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(54) **METHOD OF LOADING MATERIAL BY CURVED AUXILIARY ROCKER ARM ON MINING MACHINE, AND MINING MACHINE HAVING CURVED AUXILIARY ROCKER ARM CAPABLE OF LOADING MATERIAL FOR IMPLEMENTING SAID METHOD**

(57) A method of loading material by a curved auxiliary rocker arm (4) on a mining machine, and a mining machine having a curved auxiliary rocker arm (4) capable of loading material. A material-loading mining machine comprises a master rocker arm (3) and a curved auxiliary rocker arm (4). The auxiliary rocker arm (4) comprises a box-supporting section (4.1) and a material removal and loading box-supporting section (4.2). The auxiliary rocker arm (4) curves downward. The bottom end of the curved portion of said arm is proximate to the bottom position of a reciprocating impact power box (2) when said box comes into contact with the ground. An auxiliary rocker arm material-loading member (5) is provided on the ma-

terial removal and loading box-supporting section (4.2), said member (5) being disposed along an articulated end of the reciprocating impact power box (2) when the material removal and loading box-supporting section (4.2) comes into contact with the ground. Driven by the mining machine, when the material removal and loading box-supporting section (4.2) comes into contact with the ground, the auxiliary rocker arm material-loading member (5) pushes fallen material collected by the mining machine to a conveyor, allowing for excellent material-loading effects for the impact-type mining machine, improving the adaptability of said machine, and reducing the amount of manual labor required.

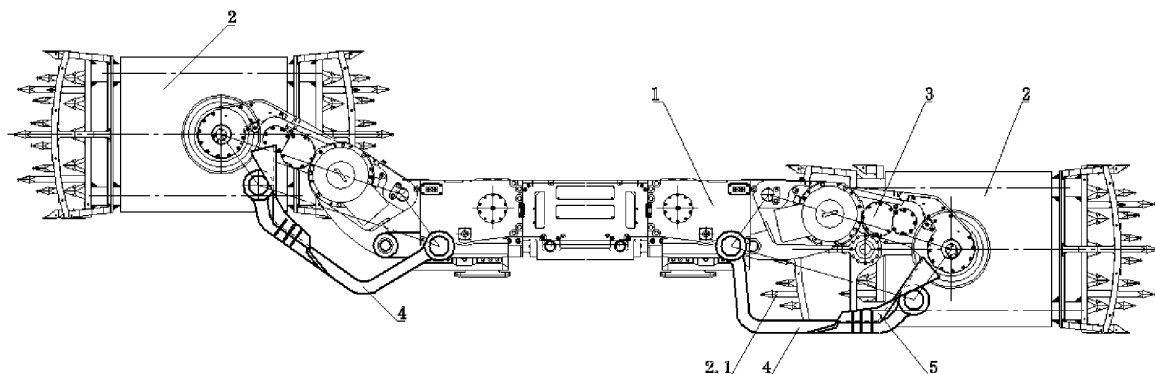


FIG. 1

Description

Field of the Invention

[0001] The present invention belongs to the field of machinery, and in particular, to a method of loading material by a curved auxiliary rocker arm on a mining machine and a mining machine having a curved auxiliary rocker arm capable of loading material for implementing the method that are applicable in the field of mining.

Background of the Invention

[0002] At present, according to the working principle, mining machines can be divided into two forms, wherein one is a drum mining machine, and the other is an impact-type mining machine. A helical groove is formed in an outer drum ring of the drum mining machine, and a material cut by cutting teeth is exported by rotation of the helical groove to realize material mining and loading; the impact-type mining machine carries out reciprocating impact on a material wall by the impact teeth of an impact blanking portion for blanking, after a reciprocating impact power box exports the material, since there is a very large gap between the reciprocating impact blanking portion and a conveyor, and as reciprocating impact teeth have no action of screwing upwards to convey the material into the conveyor, a large amount of material are accumulated in the gap, are difficult to clear and cannot be smoothly loaded in the conveyor, resulting in such problems as a bad material-loading effect of the impact-type mining machine and large difficulty of onsite clearing and the like, when the impact-type mining machine having no material clearing and loading device is used onsite, the labor intensity of workers is increased, the waste of the mining material is increased, and the time utilization efficiency is reduced

Summary of the Invention

[0003] To overcome the shortcomings of the above impact-type mining machine, the present invention provides a method of loading material by a curved auxiliary rocker arm on a mining machine and a mining machine having a curved auxiliary rocker arm capable of loading the material for implementing the method.

