** to cause the supports **212** to be adjusted to maintain the conveyor sections **202 – 208** in a generally level condition. The mobile conveyor **200** may also be laterally translated and/or longitudinally repositioned by causing each of the conveyor sections **202 – 208** to be moved substantially in the same direction and by the same amount.

By using conveyor sections **202 – 208** as modular units, the first and second mobile conveyors **104** and **110** may be easily assembled as required for excavating a particular ore deposit **100** and by adding one or more conveyor sections, may be extended to provide a greater operational reach, if required.

Suitable mobile and/or portable conveyor sections are manufactured by FLSmidth RAHCO Inc. of Spokane, WA, USA and FAM of Magdeburg, Germany.

5 Processing apparatus

Referring to Figure 4, an exemplary embodiment of a slurry processing apparatus for processing a bituminous ore is shown at **253**. The slurry apparatus **253** includes a slurry box **256** having an inlet chute **254**. The slurry apparatus **253** also includes a transfer conveyor **250** and a hopper **118**, which
10 together act as a feeder for the slurry apparatus **253**. The hopper **118** is located to receive sized ore from the discharge end **114** of the second mobile conveyor **110** and the transfer conveyor **250** conveys the sized ore to the inlet chute **254** of the slurry box **256**. In this embodiment the slurry box **256** includes a sizing roller screen **260** such as that described in commonly owned
15 Canadian Patent Application **2,476,194** entitled "Sizing Roller Screen Ore Processing". The sizing roller screen **260** screens and crushes the ore into a convenient size for producing the slurry.

In operation, hot water is generally introduced at the inlet chute **254** and at the
20 roller screen **260**. The hot water reduces ore buildup in the inlet chute **254** and the roller screen **260**. In some embodiments further additives and/or cold water may be added as required. The combination of ore, water, and other additives produces a slurry which is accumulated in the slurry box **256**. The slurry box **256** may be dimensioned such that, for an average ore feed rate
25 through the inlet chute **254**, the slurry retention time in the slurry box is approximately one minute. The slurry box **256** also includes an outlet **266** in communication with a hydro-transport pump **268**. The hydro-transport pump **268** is in communication with a hydro-transport pipeline **270**, and pumps bitumen slurry from the slurry box **256** through the hydro-transport pipeline to
30 a plant (not shown) for further processing of the bitumen slurry.

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In the embodiment shown, the slurry apparatus **253** also includes crawler tracks **272** on the slurry box **256**, and crawler tracks **252** on the transfer conveyor **250** for relocating the slurry apparatus to subsequent processing apparatus positions **154**, **158**, **162**, **166**, and **170** shown in Figure 2. In other
5 embodiments the slurry apparatus **253** may be at least partially disassembled for relocation to a subsequent processing apparatus position.

A suitable mobile slurry apparatus is disclosed in commonly owned Canadian
10 Patent Application **2,610,169** entitled "Method and Apparatus for Creating a Slurry".

In other embodiments, where the ore comprises minerals other than bitumen, the processing apparatus **116** may include various other processing stages, which may or may not produce a slurry of the sized ore.

Excavator and comminutor

The excavator **124** and comminutor **126** are shown in side view in Figure 5. In this embodiment the excavator **124** includes a front attached shovel **300** for excavating the mine face **120**. The excavator **124** also includes a revolving
20 deck **302** and is mounted for movement on tracks **304**. The excavator **124** generally excavates ore from the mine face **120** using the shovel **300** and transfers the ore to a hopper **128** of the comminutor **126** by revolving the deck **302** and/or advancing the excavator **124** using the tracks **304**. In other
25 embodiments the excavator **124** may comprise a dragline or other excavator, for example.

The comminutor **126** includes a set of comminuting rollers **306** for comminuting or crushing the excavated ore to produce a sized ore feed that is suitable for conveying by the first and second mobile conveyors **104** and **110**.
30 In one embodiment the comminuting rollers **306** are sized and spaced to produce a sized ore feed having no chunks having a diameter of greater than

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about **350** mm. The comminutor **126** also includes an apron feeder **308** for conveying the excavated ore from the hopper **128** to the comminuting rollers **306**. The comminutor **126** also includes a discharge conveyor **309**, having a receiving end **310** and a discharge end **316**. The sized ore feed is received
5 from the comminuting rollers **306** at the receiving end **310**, and is conveyed to the discharge end **316** where the sized ore is transferred to the receiving location **106** of the first mobile conveyor **104**.

In general the comminutor **126** includes controls and sensors (not shown) for
10 controlling the passage of ore from the apron feeder **308**, through the comminuting rollers **306**, and to the discharge conveyor **309**. For example, various controls may be employed to slow down or speed up the apron feeder **308** and the discharge conveyor **309** to produce a generally even rate of sized ore feed to the first mobile conveyor **104**. Sensors may also be employed to
15 detect the occurrence of metal and/or large chunks, and to slow or halt the ore feed through the apparatus to appropriately deal with these occurrences. The comminutor **126** may also include a screen (not shown) ahead of the comminuting rollers **306** to reject oversize chunks of ore.

20 In an alternative embodiment, load carrying containers such as haul trucks (not shown) may be employed during at least some of the excavation operation. The load carrying container receives ore from the excavator **124** and transports the ore to the comminutor **126**, thereby extending the operational reach of the excavator. However in general, it is desirable to limit
25 the use of haul trucks by generally maintaining the excavator **124** and comminutor **126** within operational reach of each other to reduce overall excavation cost.

Mining operations

30 As described above in connection with Figure 2, the process for mining the ore deposit **100** involves excavating subsequent rectangular sections **156**,

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160, 164, 168, and 172 by moving the processing apparatus 116 to respective processing apparatus positions 154, 158, 162, 166, and 170. The excavation of each of the rectangular sections 156, 160, 164, 168, and 172 in accordance with one embodiment of the invention is described further with reference to Figure 6 to Figure 12 showing operational stages for excavating the ore deposit.

First operational stage

Referring to Figure 6, in a first operational stage the processing apparatus 116 is located in a first processing apparatus position at a mine face 350 of an un-excavated section of the ore deposit 100. In this embodiment the processing apparatus 116 is generally centrally located with respect to the mine face 350 and the processing apparatus is oriented at an angle α between the mine face 350 and a longitudinal axis 352 of the processing apparatus, as shown at 354 in Figure 6.

The second mobile conveyor 110 is positioned such that the discharge end 114 is over the hopper 118 of the processing apparatus 116, and the second mobile conveyor is oriented at an angle β to the longitudinal axis 352 of the processing apparatus, as shown at 356. In general the angle β is selected to provide operating clearance between the second mobile conveyor 104 and the processing apparatus 116 during mining operations. In one embodiment the angle β is about 108°.

The first mobile conveyor 104 is positioned such that the discharge end 108 is proximate the transfer location 112, and the first mobile conveyor is oriented at an operational angle γ between the length of the first mobile conveyor 104 and the length of the second mobile conveyor 110, as shown at 358 in Figure 6. In the embodiment shown in Figure 6 the transfer location 112 is located proximate a distal end of the second mobile conveyor 110 at a location furthest from the discharge end 114. However, as described above, the

transfer location **112** may be moveable along the length of the second mobile conveyor **110** and may be located at any of a plurality of locations along the length of the second mobile conveyor.

5 The comminutor **126** is located such that the discharge end **316** of the discharge conveyor **309** is proximate the receiving location **106** of the first mobile conveyor **104**. The orientation of the second mobile conveyor **110** (i.e. the angle β) and the operational angle γ between the first and second mobile conveyors are selected to permit the excavator **124** to excavate the ore
10 deposit **100** at a distal mine face portion **360**.

In general, the bitumen containing ore deposit is covered by an overburden layer of sand, rock, and vegetation, which has little or no bitumen content. The overburden layer is typically removed in advance to prevent conveying
15 ore to the processing apparatus **116** that does not carry any economic value. The overburden may be removed in its entirety prior to commencing excavation, or may be removed in sections ahead of the conveyor being advanced to permit excavation of the corresponding ore deposit section.

20 Referring to Figure 7, in the first operational stage, the second mobile conveyor **110** is successively rotated about the discharge end **114** such that the transfer location **112** of the second mobile conveyor moves through an arc **376** towards the ore deposit **100**. As the second mobile conveyor **110** is rotated the operational angle γ between the first and second mobile conveyors
25 is also successively varied to cause the receiving location **106** to advance while the excavator **124** extends the distal mine face portion **360** to expose a mine face **380**. The comminutor **126** is also relocated to position the hopper **128** proximate a plurality of mine face locations along the mine face **380** while maintaining the discharge end **316** of the discharge conveyor **309** at the
30 receiving location **106** of the first mobile conveyor **104**.

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In the embodiment shown in Figure 7, on completion of the first operational stage a first portion **378** of the ore deposit **100** has been excavated and the second mobile conveyor **110** is oriented substantially parallel to the mine face **350** and the operational angle γ between the first and second mobile conveyors **104** and **110** is approximately 90° . The first portion **378** is defined by a first exposed mine face **380**, a second exposed mine face **382**, and a third exposed mine face **384**. In this embodiment the first and second exposed mine faces **380** and **382** are generally perpendicular to the length of said second mobile conveyor **110** and the third exposed mine face **384** is generally parallel to the length of said second mobile conveyor thus defining a generally rectangular excavated portion. However in other embodiments, the excavated portion may have an irregular shape.

Advantageously, by operating first and second mobile conveyors **104** and **110** at a varying operational angle γ , a generally lineal portion of the mine face such as the mine face **380** may be excavated along a boundary such as the boundary **152** shown in Figure 2, for example.

In other embodiments more than one spaced apart receiving locations (not shown) along the first mobile conveyor **104** may be simultaneously employed to further increase the excavation rate and the sized ore feed rate, if required.

Second operational stage

Referring to Figure 8, in a second operational stage the processing apparatus **116** remains located at the first processing apparatus position. The first mobile conveyor **104** and the transfer location **112** are successively translated in a lateral direction indicated by the arrow **390**, while the angle γ between the first and second mobile conveyors is maintained substantially constant (in this embodiment at an angle of about 90°). Following each successive lateral translation, excavation occurs at a second plurality of mine faces to define a second portion **392**. On completion of the second operational stage, the

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transfer location **112** is located proximate the discharge end **114** of the second mobile conveyor **110**. The second portion **392** is generally defined by extending the third exposed mine face **384** to expose a fourth exposed mine face **396**, and by exposing a fifth mine face **394**. In this embodiment the first and second portions **378** and **392** are contiguously located rectangular portions and share a common boundary **398** (shown as a broken line) generally defined by the previously exposed mine face **382**.

Third operational stage

Referring to Figure **9**, in a third operational stage the processing apparatus **116** again remains at the first processing apparatus position. The second mobile conveyor **110** is then rotated about the discharge end **108** to swing through an arc of about **180°**. Alternatively, individual conveyor sections may be detached from each other, swung through **180°** and then re-attached to reconfigure the second mobile conveyor **110** for conveying in an opposite direction. Conveyor modules such as those described above in connection with Figure **3** are not generally configured for bi-directional conveying.

The first mobile conveyor **104** may need to be moved to permit the rotation of the second mobile conveyor, whereafter the first mobile conveyor is then moved to place the discharge end **108** at the transfer location **112**, which is initially located proximate the discharge end **108**. Alternatively, if permitted by the terrain, the second mobile conveyor may be moved away from the processing apparatus **116** for rotating, thereby permitting excavation to continue using the first mobile conveyor **104**. In this case the discharge end **108** of the first mobile conveyor **104** is located to discharge sized ore directly into the hopper **118** of the processing apparatus **116**. When the second mobile conveyor **110** has been reconfigured, it may be moved back into operation as shown in Figure **9**.