[0004] The method of loading material by the curved auxiliary rocker arm on the mining machine includes the following steps:

a first step: disposing a box-supporting section and a material removal and loading box-supporting section and the like to form the curved auxiliary rocker arm, curving the curved auxiliary rocker arm downwards to make the bottom end of the curved portion of the curved auxiliary rocker arm be close to the bottom position of a reciprocating impact power box on the ground;

a second step: disposing an auxiliary rocker arm material-loading member and the like on the material removal and loading box-supporting section, and disposing the auxiliary rocker arm material-loading member along an articulated end of the reciprocating impact power box to the material removal and loading box-supporting section on the ground;

a third step: articulating one end of a master rocker arm with the reciprocating impact power box, articulating the other end of the master rocker arm with a machine body, articulating one end of the curved auxiliary rocker arm with the lower end of the side of the reciprocating impact power box, articulating the other end of the curved auxiliary rocker arm with the lower end of the side of the machine body, making the connecting line of two articulated points of the master rocker arm and the connecting line of the two articulated points of the curved auxiliary rocker arm be parallel and equilateral, and making the reciprocating impact power box, the master rocker arm, the curved auxiliary rocker arm and the connecting line of the articulated points on the machine body form a parallelogram;

a fourth step: making the master rocker arm cooperate with the box-supporting section and the material removal and loading box-supporting section and the like to support the reciprocating impact power box to ascend and descend up and down; and

a fifth step: disposing a walking portion and the like at the lower portion of the machine body, the walking portion driving the machine body to walk, the machine body driving the curved auxiliary rocker arm to walk, the curved auxiliary rocker arm providing support and thrust for the auxiliary rocker arm material-loading member through the articulated points on both ends, and the auxiliary rocker arm material-loading member on the material removal and loading box-supporting section on the ground, driven by the machine body, pushing the material collected by the mining machine into a conveyor.

[0005] According to the above steps, the auxiliary rocker arm material-loading member can also be set as a material shovel plate and a material baffle and the like, the material shovel plate is disposed on the lower curved section of the material removal and loading box-supporting section on the ground, the height of the lower curved section is equal to or lower than the that of the conveyor to prevent the lower curved section from blocking the material, the material baffle is disposed near the lower curved section of the material removal and loading box-supporting section to the articulated position of the reciprocating impact power box, the height of the material baffle is larger than that of the conveyor to make the material baffle block the material shoveled by the material shovel plate and push the material into the conveyor.

[0006] The mining machine having the curved auxiliary rocker arm capable of loading material for implementing

a method of loading material by a curved auxiliary rocker arm on a mining machine includes: a reciprocating impact power box, a master rocker arm, a curved auxiliary rocker arm, an auxiliary rocker arm material-loading member, a machine body, a walking portion and the like, wherein one end of the master rocker arm is articulated with the reciprocating impact power box, the other end of the master rocker arm is articulated with the machine body, one end of the curved auxiliary rocker arm is articulated with the lower end of the side of the reciprocating impact power box, the other end of the curved auxiliary rocker arm is articulated with the lower end of the side of the machine body, the connecting line of two articulated points of the master rocker arm and the connecting line of the two articulated points of the curved auxiliary rocker arm are parallel and equi-long, and the reciprocating impact power box, the master rocker arm, the curved auxiliary rocker arm and the connecting line of the articulated points on the machine body form a parallelogram, the curved auxiliary rocker arm includes a box-supporting section and a material removal and loading box-supporting section and the like, the curved auxiliary rocker arm curves downwards, the bottom end of the curved portion of the curved auxiliary rocker arm is close to the bottom position of the reciprocating impact power box on the ground, the auxiliary rocker arm material-loading member and the like are disposed on the material removal and loading box-supporting section, the auxiliary rocker arm material-loading member is disposed along an articulated end of the reciprocating impact power box to the material removal and loading box-supporting section on the ground, the master rocker arm cooperates with the box-supporting section and the material removal and loading box-supporting section and the like to support the reciprocating impact power box to ascend and descend up and down, the walking portion and the like are disposed at the lower portion of the machine body, the walking portion drives the machine body to walk, the machine body drives the curved auxiliary rocker arm to walk, the curved auxiliary rocker arm provides support and thrust for the auxiliary rocker arm material-loading member through the articulated points on both ends, and the auxiliary rocker arm material-loading member and the like on the material removal and loading box-supporting section on the ground, driven by the machine body, push the material collected by the mining machine into a conveyor.

[0007] The auxiliary rocker arm material-loading member includes a material shovel plate and a material baffle and the like, the conveyor and the like are disposed at the lower portion of the machine body, the material shovel plate is disposed on the lower curved section of the material removal and loading box-supporting section on the ground, the height of the lower curved section is equal to or lower than the that of the conveyor to prevent the lower curved section from blocking the material, the material baffle is disposed near the lower curved section of the material removal and loading box-supporting section to the articulated position of the reciprocating impact

power box, the height of the material baffle is larger than that of the conveyor, and the material baffle blocks the material shoveled by the material shovel plate and pushes the material into the conveyor.

[0008] The reciprocating impact power box includes an impact head and the like, the linear distance between the master rocker arm and the impact head is larger than 200mm, the material punched by the reciprocating impact power box smoothly flows out from a gap between the master rocker arm and the impact head to enter the conveyor, and the material punched by the impact head is pushed into the conveyor through the curved auxiliary rocker arm.

[0009] The master rocker arm is provided with an upper curved section of the master rocker arm and the like, and the upper curved section of the master rocker arm and the curved auxiliary rocker arm curved downwards are beneficial for the auxiliary rocker arm material-loading member to smoothly push the material into the conveyor.

[0010] The material baffle includes a bottom material baffle and a back material baffle and the like, when the reciprocating impact box is at a low position, the bottom material baffle is flush with the bottom surface of the reciprocating impact box, or the side of the bottom material baffle close to the conveyor inclines upwards for a certain angle that facilitates the material climbing into the conveyor along the inclined bottom material baffle, the back material baffle is obliquely disposed at the back end of the bottom material baffle, one side of the back material baffle is close to the reciprocating impact box, and the bottom material baffle and the back material baffle and the like are separately connected or are integrated.

[0011] A tongue plate and the like are disposed at the front portion of the material shovel plate, the upper end of the tongue plate is close to the upper surface of the material removal and loading box-supporting section, and the lower end of the tongue plate is close to the lower surface of the material removal and loading box-supporting section, so as to conveniently shovel the material.

[0012] The junction of the bottom material baffle and the back material baffle is an arc-shaped transition and/or the material blocking surface of the back material baffle is a curved surface, and the curved surface includes a paraboloid, hyperboloid or a special-shaped curved surface, or the like.

[0013] The shape of the section of the curved auxiliary rocker arm includes a circle, an oval, a square, a rectangle, a triangle, a polygon or a special shape, or the like.

[0014] The auxiliary rocker arm material-loading member and the curved auxiliary rocker arm are separately connected or are integrated, and the auxiliary rocker arm material-loading member is convenient to adjust and change in the case of separate connection.

[0015] The reciprocating impact box includes an impact head and the like, and the length of the lower curved section of the curved auxiliary rocker arm is larger than that of the impact head disposed near the curved auxiliary rocker arm, in order to avoid the lower curved section

blocking the material flow.

[0016] The width of the back material baffle is larger than or equal to that of the bottom material baffle, in order to push the material into the conveyor.

[0017] The auxiliary rocker arm material-loading member is made of a wear-resistant material or the wear-resistant material and the like are disposed on the material-loading surface of the auxiliary rocker arm material-loading member.

[0018] The present invention has the following beneficial effects:

1. The curved auxiliary rocker arm is curved downwards, so the bottom end of the curved portion of the curved auxiliary rocker arm is close to the bottom position of the reciprocating impact power box on the ground, the auxiliary rocker arm material-loading member and the like are disposed on the material removal and loading box-supporting section, the auxiliary rocker arm material-loading member is disposed along the articulated end of the reciprocating impact power box to the material removal and loading box-supporting section on the ground, the connecting line of two articulated points of the master rocker arm and the connecting line of the two articulated points of the curved auxiliary rocker arm are parallel and equilateral, the reciprocating impact power box, the master rocker arm, the curved auxiliary rocker arm and the connecting line of the articulated points on the machine body form a parallelogram, the master rocker arm cooperates with the box-supporting section and the material removal and loading box-supporting section to support the reciprocating impact power box to ascend and descend up and down, the machine body drives the curved auxiliary rocker arm and the like to walk, the curved auxiliary rocker arm provides support and thrust for the auxiliary rocker arm material-loading member through the articulated points on both ends, and the auxiliary rocker arm material-loading member on the material removal and loading box-supporting section on the ground, driven by the machine body, pushes the material collected by the mining machine into the conveyor, therefore an impact-type mining machine has a better material-loading effect, the adaptability of the impact-type mining machine is improved, the labor intensity of workers is reduced, and the material removal and loading problem of the reciprocating impact mining machine is completely solved.

2. The material shovel plate is disposed on the lower curved section of the material removal and loading box-supporting section on the ground, the height of the lower curved section is equal to or lower than the that of the conveyor to prevent the lower curved section from blocking the material, the material baffle is disposed near the lower curved section of the material removal and loading box-supporting section to the articulated position of the reciprocating impact

power box, the height of the material baffle is larger than that of the conveyor to make the material baffle block the material shoveled by the material shovel plate and push the material into the conveyor, the structure is suitable for material loading, material guide, material removal and the like between the mining machine and the conveyor, and the material removal efficiency is improved.

3. The linear distance between the master rocker arm and the impact head is larger than 200mm, the material punched by the reciprocating impact power box smoothly flows out from the gap between the master rocker arm and the impact head to enter the conveyor, and the material punched by the impact head is pushed into the conveyor and the like through the curved auxiliary rocker arm.

4. The upper curved section of the master rocker arm and the curved auxiliary rocker arm curved downwards increase the material passing space and are beneficial for the auxiliary rocker arm material-loading member to smoothly push the material into the conveyor.

5. When the reciprocating impact box is at the low position, the bottom material baffle is flush with the bottom surface of the reciprocating impact box, or the side of the bottom material baffle close to the conveyor inclines upwards for a certain angle that facilitates the material climbing into the conveyor along the inclined bottom material baffle, the back material baffle is obliquely disposed at the back end of the bottom material baffle, one side of the back material baffle is close to the reciprocating impact box, and the bottom material baffle and the back material baffle cooperate to smoothly push and guide the material into the conveyor.

6. The upper end of the tongue plate is close to the upper surface of the material removal and loading box-supporting section, and the lower end of the tongue plate is close to the lower surface of the material removal and loading box-supporting section, so as to conveniently shovel the material, and thus the material removal efficiency of the material falling to the bottom is improved.