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Referring to Figure 10, in the third operational stage sized ore received at the transfer location 112 is conveyed to the discharge end 108. As described above in connection with Figure 7 and 8 the first mobile conveyor 104 and the transfer location 112 are again successively translated in a lateral direction indicated by the arrow 390, while the angle γ between the first and second mobile conveyors maintained substantially constant. Referring to Figure 11, following each successive lateral translation, excavation occurs at a third plurality of mine faces to define a third portion 410. The third portion 410 is generally defined by extending the fourth exposed mine face 396 to expose a sixth exposed mine face 414, and by exposing a seventh mine face 412. In this embodiment the second and third portions 392 and 410 are contiguously located rectangular portions and share a common boundary 416 (shown as a broken line) generally defined by the previously exposed mine face 394.

Referring to Figure 12, an alternative operational embodiment may include a fourth operation stage following completion of the third operational stage. In the fourth operational stage the first and second mobile conveyors 104 and 110 are disposed substantially in-line with each other to permit the sized ore feed to be received at a mine face 422 proximate a distally located corner of the section comprising portions 378, 392, and 410.

Advantageously, excavation of the first, second, and third portions 378, 392 and 410 as described above results in an extensive section of the ore deposit 100 being excavated while the processing apparatus 116 remains located in the first processing apparatus position. By moving both the first and second mobile conveyors 104 and 110, the process line 102 facilitates excavation of lineal walls along the mine face and/or excavation of substantially rectangular sections of ore.

In one embodiment the first mobile conveyor may be about 240 meters in length and the second mobile conveyor may be about 200 meters in length,

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which facilitates excavation of a section having a mine face of about **710** meters wide and extending about **270** meters into the mine face (i.e. in a direction away from the processing apparatus position).

5 Referring to Figure **13**, in another operational embodiment the first and second mobile conveyors **104** and **110** may be operated to move around a portion **440** of the ore deposit **100** that is not to be excavated. The portion **440** may include low grade ore having a bitumen content that is lower than a minimum content for economical processing. Alternatively, the portion **440**
10 may comprise a hard rock outcrop, or other obstacle around which it is desired to excavate the ore while leaving the obstacle substantially intact.

Referring back to Figure **7**, once the portion **378** has been excavated and it has been determined that at least a portion of the mine face **382** should not
15 be excavated, the second mobile conveyor **110** is rotated about the discharge end **114** away from the mine face **350**. In this embodiment the first mobile conveyor **104** is moved to follow the second mobile conveyor **110**, such that the conveyors return to the general location shown in broken outline in Figure **7**. In general, the degree of rotation of the second mobile conveyor **110** away
20 from the mine face **350** should be sufficient to permit the first mobile conveyor **104** to clear the mine face **350**.

Referring back to Figure **13**, the first mobile conveyor **104** is then rotated about the transfer location **112** as shown in broken outline at **442**.

25

During these movements of the first and second mobile conveyors **104** and **110**, receiving of the sized ore may be temporarily suspended until the respective conveyors are repositioned. At this time the excavator **124** and comminutor **126** may be moved into position for continuing excavation along a
30 mine face **446** of the portion **440**. Operations then generally continue as described above and excavation continues along the generally lineal mine

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face **446** and a further portion **448** is excavated while leaving the portion **440** un-excavated.

5 Advantageously, using first and second mobile conveyors **104** and **110**
configurable at the varying angle γ , facilitates mining around the portion **140**.
Prior art process lines would require the portion **440** to be excavated and
removed to permit the conveyor to pass in its operational arc. Furthermore,
by permitting the portion **440** to remain unexcavated, it is not necessary to
remove the overburden above the portion **440**. Removal of overburden
10 represents an un-recoverable cost in excavating an ore deposit since the
overburden has little or no economic value. Furthermore removing the need
to process low grade ore advantageously increases the proportion of bitumen
containing ore in the total volume of ore that is excavated, thereby improving
operational efficiency.

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While specific embodiments of the invention have been described and
illustrated, such embodiments should be considered illustrative of the
invention only and not as limiting the invention as construed in accordance
with the accompanying claims.

What is claimed is:

1. A method for processing a sized ore feed excavated from an ore deposit, the method comprising:

5 disposing a processing apparatus in a processing apparatus position relative to the ore deposit;

10 disposing a first mobile conveyor to receive a sized ore feed at a receiving location located along a length of said first mobile conveyor, said first mobile conveyor being operable to convey the sized ore from said receiving location to a discharge end of said first mobile conveyor;

15 disposing a second mobile conveyor to receive the sized ore from said discharge end of said first mobile conveyor at a transfer location selected from a plurality of transfer locations available along a length of said second mobile conveyor and to convey the sized ore from said transfer location to said processing apparatus, said first and second mobile conveyors being oriented at an operational angle between said length of said first mobile conveyor and said length of said second mobile conveyor; and

20 moving at least one of said first and second mobile conveyors to vary at least one of said operational angle and said transfer location wherein moving said at least one of first and second mobile conveyors comprises:

25 (a) in a first type of movement, causing the operational angle between the first and second mobile

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conveyors to be varied while the transfer location is maintained substantially constant,

5 (b) in a second type of movement, causing the transfer location to be varied while the operational angle between the first and second mobile conveyors is maintained substantially constant, and

(c) in a third type of movement, causing both the transfer location and the operational angle to be varied,

10 to permit successive portions of the ore deposit within operational reach of said receiving location to be received for conveying along said first and second mobile conveyors to said processing apparatus while said processing apparatus is located in said processing apparatus position.

15 2. The method of claim 1 wherein the ore deposit comprises at least one portion within operational reach of said receiving location that is not to be excavated and wherein moving said at least one of said first and second mobile conveyors comprises varying at least one of said operational angle and said transfer location to move said receiving location around said at least one portion that is not to be excavated.

20 3. The method of any one of claims 1 to 2 wherein receiving the sized ore feed at said receiving location comprises receiving the sized ore feed proximate at least one of a plurality of receiving locations along said length of said first mobile conveyor.

25 4. The method of claim 3 wherein receiving the sized ore feed at said at least one of said plurality of receiving locations comprises receiving the

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sized ore feed at a hopper mounted for movement on a track extending along at least a portion of said length of said first mobile conveyor.

- 5 **5.** The method of any one of claims 1 to 3 wherein receiving said sized ore feed comprises receiving ore from an excavator and comminuting the ore to produce said sized ore feed.
- 6.** The method of claim 5 wherein receiving said ore from said excavator comprises receiving said ore in a load carrying container and transporting said ore to a comminutor for comminuting the ore.
- 10 **7.** The method of any one of claims 1 to 6 wherein disposing said processing apparatus comprises disposing said processing apparatus at an angle to a mine face of the ore deposit to provide clearance between said second mobile conveyor and said processing apparatus when moving said second mobile conveyor.
- 15 **8.** The method of any one of claims 1 to 7 wherein in a first operational stage:
- disposing said first mobile conveyor comprises disposing said first mobile conveyor to position said receiving location of said first mobile conveyor at a distal mine face location with respect to said processing apparatus position;
- 20 disposing said second mobile conveyor comprises causing said second mobile conveyor to be disposed to discharge the sized ore into a feeder of the processing apparatus; and
- 25 wherein moving at least one of said first and second mobile conveyors comprises causing said second mobile conveyor to successively move toward the mine face about said feeder while

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causing said first mobile conveyor to progressively advance into the ore deposit while excavating a first portion of the ore deposit within operational reach of said receiving location.

- 5 **9.** The method of claim **8** wherein disposing said second mobile conveyor to receive the sized ore from said discharge end of said first mobile conveyor comprises disposing said second mobile conveyor to receive the sized ore at a transfer location proximate an end of said second mobile conveyor that is distally located with respect to the discharge end of said second mobile conveyor.
- 10 **10.** The method of claim **8** wherein in a second operational stage:
- disposing said second mobile conveyor comprises causing said second mobile conveyor to be disposed generally parallel to the mine face; and
- 15 wherein moving said at least one of said first and second mobile conveyors comprises causing said first mobile conveyor to be laterally translated while successively moving said transfer location along said second mobile conveyor toward said feeder of said processing apparatus while maintaining said operational angle substantially constant to permit excavation of a second
- 20 portion of the ore deposit within operational reach of said receiving location.
- 11.** The method of claim **10** wherein maintaining said operational angle substantially constant comprises maintaining an operational angle of about **90** degrees.
- 25 **12.** The method of claim **10** wherein in a third operational stage:

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disposing said second mobile conveyor comprises causing said second mobile conveyor to be moved to position said transfer location on an opposite side of said feeder of said processing apparatus; and

5 wherein moving said at least one of said first and second mobile conveyors comprises:

moving said first mobile conveyor to place said discharge end of said first mobile conveyor at said transfer location; and

10 causing said first mobile conveyor to be laterally translated while successively moving said transfer location along said second mobile conveyor away from said feeder of said processing apparatus while maintaining said operational angle substantially constant
15 to permit excavation of a third portion of the ore deposit within operational reach of said receiving location.

13. The method of claim 12 wherein in a fourth operational stage:

20 moving said at least one of said first and second mobile conveyors comprises causing said first and second mobile conveyors to be disposed at an operational angle of about 180 degrees such that the first and second mobile conveyors are generally in-line with each other to permit excavation of distally located portions of the ore deposit within operational reach of said receiving location.

25 14. The method of claim 1 wherein moving at least one of said first and second mobile conveyors comprises moving both said first mobile

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conveyor and said second mobile conveyor while varying said operational angle to permit excavation along a generally linear mine face portion of the ore deposit.

5 **15.** The method of any one of claims **1** to **13** wherein said processing apparatus position comprises a first processing apparatus position and further comprising, on completion of excavation of said successive portions of the ore deposit within operational reach of said receiving location, relocating said processing apparatus to a second processing apparatus position to permit excavation of further portions of the ore
10 deposit while said processing apparatus is located in said second processing apparatus position.

16. The method of any one of claims **1** to **15** wherein:

- (a) said first type of movement comprises rotation of said first mobile conveyor generally about said transfer location;
- 15 (b) said second type of movement comprises lateral translation of said first mobile conveyor and said transfer location along said second mobile conveyor; and
- (c) said third type of movement comprises rotation of said first mobile conveyor generally about said transfer location
20 combined with lateral translation of said first mobile conveyor and transfer location along said second mobile conveyor.

17. The method of any one of claims **1** to **15** wherein:

- (a) said first type of movement comprises rotation of said first mobile conveyor generally about said transfer location;

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(b) said second type of movement comprises rotation of said transfer location generally about an ore-receiving intake of said processing apparatus; and

5 (c) said third type of movement comprises rotation of said first mobile conveyor generally about said transfer location combined with rotation of said transfer location generally about said ore-receiving intake.

10 18. The method of any one of claims 1 to 17 further comprising varying said operational angle at least between about 90 degrees and about 180 degrees.

19. The method of any one of claims 1 to 18 wherein said processing apparatus comprises an apparatus for producing a slurry.

20. A method for processing a sized ore feed excavated from an ore deposit, the method comprising:

15 disposing a processing apparatus in a first processing apparatus position relative to the ore deposit;

20 disposing a first mobile conveyor to receive a sized ore feed at a receiving location located along a length of said first mobile conveyor, said first mobile conveyor being operable to convey the sized ore from said receiving location to a discharge end of said first mobile conveyor;

25 disposing a second mobile conveyor to receive the sized ore from said discharge end of said first mobile conveyor at a transfer location disposed at one of a plurality of transfer locations available along a length of said second mobile

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5 conveyor and to convey the sized ore from said transfer location along said second mobile conveyor to a discharge end of said second mobile conveyor aligned to convey the sized ore to an intake of said processing apparatus, said first and second mobile conveyors being oriented at an operational angle between said length of said first mobile conveyor and said length of said second mobile conveyor; and

10 excavating in a generally straight line along a generally linear mine face wherein excavating comprises advancing said receiving location along said generally straight line by a combination of:

15 (a) causing said second mobile conveyor and said transfer location to rotate generally about said intake of said processing apparatus while maintaining alignment of said discharge end of said second mobile conveyor with said intake; and

20 (b) causing said first mobile conveyor to rotate about said transfer location on said second mobile conveyor to vary said operational angle while maintaining alignment of said discharge end of said first mobile conveyor with said transfer location on said second mobile conveyor;

25 to permit successive portions of the ore deposit within operational reach of said receiving location as it advances along said generally linear mine face to be received for conveyance along said first and second mobile conveyors to said processing apparatus while said processing apparatus is located in said processing apparatus position.