7. The junction of the bottom material baffle and the back material baffle is an arc-shaped transition and/or the material blocking surface of the back material baffle is the curved surface, therefore the material flow resistance is reduced, and the attrition of the bottom material baffle and the back material baffle is reduced.

8. The auxiliary rocker arm material-loading member and the curved auxiliary rocker arm are separately connected or are integrated, and the auxiliary rocker arm material-loading member is convenient to adjust and change and the like in the case of separate connection.

9. The length of the lower curved section of the curved auxiliary rocker arm is larger than that of the

impact head disposed near the curved auxiliary rocker arm, in order to avoid the lower curved section blocking the material flow and prevent breakage to the lump material.

10. The width of the back material baffle is larger than or equal to that of the bottom material baffle, which is conducive to pushing the material into the conveyor, and the material leakage rate is reduced.

11. The auxiliary rocker arm material-loading member is made of the wear-resistant material or the wear-resistant material and the like are disposed on the material-loading surface of the auxiliary rocker arm material-loading member, so the service life of the auxiliary rocker arm material-loading member is prolonged.

Brief Description of the Drawings

[0019]

Fig. 1 is a front view of a first embodiment;
 Fig. 2 is a left view of the first embodiment;
 Fig. 3 is a front view of a curved auxiliary rocker arm and a material baffle in a second embodiment;
 Fig. 4 is a top view of the curved auxiliary rocker arm and the material baffle in the second embodiment;
 Fig. 5 is a left view of the curved auxiliary rocker arm and the material baffle in the second embodiment;
 Fig. 6 is a section view of the curved auxiliary rocker arm in the second embodiment;
 Fig. 7 is a front view of a third embodiment;
 Fig. 8 is a section view of a bottom material baffle in the third embodiment;
 Fig. 9 is a section view of a curved auxiliary rocker arm in the third embodiment;
 Fig. 10 is an axonometric drawing of a curved auxiliary rocker arm and a material baffle in a fourth embodiment; and
 Fig. 11 is a section view of the curved auxiliary rocker arm in the fourth embodiment. Reference signs:

1: walking portion, 2: reciprocating impact power box, 2.1: impact head, 3: master rocker arm, 4: curved auxiliary rocker arm, 4.1: box-supporting section, 4.2: material removal and loading box-supporting section, 5: auxiliary rocker arm material-loading member, 5.1: material shovel plate, 5.2: material baffle, 5.2.1: bottom material baffle, 5.2.2: back material baffle, 5.3: tongue plate, 6: conveyor, 7: reinforcing rib, 8: curved surface, 9: bolt, 10: machine body, L: linear distance between the master rocker arm and the impact head.

Detailed Description of the Embodiments

First embodiment

5 [0020] As shown in Figs. 1 and 2, a mining machine having a curved auxiliary rocker arm capable of loading material for implementing a method of loading material by a curved auxiliary rocker arm on a mining machine includes: a reciprocating impact power box 2, a master rocker arm 3, a curved auxiliary rocker arm 4, an auxiliary rocker arm material-loading member 5, a machine body 10, a walking portion 1 and the like, wherein one end of the master rocker arm 3 is articulated with the reciprocating impact power box 2 and the like, the other end of the master rocker arm is articulated with the machine body 10 and the like, one end of the curved auxiliary rocker arm 4 is articulated with the reciprocating impact power box 2 and the like, the other end of the curved auxiliary rocker arm is articulated with the lower end of the side of the machine body 10, the connecting line of two articulated points of the master rocker arm 3 and the connecting line of the two articulated points of the curved auxiliary rocker arm 4 are parallel and equiangular, and the reciprocating impact power box 2, the master rocker arm 3, the curved auxiliary rocker arm 4 and the connecting line of the articulated points on the machine body 10 and the like form a parallelogram.

[0021] The curved auxiliary rocker arm 4 includes a box-supporting section 4.1 and a material removal and loading box-supporting section 4.2 and the like, the curved auxiliary rocker arm 4 curves downwards, the bottom end of the curved portion of the curved auxiliary rocker arm 4 is close to the bottom position of the reciprocating impact power box 2 on the ground, the auxiliary rocker arm material-loading member 5 and the like are disposed on the material removal and loading box-supporting section 4.2, the auxiliary rocker arm material-loading member 5 is disposed along an articulated end of the reciprocating impact power box 2 to the material removal and loading box-supporting section 4.2 on the ground, the master rocker arm 3 cooperates with the box-supporting section 4.4 and the material removal and loading box-supporting section 4.2 and the like to support the reciprocating impact power box 2 to ascend and descend up and down, the walking portion 1 and the like are disposed at the lower portion of the machine body 10, the walking portion 1 drives the machine body 10 to walk, the machine body 10 drives the curved auxiliary rocker arm 4 to walk, the curved auxiliary rocker arm 4 provides support and thrust for the auxiliary rocker arm material-loading member 5 through the articulated points on both ends, and the auxiliary rocker arm material-loading member 5 and the like on the material removal and loading box-supporting section on the ground is driven by the machine body 10 to push the material collected by the mining machine into a conveyor 6.