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21. The method of claim **20** further comprising:

in response to a determination that at least a portion of a particular mine face portion should not be excavated:

5

causing the second mobile conveyor to rotate about its discharge end away from the particular mine face; and

causing the first mobile conveyor to move to follow the second mobile conveyor while causing the first mobile conveyor to rotate about said transfer location so as to:

10

(i) decrease the operational angle sufficiently to permit the first mobile conveyor to clear the particular mine face; and

15

(ii) place the first mobile conveyor into a position from which it can advance in cooperation with the second mobile conveyor to facilitate mining of a different mine face portion, spaced apart from said particular mine face portion.

22. The method of claim **21** further comprising temporarily suspending receiving of the sized ore while the first and second mobile conveyors are repositioning.

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23. The method of claim **22** further comprising moving said receiving location along said different mine face portion in a second generally straight line, wherein the second generally straight line is not parallel to the second mobile mining conveyor.

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24. The method of any one of claims **20** to **23** wherein said processing apparatus comprises a mobile slurry apparatus.

25. A method for processing a sized ore feed excavated from an ore deposit, the method comprising:

5 disposing a processing apparatus in a processing apparatus position relative to the ore deposit;

10 disposing a first mobile conveyor to receive a sized ore feed at a receiving location located along a length of said first mobile conveyor, said first mobile conveyor being operable to convey the sized ore from said receiving location to a discharge end of said first mobile conveyor;

15 disposing a second mobile conveyor to receive the sized ore from said discharge end of said first mobile conveyor at a transfer location along a length of said second mobile conveyor and to convey the sized ore from said transfer location to said processing apparatus, said first and second mobile conveyors being oriented at an operational angle between said length of said first mobile conveyor and said length of said second mobile conveyor; and

20 moving said first mobile conveyor and said second mobile conveyor to vary said operational angle and said transfer location by:

25 (a) rotating said first mobile conveyor about said discharge end of said first mobile conveyor such that the operational angle between said first and second mobile

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conveyors is varied while the transfer location is maintained substantially constant,

5 (b) rotating said second mobile conveyor generally about an ore-receiving intake of said processing apparatus such that said transfer location is moved in an arc while maintaining alignment of said second mobile conveyor with said ore-receiving intake of said processing apparatus, and

10 (c) laterally translating said first mobile conveyor along said second mobile conveyor such that the transfer location along said second mobile conveyor is laterally translated while said operational angle between the first and second mobile conveyors is maintained substantially constant,

15 to permit successive portions of the ore deposit within operational reach of said receiving location to be to be excavated and received for conveying along the first and second mobile conveyors to said processing apparatus while said processing apparatus is located in said processing apparatus
20 position.

25 26. The method of claim 25 wherein the ore deposit comprises at least one portion within operational reach of said receiving location that is not to be excavated and wherein the method further comprises moving said first and second mobile conveyors to vary at least one of said operational angle and said transfer location to move said receiving location around said at least one portion that is not to be excavated.

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27. The method of claim **25** or **26** wherein said receiving location comprises at least one of a plurality of receiving locations along said length of said first mobile conveyor.
- 5 28. The method of claim **27** further comprising receiving the sized ore feed at a hopper mounted for movement on a track extending along at least a portion of said length of said first mobile conveyor.
29. The method of any one of claims **25** to **28** further comprising:
- excavating ore from the ore deposit using an excavator; and
- receiving excavated ore from the excavator at a comminutor and
- 10 comminuting the ore to produce said sized ore feed.
30. The method of claim **29** further comprising transporting said ore between said excavator and said comminutor using a plurality of load carrying containers.
- 15 31. The method any one of claims **25** to **30** wherein moving said first mobile conveyor and said second mobile conveyor to vary said operational angle and said transfer location comprises moving said receiving location along a linear mine face in a generally straight line, wherein the generally straight line is not parallel to the second mobile mining conveyor.
- 20 32. The method of any one of claims **25** to **31** further comprising, upon completion of excavation of said successive portions of the ore deposit within operational reach of said receiving location while said processing apparatus is located in said processing apparatus position, relocating said processing apparatus to a subsequent processing apparatus position, and relocating the first and second mobile conveyors to
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cooperate to convey excavated ore to the subsequent processing apparatus position, to permit excavation of further portions of the ore deposit within operational reach while said processing apparatus is located at the subsequent processing apparatus position.

5 **33.** The method of any one of claims **25** to **32** wherein said processing apparatus comprises a mobile slurry apparatus.

34. A process line apparatus for processing sized ore excavated from a bitumen containing ore deposit, the apparatus comprising:

10 a processing apparatus disposed in a processing apparatus position relative to the ore deposit;

15 a first mobile conveyor disposed to receive a sized ore feed at a receiving location located along a length of said first mobile conveyor, said first mobile conveyor being operable to convey the sized ore from said receiving location to a discharge end of said first mobile conveyor;

20 a second mobile conveyor disposed to receive the sized ore from said discharge end of said first mobile conveyor at a transfer location selected from a plurality of transfer locations available along a length of said second mobile conveyor and to convey the sized ore from said transfer location to said processing apparatus, said first and second mobile conveyors being oriented at an operational angle between said length of said first mobile conveyor and said length of said second mobile conveyor; and

25 means for moving at least one of said first and second mobile conveyors to vary at least one of said operational angle and said

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transfer location, the means for moving further comprising means for selectively causing:

5 (a) a first type of movement in which the operational angle between the first and second mobile conveyors is varied while the transfer location is maintained substantially constant,

10 (b) a second type of movement in which the transfer location is varied while the operational angle between the first and second mobile conveyors is maintained substantially constant, and

(c) a third type of movement in which both the transfer location and the operational angle are varied,

15 to permit successive portions of the ore deposit within operational reach of said receiving location to be received for conveying along the first and second mobile conveyors to said processing apparatus while said processing apparatus is located in said processing apparatus position.

20 **35.** The apparatus of claim **34** wherein the ore deposit comprises at least one portion within operational reach of said receiving location that is not to be excavated and wherein said means for moving said at least one of said first and second mobile conveyors comprises means for varying at least one of said operational angle and said transfer location to move said receiving location around said at least one portion that is not to be excavated.

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36. The apparatus of any one of claims 34 to 35 wherein said receiving location comprises at least one of a plurality of receiving locations along said length of said first mobile conveyor.
- 5 37. The apparatus of claim 36 wherein said first mobile conveyor is operably configured to receive the sized ore feed at a hopper mounted for movement on a track extending along at least a portion of said length of said first mobile conveyor.
38. The apparatus of any one of claims 34 to 37 further comprising:
- an excavator for excavating ore from the ore deposit; and
- 10 a comminutor for receiving the excavated ore from the excavator and comminuting the ore to produce said sized ore feed.
39. The apparatus of claim 38 further comprising a load carrying container for transporting said ore between said excavator and said comminutor.
- 15 40. The apparatus of any one of claims 34 to 39 wherein said processing apparatus is disposed at an angle to a mine face of the ore deposit to provide clearance between said second mobile conveyor and said processing apparatus when moving said second mobile conveyor.
41. The apparatus of any one of claims 34 to 40 wherein said first mobile conveyor and said second mobile conveyor each comprise:
- 20 a plurality of conveyor sections, each conveyor section comprising means for moving said conveyor section; and
- alignment means for aligning said plurality of conveyor sections.

- 5 **42.** The apparatus of claim **34** wherein said means for moving at least one of said first and second mobile conveyors comprises means for moving both said first mobile conveyor and said second mobile conveyor while varying said operational angle to permit excavation along a generally linear mine face portion of the ore deposit.
- 10 **43.** A process line apparatus for processing sized ore excavated from a bitumen containing ore deposit, the apparatus comprising:
- 15 a processing apparatus disposed in a processing apparatus position relative to the ore deposit;
- 20 a first mobile conveyor disposed to receive a sized ore feed at a receiving location located along a length of said first mobile conveyor, said first mobile conveyor being operable to convey the sized ore from said receiving location to a discharge end of said first mobile conveyor;
- 25 a second mobile conveyor disposed to receive the sized ore from said discharge end of said first mobile conveyor at a transfer location selected from a plurality of transfer locations available along a length of said second mobile conveyor and to convey the sized ore from said transfer location to said processing apparatus, said first and second mobile conveyors being oriented at an operational angle between said length of said first mobile conveyor and said length of said second mobile conveyor; and
- said first mobile conveyor and said second mobile conveyor being operably configured to move to vary at least one of said operational angle and said transfer location by:

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5 (a) rotating said first mobile conveyor about said discharge end of said first mobile conveyor such that the operational angle between said first and second mobile conveyors is varied while the transfer location is maintained substantially constant,

10 (b) rotating said second mobile conveyor generally about an ore-receiving intake of said processing apparatus such that said transfer location is moved in an arc while maintaining alignment of said second mobile conveyor with said ore-receiving intake of said processing apparatus, and

15 (c) laterally translating said first mobile conveyor along said second mobile conveyor such that the transfer location along said second mobile conveyor is laterally translated while said operational angle between the first and second mobile conveyors is maintained substantially constant,

20 to permit successive portions of the ore deposit within operational reach of said receiving location to be to be excavated and received for conveying along the first and second mobile conveyors to said processing apparatus while said processing apparatus is located in said processing apparatus position.

25 **44.** The apparatus of claim **43** wherein the ore deposit comprises at least one portion within operational reach of said receiving location that is not to be excavated and wherein said first and second mobile conveyors are operably configured to vary at least one of said

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operational angle and said transfer location to move said receiving location around said at least one portion that is not to be excavated.

5 **45.** The apparatus of any one of claims **43** to **44** wherein said receiving location comprises at least one of a plurality of receiving locations along said length of said first mobile conveyor.

46. The apparatus of claim **45** wherein said first mobile conveyor is operably configured to receive the sized ore feed at a hopper mounted for movement on a track extending along at least a portion of said length of said first mobile conveyor.

10 **47.** The apparatus of any one of claims **43** to **46** further comprising:

an excavator for excavating ore from the ore deposit; and

a comminutor for receiving the excavated ore from the excavator and comminuting the ore to produce said sized ore feed.

15 **48.** The apparatus of claim **47** further comprising a load carrying container for transporting said ore between said excavator and said comminutor.

49. A method for processing an ore feed excavated from an ore deposit, the method comprising:

disposing a processing apparatus in a processing apparatus position relative to the ore deposit;

20 disposing a first conveyor to receive a sized ore feed at a first receiving location located along a length of said first conveyor, said first conveyor being operable to convey the sized ore from said first receiving location to a discharge end of said first

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conveyor, said first conveyor comprising a plurality of first conveyor sections each having respective moving means for moving the respective first conveyor section in response to control signals;

5 disposing a second conveyor to receive the sized ore from said discharge end of said first conveyor at a transfer location disposed at a first position along a length of said second conveyor and to convey the sized ore from said transfer location to said processing apparatus, said first and second conveyors
10 being oriented at an operational angle between said length of said first conveyor and said length of said second conveyor; and

moving said first conveyor relative to the second conveyor by activating said moving means on said first conveyor to:

15 (a) vary said operational angle between said length of said first conveyor and said length of said second conveyor; and

(b) move said transfer location from said first position to a second position along said length of said second conveyor;

20 to permit successive portions of the ore deposit within operational reach of said first receiving location to be received for conveying along said first and second conveyors to said processing apparatus while said processing apparatus is located in said processing apparatus position.