Second embodiment

[0022] As shown in Figs. 3-6, the auxiliary rocker arm material-loading member 5 includes a material shovel plate 5.1 and a material baffle 5.2 and the like, the material shovel plate 5.1 is disposed on the lower curved section of the material removal and loading box-supporting section 4.2 on the ground, the height of the lower curved section of the material removal and loading box-supporting section 4.2 on the ground is equal to or lower than that of the conveyor 6 to prevent the lower curved section of the material removal and loading box-supporting section 4.2 on the ground from blocking the material, the material baffle 5.2 is disposed near the lower curved section of the material removal and loading box-supporting section 4.2 to the articulated position of the reciprocating impact power box 2, the height of the material baffle 5.2 is larger than that of the conveyor 6, and the material baffle 5.2 blocks the material shoveled by the material shovel plate 5.1 and pushes the material into the conveyor 6.

[0023] The material baffle 5.2 includes a bottom material baffle 5.2.1 and a back material baffle 5.2.2 and the like, when the reciprocating impact box 2 is at a low position, the bottom material baffle 5.2.1 is flush with the bottom surface of the reciprocating impact box 2, or the side of the bottom material baffle 5.2.1 close to the conveyor 6 inclines upwards for a certain angle that facilitates the material climbing into the conveyor 6 along the inclined bottom material baffle 5.2.1, the back material baffle 5.2.2 is obliquely disposed at the back end of the bottom material baffle 5.2.1, one side of the back material baffle 5.2.2 is close to the reciprocating impact box 2, and the bottom material baffle 5.2.1 and the back material baffle 5.2.2 are separately connected or are integrated.

[0024] The junction of the bottom material baffle 5.2.1 and the back material baffle 5.2.2 and the like is an arc-shaped transition, and thus the material flow resistance is reduced.

[0025] A tongue plate 5.3 is disposed at the front portion of the material shovel plate 5.1, the upper end of the tongue plate 5.3 is close to the upper surface of the material removal and loading box-supporting section 4.2, and the lower end of the tongue plate 5.3 is close to the lower surface of the material removal and loading box-supporting section 4.2, so as to conveniently shovel the material.

[0026] The shape of the section of the curved auxiliary rocker arm 4 includes a circle, and can also be an oval, a square, a rectangle, a triangle, a polygon or a special shape, or the like.

[0027] A reinforcing rib 7 and the like are disposed between the auxiliary rocker arm material-loading member 5 and the curved auxiliary rocker arm 4, so that the connection of the auxiliary rocker arm material-loading member 5 and the curved auxiliary rocker arm 4 is more firm.

[0028] The reciprocating impact power box 2 includes an impact head 2.1, and the length of the lower curved

section of the curved auxiliary rocker arm 4 is larger than that of the impact head 2.1 disposed near the curved auxiliary rocker arm, in order to avoid the lower curved section blocking the material flow.

[0029] The width of the material shovel plate 5.1 at the lower curved section 4.2 is not larger than the distance between the lower curved section and the conveyor 6, in order to avoid collision with the conveyor 6 and the like when ascending and descending, and the width of the back material baffle 5.2.2 is larger than or equal to that of the bottom material baffle 5.2.1 to block and push the material and the like into the conveyor 6.

[0030] The linear distance L between the master rocker arm and the impact head is larger than 200mm, so the material punched by the reciprocating impact power box 2 smoothly flows out from a gap between the master rocker arm 3 and the impact head 2.1 to enter the conveyor 6, and the material punched by the impact head 2.1 is pushed into the conveyor 6 through the auxiliary rocker arm material-loading member 5.

[0031] The master rocker arm 3 is provided with an upper curved section of the master rocker arm, and the upper curved section of the master rocker arm and the curved auxiliary rocker arm 4 curved downwards are beneficial for the auxiliary rocker arm material-loading member 5 to smoothly push the material into the conveyor 6.

[0032] The auxiliary rocker arm material-loading member 5 is made of a wear-resistant material. The rest is the same as in the first embodiment.

Third embodiment

[0033] As shown in Figs. 7-9, a mining machine having a curved auxiliary rocker arm capable of loading material for implementing a method of loading material by a curved auxiliary rocker arm on a mining machine includes: a reciprocating impact power box 2, a master rocker arm 3, a curved auxiliary rocker arm 4, an auxiliary rocker arm material-loading member 5, a machine body 10, a walking portion 1 and the like, wherein one end of the master rocker arm 3 is articulated with the reciprocating impact power box 2 and the like, the other end of the master rocker arm is articulated with the machine body 10 and the like, one end of the curved auxiliary rocker arm 4 is articulated with the reciprocating impact power box 2 and the like, the other end of the curved auxiliary rocker arm is articulated with the lower end of the side of the machine body 10, the connecting line of two articulated points of the master rocker arm 3 and the connecting line of the two articulated points of the curved auxiliary rocker arm 4 are parallel and equiangular, and the reciprocating impact power box 2, the master rocker arm 3, the curved auxiliary rocker arm 4 and the connecting line of the articulated points on the machine body 10 and the like form a parallelogram, and the auxiliary rocker arm material-loading member 5 is disposed along an articulated end of the reciprocating impact power box 2 to the material removal and loading box-supporting section

5.2 on the ground.

[0034] The material blocking surface of the back material baffle 5.2.2 is a curved surface and the like, so the flow resistance of the material and the like are reduced, and material guide, material loading and other functions are realized, and the curved surface 8 includes a paraboloid, hyperboloid or a special-shaped curved surface, or the like.

[0035] The bottom material baffle 5.2.1 and the back material baffle 5.2.2 and the like are separately connected or are integrated.

[0036] The shape of the section of the curved auxiliary rocker arm 4 includes a rectangle, and can also be a circle, an oval, a square, a triangle, a polygon or a special shape, or the like.

[0037] The auxiliary rocker arm material-loading member 5 and the curved auxiliary rocker arm 4 are separately connected and are fixed by a bolt 9, and the auxiliary rocker arm material-loading member 5 is convenient to adjust and change in the case of separate connection, and they can also be integrated.

[0038] The rest is the same as in the first embodiment.

Fourth embodiment

[0039] As shown in Figs. 10-11, the auxiliary rocker arm material-loading member 5 and the curved auxiliary rocker arm 4 are integrated and can also be separately connected and the like.

[0040] A wear-resistant material 10 and the like are disposed on the material-loading surface of the auxiliary rocker arm material-loading member 5 to reinforce the wearing resistance of the auxiliary rocker arm material-loading member 5, and the wear-resistant material 10 and the auxiliary rocker arm material-loading member 5 are separately connected by the bolt 9 and can also be integrated.

[0041] The rest is the same as in the first embodiment.

Claims

1. A method of loading material by a curved auxiliary rocker arm on a mining machine, comprising the following steps:

a first step: disposing a box-supporting section and a material removal and loading box-supporting section to form the curved auxiliary rocker arm, curving the curved auxiliary rocker arm downwards to make the bottom end of the curved portion of the curved auxiliary rocker arm be close to the bottom position of a reciprocating impact power box on the ground;

a second step: disposing an auxiliary rocker arm material-loading member on the material removal and loading box-supporting section, and disposing the auxiliary rocker arm material-loading

member along an articulated end of the reciprocating impact power box to the material removal and loading box-supporting section on the ground;

a third step: articulating one end of a master rocker arm with the reciprocating impact power box, articulating the other end of the master rocker arm with a machine body, articulating one end of the curved auxiliary rocker arm with the lower end of the side of the reciprocating impact power box, articulating the other end of the curved auxiliary rocker arm with the lower end of the side of the machine body, making the connecting line of two articulated points of the master rocker arm and the connecting line of the two articulated points of the curved auxiliary rocker arm be parallel and equiangular, and making the reciprocating impact power box, the master rocker arm, the curved auxiliary rocker arm and the connecting line of the articulated points on the machine body form a parallelogram;

a fourth step: making the master rocker arm cooperate with the box-supporting section and the material removal and loading box-supporting section to support the reciprocating impact power box to ascend and descend up and down; and a fifth step: disposing a walking portion at the lower portion of the machine body, the walking portion driving the machine body to walk, the machine body driving the curved auxiliary rocker arm to walk, the curved auxiliary rocker arm providing support and thrust for the auxiliary rocker arm material-loading member through the articulated points on both ends, and the auxiliary rocker arm material-loading member on the material removal and loading box-supporting section on the ground, driven by the machine body, pushing the material collected by the mining machine into a conveyor.

2. The method of loading material by the curved auxiliary rocker arm on the mining machine of claim 1, wherein auxiliary rocker arm material-loading member is set as a material shovel plate and a material baffle, the material shovel plate is disposed on the lower curved section of the material removal and loading box-supporting section on the ground, the height of the lower curved section is equal to or lower than the that of the conveyor to prevent the lower curved section from blocking the material, the material baffle is disposed near the lower curved section of the material removal and loading box-supporting section to the articulated position of the reciprocating impact power box, the height of the material baffle is larger than that of the conveyor to make the material baffle block the material shoveled by the material shovel plate and push the material into the con-

veyor.