25 **50.** The method of claim **49** further comprising receiving said sized ore feed at said first receiving location located along said length of said first

5 conveyor, and receiving a further sized ore feed at a second receiving location, spaced apart from said first receiving location on said first conveyor, said first conveyor being operable to convey sized ore from said first and second receiving locations to said discharge end of said first conveyor.

10 **51.** The method of claim **50** further comprising disposing a first excavator and first comminutor within operational reach of said first receiving location to provide said sized ore feed to said first receiving location and disposing a second excavator and second comminutor within operational reach of said second receiving location to provide said further sized ore feed to said second receiving location.

52. The method of claim **50** further comprising simultaneously receiving said sized ore feed at said first receiving location and said further sized ore feed at said second receiving location on said first conveyor.

15 **53.** The method of claim **50** wherein the first and second receiving locations comprise first and second movable hoppers, respectively.

20 **54.** The method of any one of claims **49** to **53** wherein the ore deposit comprises a portion within operational reach of said first receiving location that is not to be excavated and wherein moving said first conveyor comprises varying at least one of said operational angle and said transfer location to move said first receiving location around said portion that is not to be excavated.

25 **55.** The method of any one of claims **49** to **54** wherein receiving said sized ore feed comprises receiving ore from an excavator and comminuting the ore to produce said sized ore feed.

- 5 **56.** The method of any one of claims **49** to **55** further comprising moving said second conveyor to a new location to provide access to a new section of the ore deposit, and varying at least one of the operational angle and the transfer point to put the receiving location of the first conveyor within operational reach of successive portions of the new section of the ore deposit.
- 57.** The method of claim **56** wherein said second conveyor includes a second conveyor moving means for moving the second conveyor to said new location.
- 10 **58.** The method of any one of claims **49** to **57** further comprising varying said operational angle at least between about **90** degrees and about **180** degrees while maintaining operational alignment between the first conveyor and the second conveyor at said transfer point.
- 15 **59.** The method of any one of claims **49** to **58** further comprising, in response to a determination that at least a portion of a particular mine face portion should not be excavated:
- repositioning the second conveyor to rotate generally about its discharge end away from the particular mine face; and
- 20 repositioning the first conveyor to move to generally follow the second conveyor and to rotate generally about said transfer location so as to:
- (i) decrease the operational angle sufficiently to permit the first conveyor to clear the particular mine face; and

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(ii) place the first conveyor into a position from which it can cooperate with the second conveyor to facilitate mining of a different mine face portion, spaced apart from said particular mine face portion.

- 5 **60.** The method of claim **59** further comprising temporarily suspending receiving of the sized ore while the first and second conveyors are repositioning.
- 61.** The method of any one of claims **49** to **60** wherein said processing apparatus comprises a mobile slurry apparatus.
- 10 **62.** The method of any one of claims **49** to **61** further comprising relocating said processing apparatus to a second processing apparatus position to permit excavation of further portions of the ore deposit while said processing apparatus is located in said second processing apparatus position.
- 15 **63.** The method of claim **62** further comprising relocating said first and second conveyors and relocating an excavator and comminutor to cooperate with said first and second conveyors and said processing apparatus to excavate said further portions of the ore deposit.
- 20 **64.** The method of any one of claims **49** to **63** wherein said processing apparatus position is initially disposed proximate an unexcavated mine face of the ore deposit.
- 25 **65.** The method of claim **64** further comprising disposing said processing apparatus an angle to said mine face of the ore deposit to provide clearance between the second conveyor and the processing apparatus when moving the second conveyor.

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- 66.** A method for processing an ore feed excavated from an ore deposit, the method comprising:

disposing a processing apparatus in a first processing apparatus position relative to the ore deposit;

5 disposing a first conveyor to receive a sized ore feed at a first receiving location located along a length of said first conveyor, said first conveyor being operable to convey the sized ore from said first receiving location to a discharge end of said first conveyor, the first conveyor having at least a first set of moving
10 means for moving the first conveyor in response to control signals;

disposing a second conveyor to receive the sized ore from said discharge end of said first conveyor at a transfer location disposed along a length of said second conveyor and to convey
15 the sized ore from said transfer location along said second conveyor to a discharge end of said second conveyor aligned to convey the sized ore to an intake of said processing apparatus, said first and second conveyors being oriented at an operational angle between said length of said first conveyor and said length
20 of said second conveyor; and

facilitating excavation in a generally straight line along a generally linear mine face by a combination of varying the operational angle and by translating the transfer location along
said length of said second conveyor, to permit successive
25 portions of the ore deposit within operational reach of said first receiving location as it advances along said generally linear mine face to be received for conveyance along said first and

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second conveyors to said processing apparatus while said processing apparatus is located in said processing apparatus position.

- 5 **67.** A method for processing an ore feed excavated from an ore deposit, the method comprising:

disposing a processing apparatus in a processing apparatus position relative to the ore deposit;

10 disposing a first conveyor to receive a first sized ore feed at a first receiving location located along a length of said first conveyor, said first conveyor being operable to convey sized ore from said first receiving location to a discharge end of said first conveyor, the first conveyor having at least a first set of moving means for moving the first conveyor in response to control signals;

15 disposing a second conveyor to receive the sized ore from said discharge end of said first conveyor at a transfer location along a length of said second conveyor and to convey the sized ore from said transfer location to said processing apparatus, said first and second conveyors being oriented at an operational angle between said length of said first conveyor and said length of said second conveyor; and

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facilitating excavation of successive portions of the ore deposit by moving said first conveyor, including:

25 (a) rotating said first conveyor about said discharge end of said first conveyor such that the operational angle between said first and second conveyors is varied; and

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(b) translating said first conveyor along said second conveyor such that the transfer location along said second conveyor is translated;

5 to permit successive portions of the ore deposit within operational reach of said first conveyor to be to be excavated and received for conveying along the first and second conveyors to said processing apparatus while said processing apparatus is located in said processing apparatus position.

10 **68.** The method of claim **67** further comprising receiving said first sized ore feed at said first receiving location, and simultaneously receiving a second sized ore feed at a second receiving location, spaced apart from said first receiving location, said first conveyor conveying sized ore from said first and second receiving locations to said discharge end of said first conveyor.

15 **69.** A method for processing a sized ore feed excavated from an ore deposit, the method comprising:

disposing a processing apparatus in a processing apparatus position relative to the ore deposit;

20 disposing a first mobile conveyor to receive a sized ore feed at a receiving location located along a length of said first mobile conveyor, said first mobile conveyor being operable to convey the sized ore from said receiving location to a discharge end of said first mobile conveyor;

25 disposing a second mobile conveyor to receive the sized ore from said discharge end of said first mobile conveyor at a transfer location along a length of said second mobile conveyor and to convey the sized ore from said transfer location to said

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processing apparatus, said first and second mobile conveyors being oriented at an operational angle between said length of said first mobile conveyor and said length of said second mobile conveyor; and

5 moving at least one of said first and second mobile conveyors to vary at least one of said operational angle and said transfer location to permit successive portions of the ore deposit within operational reach of said receiving location to be received for conveying along said first and second mobile conveyors to said
10 processing apparatus while said processing apparatus is located in said processing apparatus position;

wherein receiving the sized ore feed at said receiving location comprises receiving the sized ore feed proximate at least one of a plurality of receiving locations along said length of said first
15 mobile conveyor.

70. The method of claim **69** wherein receiving the sized ore feed at said at least one of said plurality of receiving locations comprises receiving the sized ore feed at a hopper mounted for movement on a track extending along at least a portion of said length of said first mobile conveyor.

20 **71.** A method for processing a sized ore feed excavated from an ore deposit, the method comprising:

disposing a processing apparatus in a processing apparatus position relative to the ore deposit;

25 disposing a first mobile conveyor to receive a sized ore feed at a receiving location located along a length of said first mobile conveyor, said first mobile conveyor being operable to convey

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the sized ore from said receiving location to a discharge end of said first mobile conveyor;

5 disposing a second mobile conveyor to receive the sized ore from said discharge end of said first mobile conveyor at a transfer location along a length of said second mobile conveyor and to convey the sized ore from said transfer location to said processing apparatus, said first and second mobile conveyors being oriented at an operational angle between said length of said first mobile conveyor and said length of said second mobile conveyor; and

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moving at least one of said first and second mobile conveyors to vary at least one of said operational angle and said transfer location to permit successive portions of the ore deposit within operational reach of said receiving location to be received for conveying along said first and second mobile conveyors to said processing apparatus while said processing apparatus is located in said processing apparatus position;

15

wherein in a first operational stage:

20 disposing said first mobile conveyor comprises disposing said first mobile conveyor to position said receiving location of said first mobile conveyor at a distal mine face location with respect to said processing apparatus position;

25 disposing said second mobile conveyor comprises causing said second mobile conveyor to be disposed to discharge the sized ore into a feeder of the processing apparatus; and

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5 wherein moving at least one of said first and second mobile conveyors comprises causing said second mobile conveyor to successively move toward the mine face about said feeder while causing said first mobile conveyor to progressively advance into the ore deposit while excavating a first portion of the ore deposit within operational reach of said receiving location; and

wherein in a second operational stage:

10 disposing said second mobile conveyor comprises causing said second mobile conveyor to be disposed generally parallel to the mine face; and

15 wherein moving said at least one of said first and second mobile conveyors comprises causing said first mobile conveyor to be laterally translated while successively moving said transfer location along said second mobile conveyor toward said feeder of said processing apparatus while maintaining said operational angle substantially constant to permit excavation of a second portion of the ore deposit within operational reach of said receiving location.

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72. The method of claim 71 wherein maintaining said operational angle substantially constant comprises maintaining an operational angle of about 90 degrees.

73. The method of claim 71 wherein in a third operational stage:

25 disposing said second mobile conveyor comprises causing said second mobile conveyor to be moved to position said transfer

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location on an opposite side of said feeder of said processing apparatus; and

wherein moving said at least one of said first and second mobile conveyors comprises:

5 moving said first mobile conveyor to place said discharge end of said first mobile conveyor at said transfer location; and

10 causing said first mobile conveyor to be laterally translated while successively moving said transfer location along said second mobile conveyor away from said feeder of said processing apparatus while maintaining said operational angle substantially constant to permit excavation of a third portion of the ore deposit within operational reach of said receiving location.

15 **74.** The method of claim **73** wherein in a fourth operational stage:

20 moving said at least one of said first and second mobile conveyors comprises causing said first and second mobile conveyors to be disposed at an operational angle of about **180** degrees such that the first and second mobile conveyors are generally in-line with each other to permit excavation of distally located portions of the ore deposit within operational reach of said receiving location.

75. A process line apparatus for processing sized ore excavated from a bitumen containing ore deposit, the apparatus comprising:

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a processing apparatus disposed in a processing apparatus position relative to the ore deposit;

5 a first mobile conveyor disposed to receive a sized ore feed at a receiving location located along a length of said first mobile conveyor, said first mobile conveyor being operable to convey the sized ore from said receiving location to a discharge end of said first mobile conveyor;

10 a second mobile conveyor disposed to receive the sized ore from said discharge end of said first mobile conveyor at a transfer location along a length of said second mobile conveyor and to convey the sized ore from said transfer location to said processing apparatus, said first and second mobile conveyors being oriented at an operational angle between said length of said first mobile conveyor and said length of said second mobile conveyor; and

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means for moving at least one of said first and second mobile conveyors to vary at least one of said operational angle and said transfer location to permit successive portions of the ore deposit within operational reach of said receiving location to be received for conveying along the first and second mobile conveyors to said processing apparatus while said processing apparatus is located in said processing apparatus position;

20

wherein said receiving location comprises at least one of a plurality of receiving locations along said length of said first mobile conveyor.