3. A mining machine having a curved auxiliary rocker arm capable of loading material for implementing a method of loading material by a curved auxiliary rocker arm on a mining machine, comprising: a reciprocating impact power box, a master rocker arm, a curved auxiliary rocker arm, an auxiliary rocker arm material-loading member, a machine body and a walking portion, wherein one end of the master rocker arm is articulated with the reciprocating impact power box, the other end of the master rocker arm is articulated with the machine body, one end of the curved auxiliary rocker arm is articulated with the lower end of the side of the reciprocating impact power box, the other end of the curved auxiliary rocker arm is articulated with the lower end of the side of the machine body, the connecting line of two articulated points of the master rocker arm and the connecting line of the two articulated points of the curved auxiliary rocker arm are parallel and equiangular, and the reciprocating impact power box, the master rocker arm, the curved auxiliary rocker arm and the connecting line of the articulated points on the machine body form a parallelogram, the curved auxiliary rocker arm comprises a box-supporting section and a material removal and loading box-supporting section, the curved auxiliary rocker arm curves downwards, the bottom end of the curved portion of the curved auxiliary rocker arm is close to the bottom position of the reciprocating impact power box on the ground, the auxiliary rocker arm material-loading member is disposed on the material removal and loading box-supporting section, the auxiliary rocker arm material-loading member is disposed along an articulated end of the reciprocating impact power box to the material removal and loading box-supporting section on the ground, the master rocker arm cooperates with the box-supporting section and the material removal and loading box-supporting section to support the reciprocating impact power box to ascend and descend up and down, the walking portion is disposed at the lower portion of the machine body, the walking portion drives the machine body to walk, the machine body drives the curved auxiliary rocker arm to walk, the curved auxiliary rocker arm provides support and thrust for the auxiliary rocker arm material-loading member through the articulated points on both ends, and the auxiliary rocker arm material-loading member on the material removal and loading box-supporting section on the ground, driven by the machine body, pushes the material collected by the mining machine into a conveyor.
4. The mining machine having the curved auxiliary rocker arm capable of loading material of claim 3, wherein the auxiliary rocker arm material-loading member comprises a material shovel plate and a material baffle, the conveyor is disposed at the lower portion of the machine body, the material shovel plate is disposed on the lower curved section of the material removal and loading box-supporting section on the ground, the height of the lower curved section is equal to or lower than the that of the conveyor to prevent the lower curved section from blocking the material, the material baffle is disposed near the lower curved section of the material removal and loading box-supporting section to the articulated position of the reciprocating impact power box, the height of the material baffle is larger than that of the conveyor, and the material baffle blocks the material shoveled by the material shovel plate and pushes the material into the conveyor.
5. The mining machine having the curved auxiliary rocker arm capable of loading material of claim 3, wherein the reciprocating impact power box comprises an impact head, the linear distance between the master rocker arm and the impact head is larger than 200mm, the material punched by the reciprocating impact power box smoothly flows out from a gap between the master rocker arm and the impact head to enter the conveyor, and the material punched by the impact head is pushed into the conveyor through the auxiliary rocker arm material-loading member.
6. The mining machine having the curved auxiliary rocker arm capable of loading material of claim 3, wherein the master rocker arm is provided with an upper curved section of the master rocker arm, and the upper curved section of the master rocker arm and the curved auxiliary rocker arm curved downwards are beneficial for the auxiliary rocker arm material-loading member to smoothly push the material into the conveyor.
7. The mining machine having the curved auxiliary rocker arm capable of loading material of claim 4, wherein the material baffle comprises a bottom material baffle and a back material baffle, when the reciprocating impact box is at a low position, the bottom material baffle is flush with the bottom surface of the reciprocating impact box, or the side of the bottom material baffle close to the conveyor inclines upwards for a certain angle that facilitates the material climbing into the conveyor along the inclined bottom material baffle, the back material baffle is obliquely disposed at the back end of the bottom material baffle, one side of the back material baffle is close to the reciprocating impact box, and the bottom material baffle and the back material baffle are separately connected or are integrated.
8. The mining machine having the curved auxiliary rocker arm capable of loading material of claim 4,

wherein a tongue plate is disposed at the front portion of the material shovel plate, the upper end of the tongue plate is close to the upper surface of the material removal and loading box-supporting section, and the lower end of the tongue plate is close to the lower surface of the material removal and loading box-supporting section, so as to conveniently shovel the material. 5

9. The mining machine having the curved auxiliary rocker arm capable of loading material of claim 7, wherein the junction of the bottom material baffle and the back material baffle is an arc-shaped transition and/or the material blocking surface of the back material baffle is a curved surface, and the curved surface comprises a paraboloid, hyperboloid or a special-shaped curved surface. 10 15
10. The mining machine having the curved auxiliary rocker arm capable of loading material of claim 3, wherein the shape of the section of the curved auxiliary rocker arm comprises a circle, an oval, a square, a rectangle, a triangle, a polygon or a special shape. 20 25
11. The mining machine having the curved auxiliary rocker arm capable of loading material of claim 3, wherein the auxiliary rocker arm material-loading member and the curved auxiliary rocker arm are separately connected or are integrated, and the auxiliary rocker arm material-loading member is convenient to adjust and change in the case of separate connection. 30
12. The mining machine having the curved auxiliary rocker arm capable of loading material of claim 3, wherein the reciprocating impact box comprises an impact head, and the length of the lower curved section of the curved auxiliary rocker arm is larger than that of the impact head disposed near the curved auxiliary rocker arm, in order to avoid the lower curved section blocking the material flow. 35 40
13. The mining machine having the curved auxiliary rocker arm capable of loading material of claim 7, wherein the width of the back material baffle is larger than or equal to that of the bottom material baffle, in order to push the material into the conveyor. 45
14. The mining machine having the curved auxiliary rocker arm capable of loading material of claim 3, wherein the auxiliary rocker arm material-loading member is made of a wear-resistant material or the wear-resistant material is disposed on the material-loading surface of the auxiliary rocker arm material-loading member. 50 55