25

76. The apparatus of claim **75** wherein said first mobile conveyor is operably configured to receive the sized ore feed at a hopper mounted

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for movement on a track extending along at least a portion of said length of said first mobile conveyor.

77. A process line apparatus for processing sized ore excavated from a bitumen containing ore deposit, the apparatus comprising:

5 a processing apparatus disposed in a processing apparatus position relative to the ore deposit;

10 a first mobile conveyor disposed to receive a sized ore feed at a receiving location located along a length of said first mobile conveyor, said first mobile conveyor being operable to convey the sized ore from said receiving location to a discharge end of said first mobile conveyor;

15 a second mobile conveyor disposed to receive the sized ore from said discharge end of said first mobile conveyor at a transfer location along a length of said second mobile conveyor and to convey the sized ore from said transfer location to said processing apparatus, said first and second mobile conveyors being oriented at an operational angle between said length of said first mobile conveyor and said length of said second mobile conveyor; and

20 said first mobile conveyor and said second mobile conveyor being operably configured to move to vary at least one of said operational angle and said transfer location to permit successive portions of the ore deposit within operational reach of said receiving location to be to be excavated and received for
25 conveying along the first and second mobile conveyors to said processing apparatus while said processing apparatus is located in said processing apparatus position;

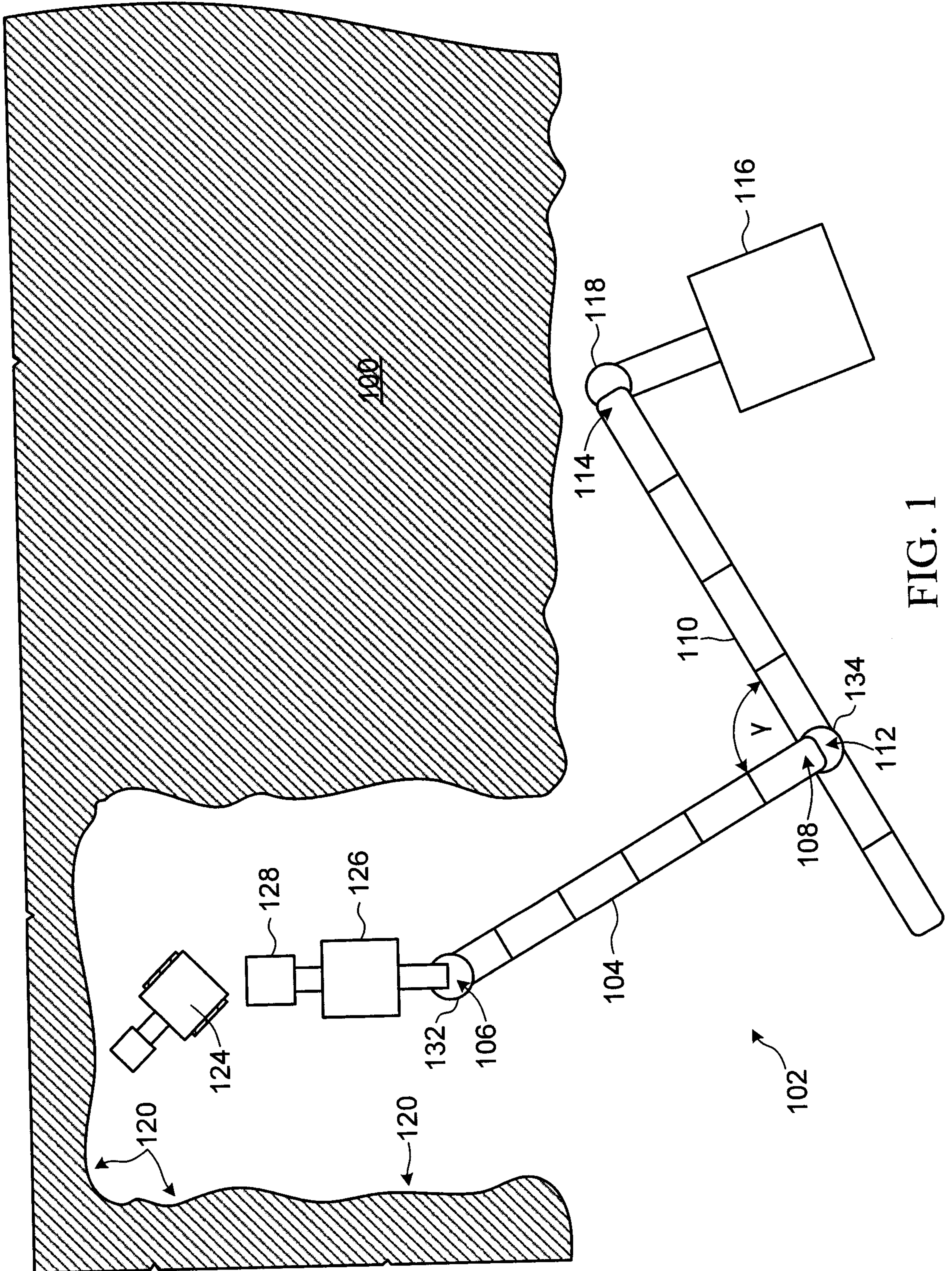
-56-

wherein said receiving location comprises at least one of a plurality of receiving locations along said length of said first mobile conveyor.

- 5 **78.** The apparatus of claim **77** wherein said first mobile conveyor is operably configured to receive the sized ore feed at a hopper mounted for movement on a track extending along at least a portion of said length of said first mobile conveyor.

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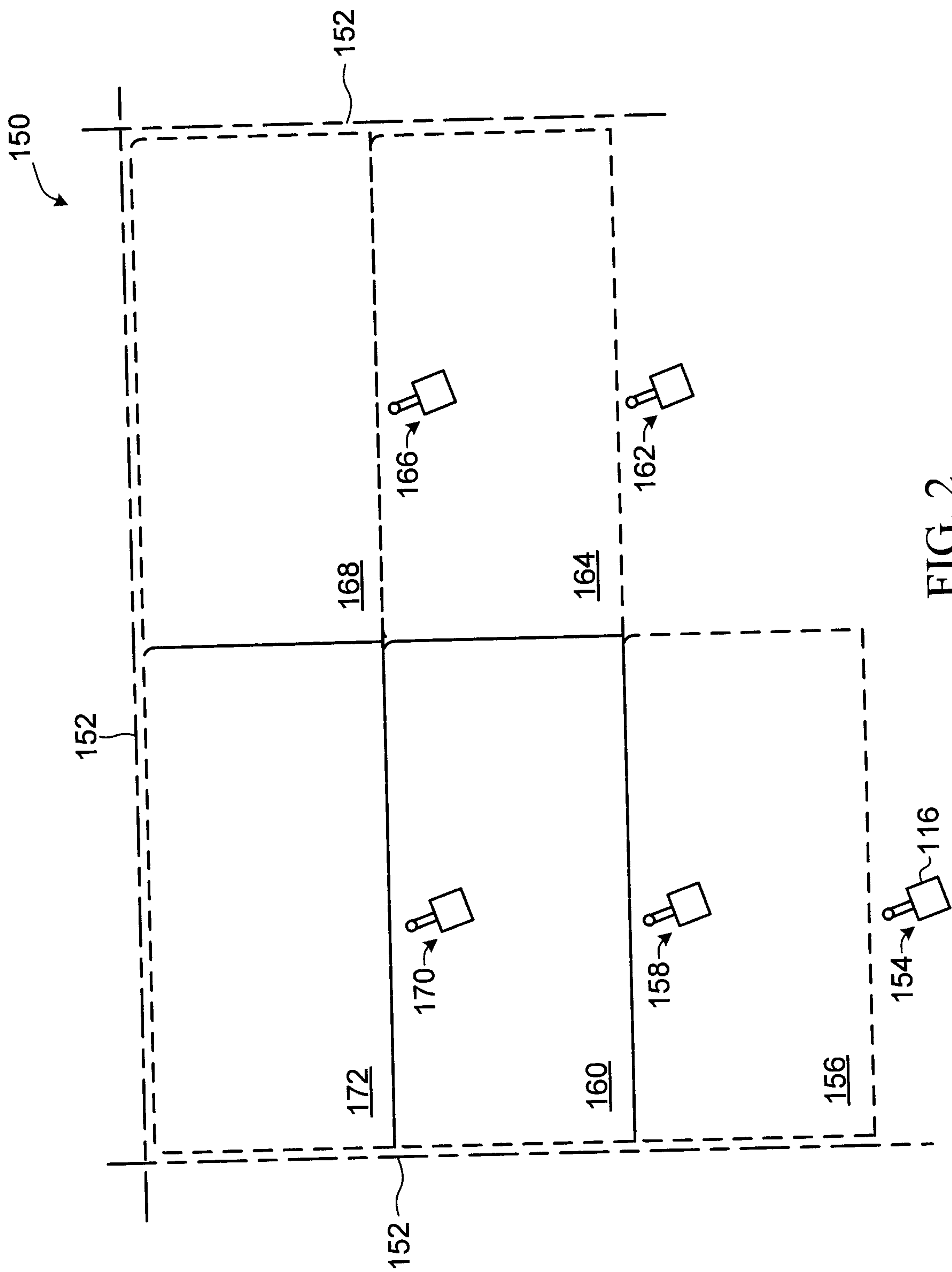


FIG. 2

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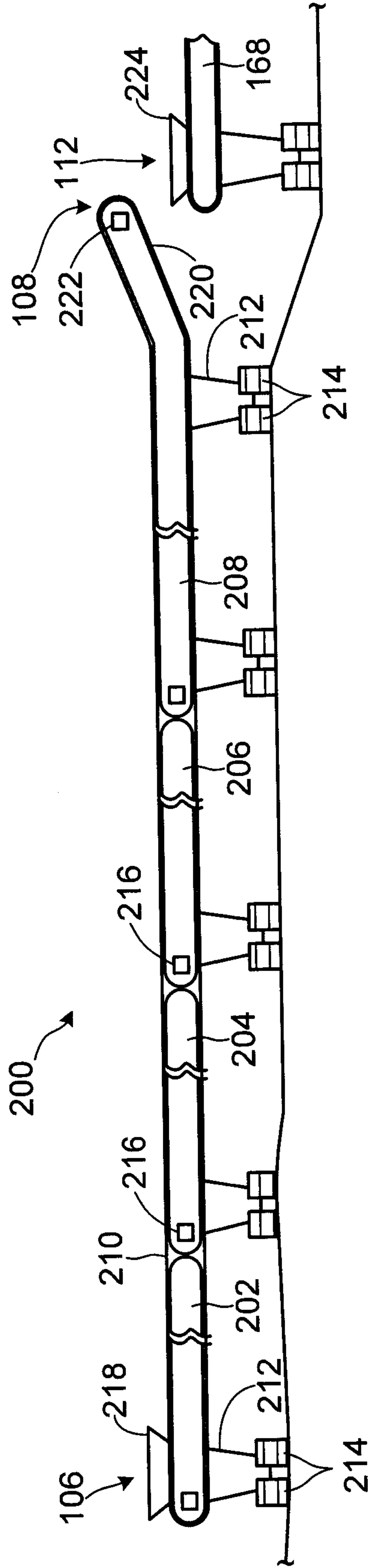


FIG. 3

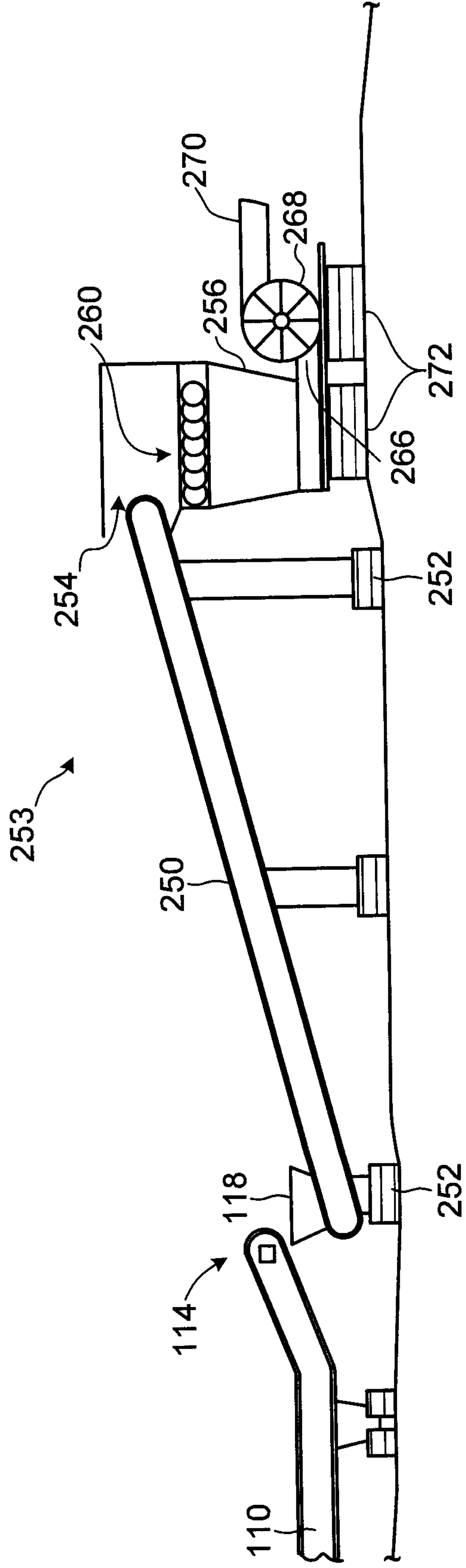


FIG. 4

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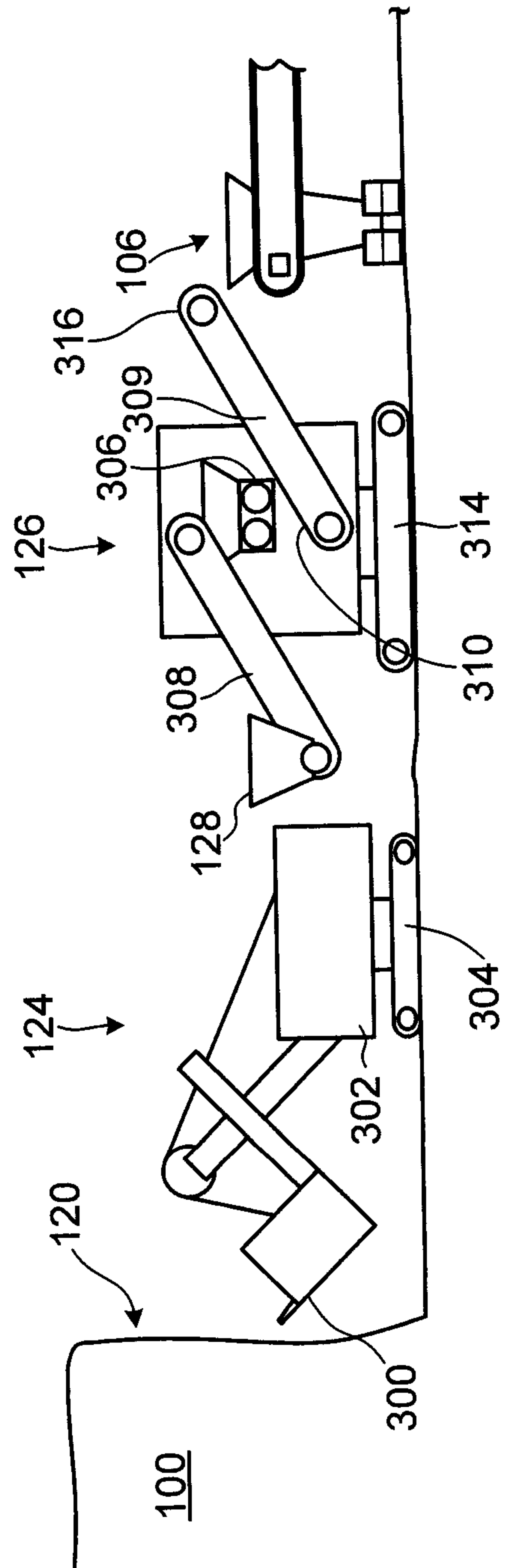


FIG. 5

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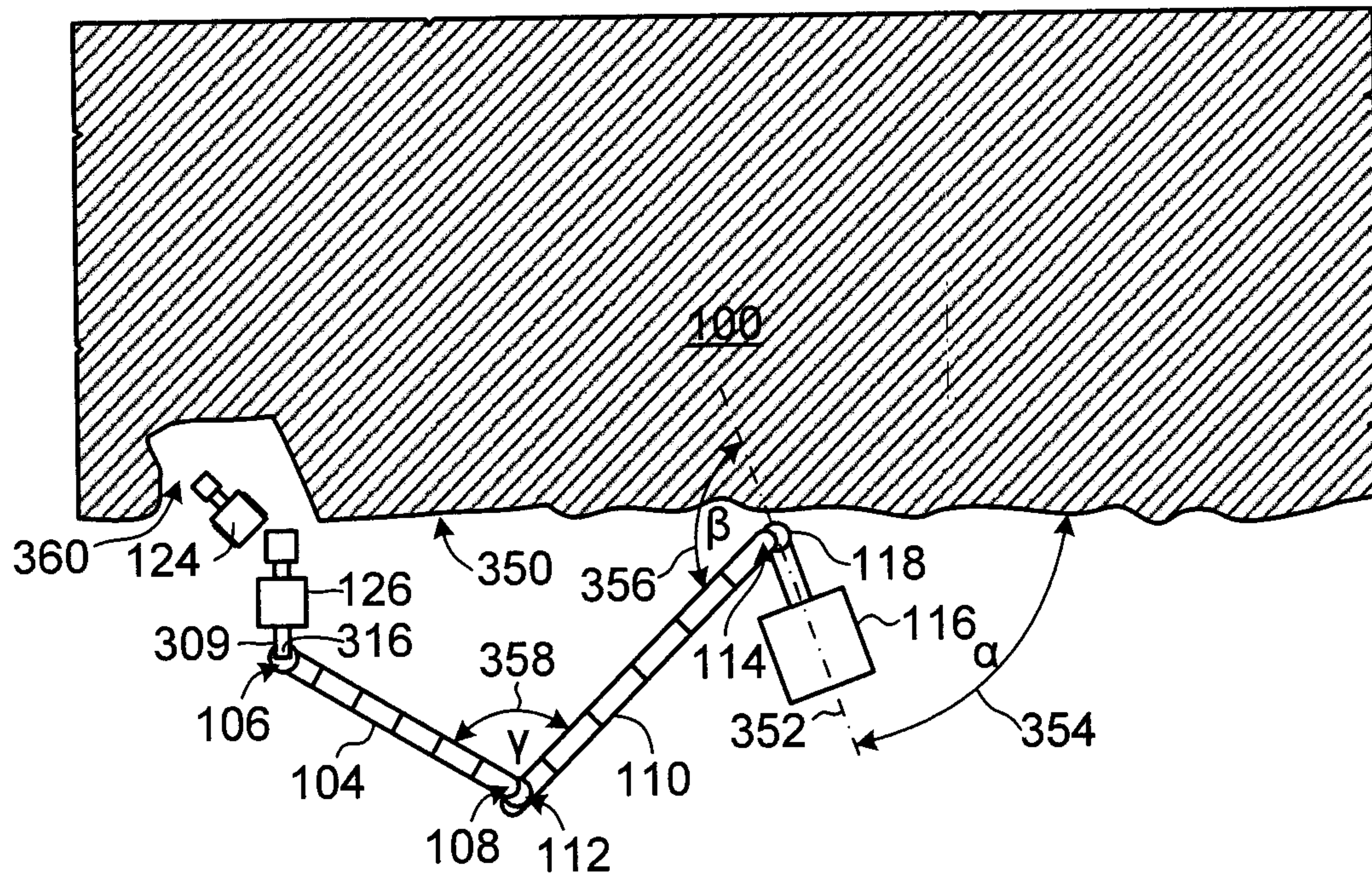


FIG. 6

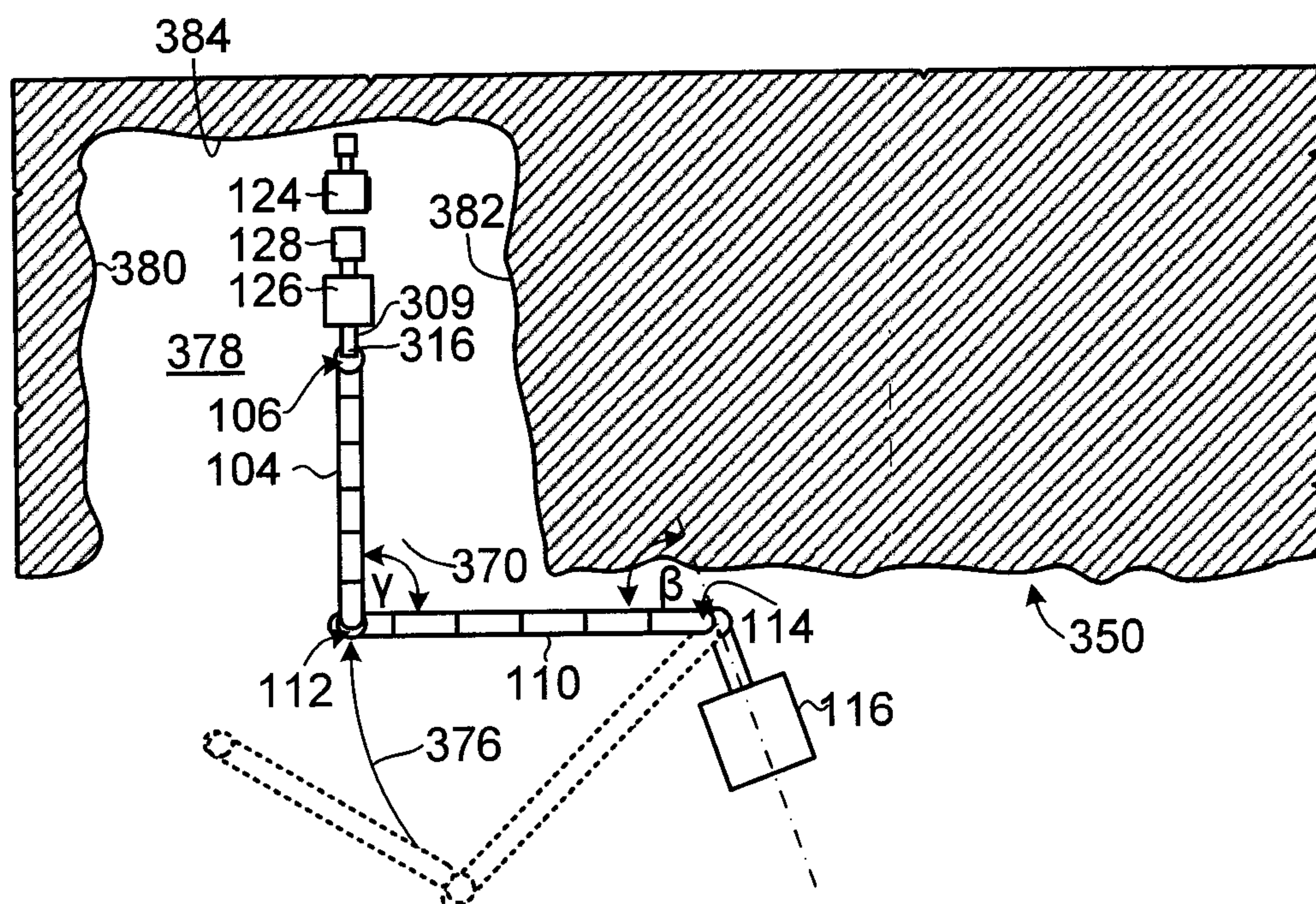


FIG. 7

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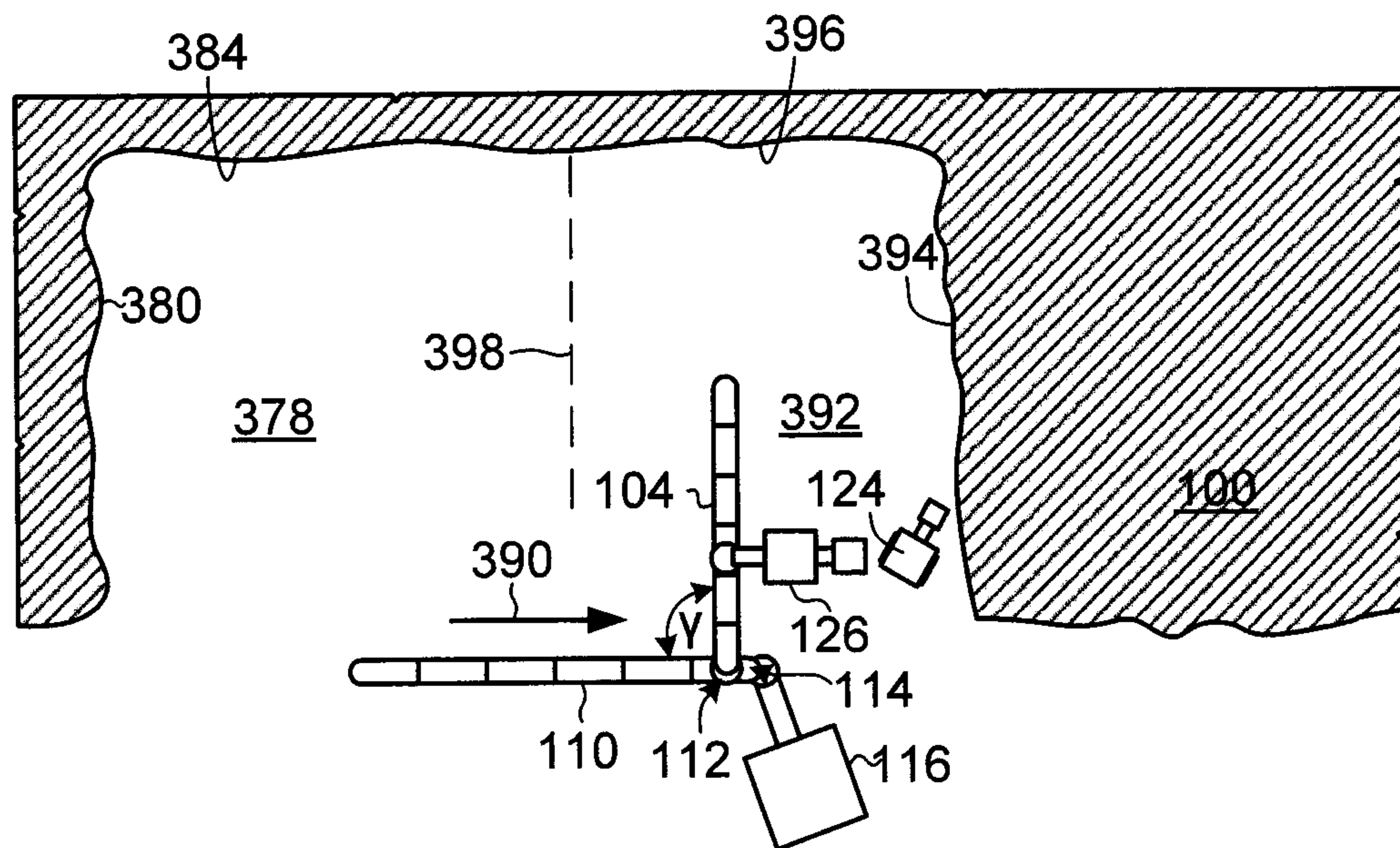


FIG. 8

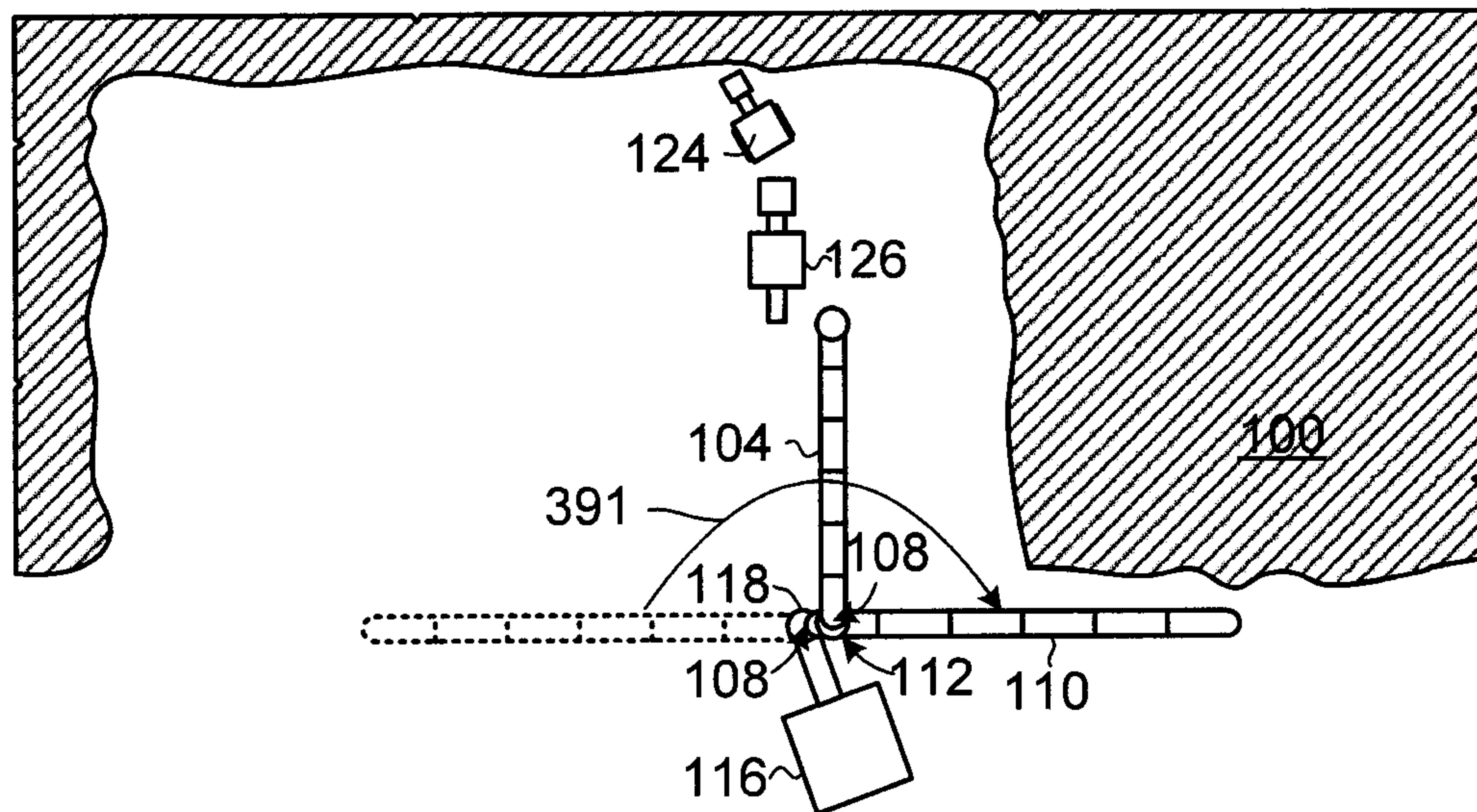


FIG. 9

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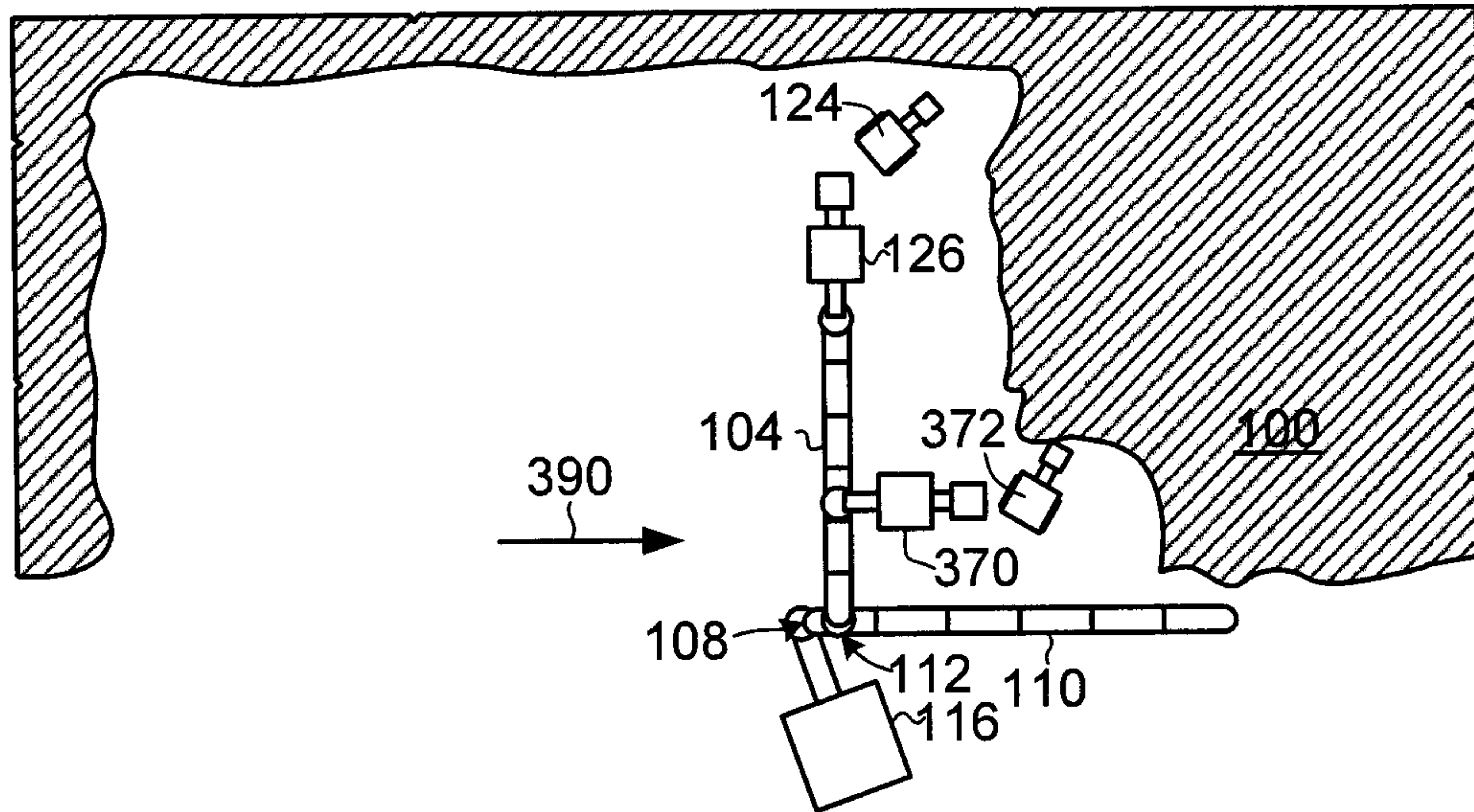


FIG. 10

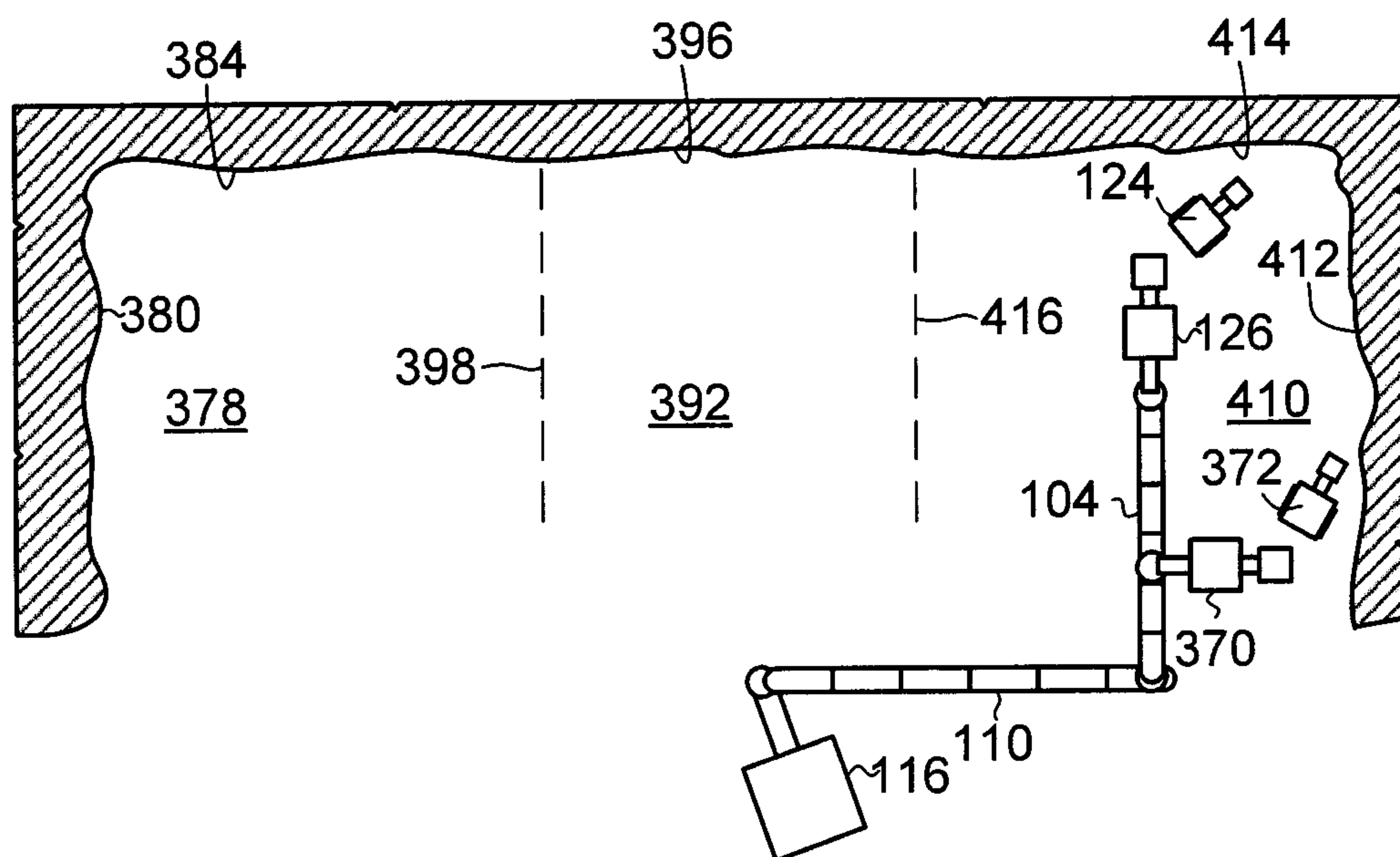


FIG. 11

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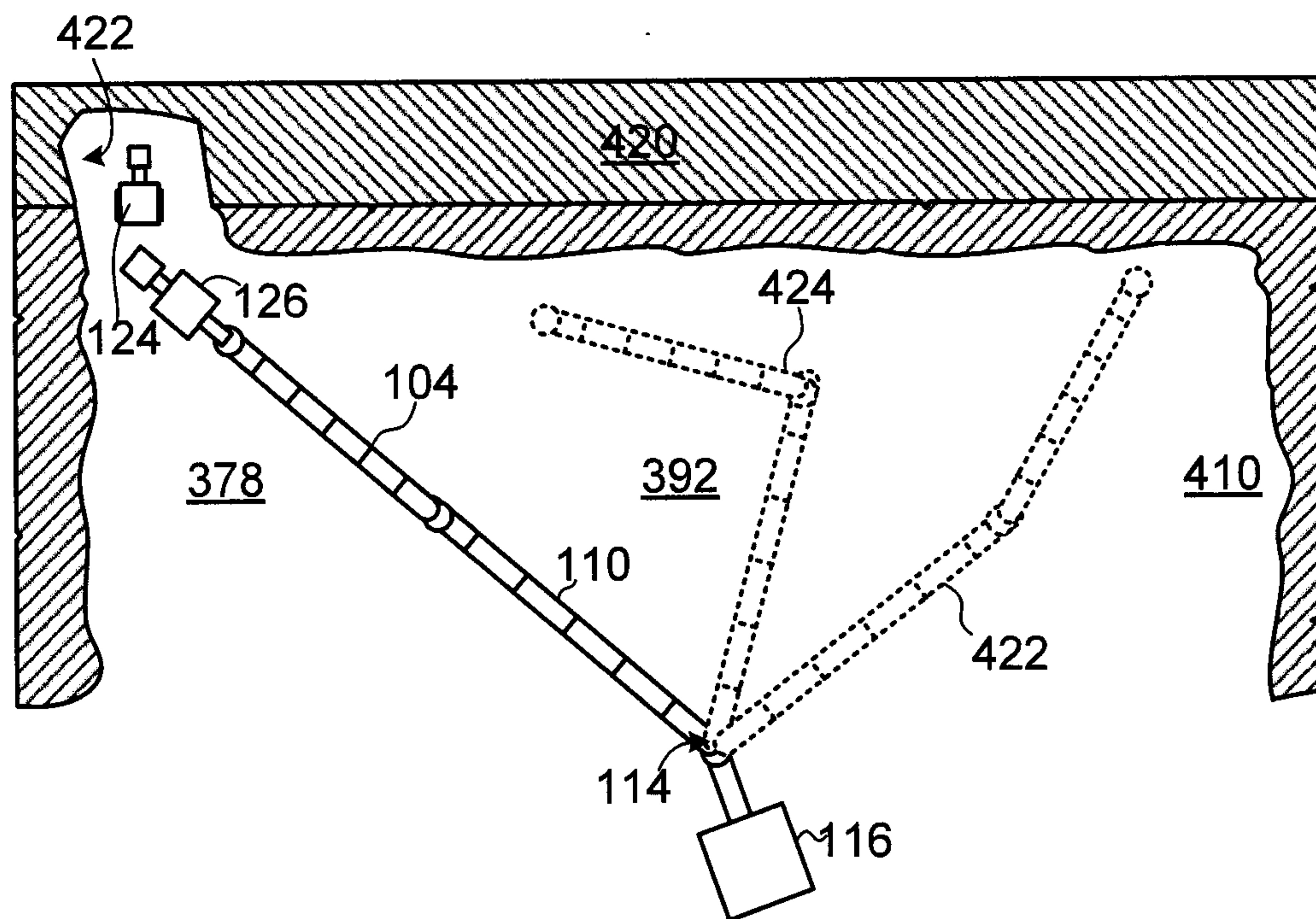


FIG. 12

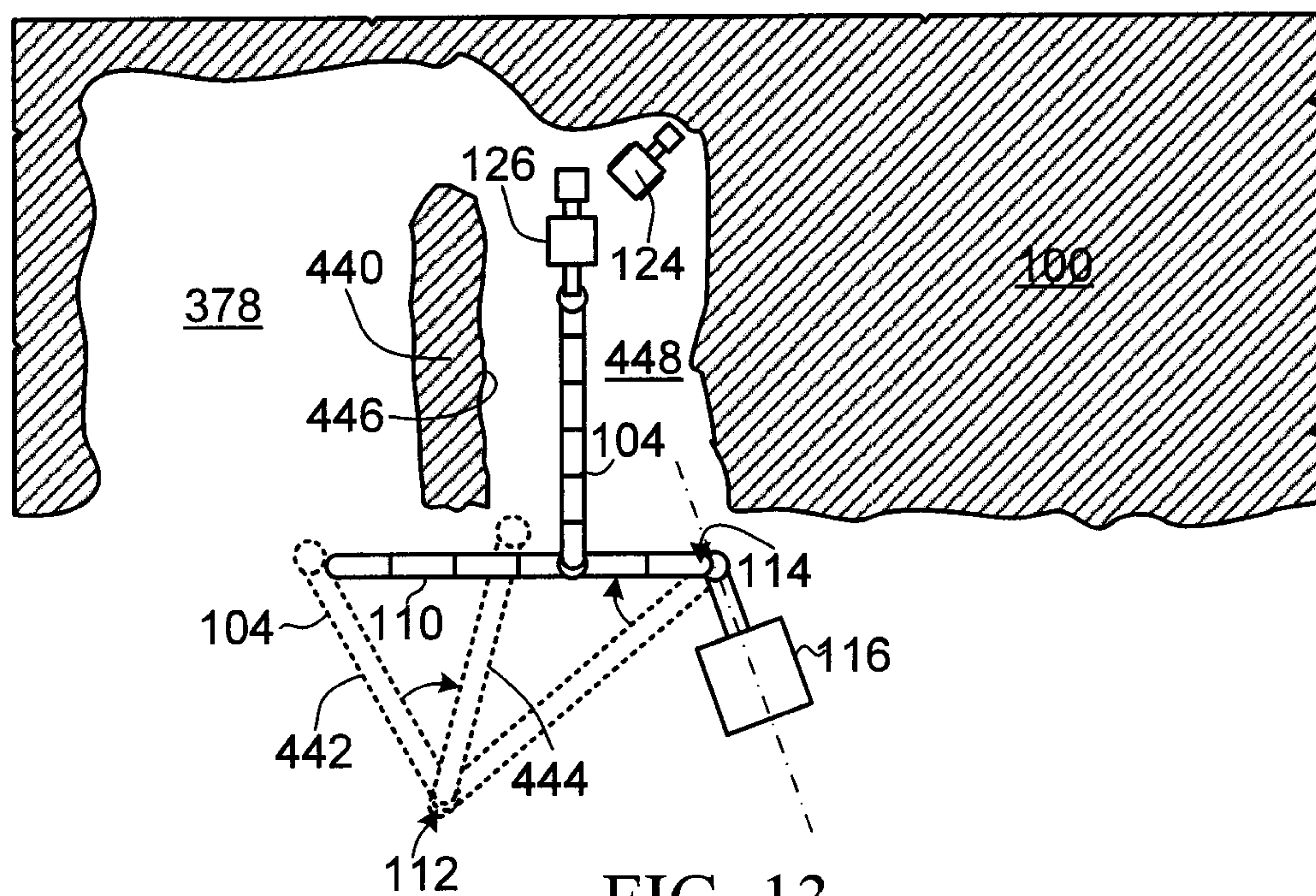


FIG. 13