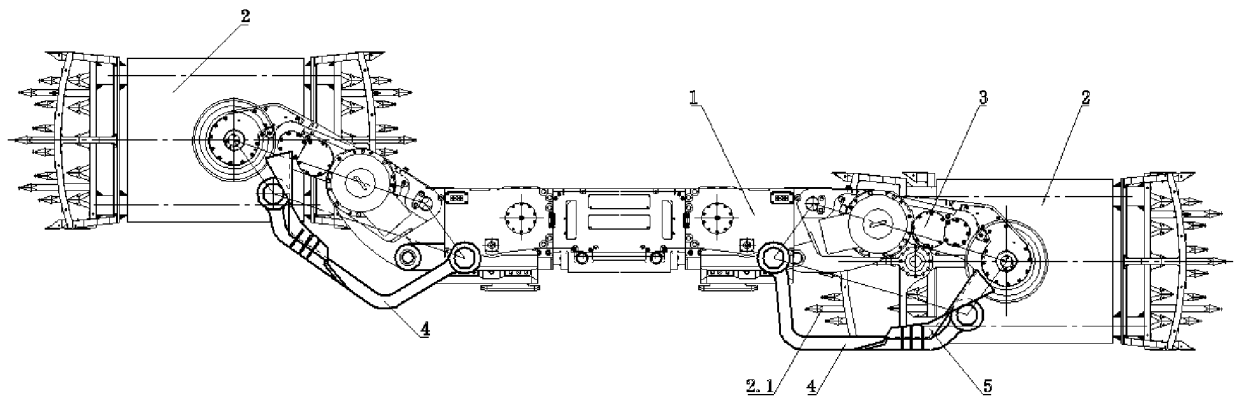


FIG. 1

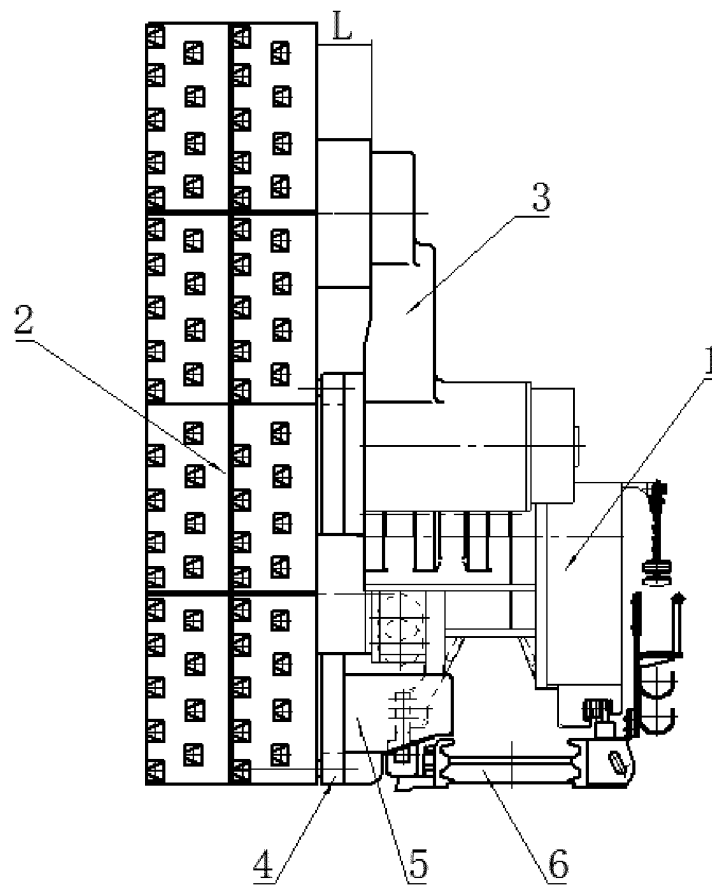


FIG. 2

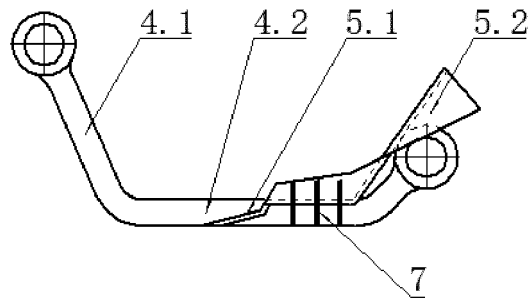


FIG. 3

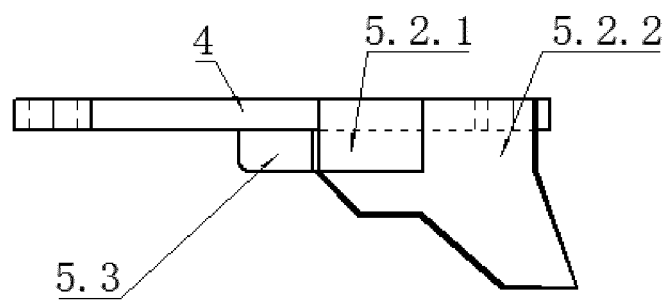


FIG. 4

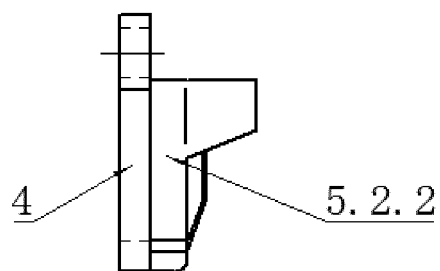


FIG. 5

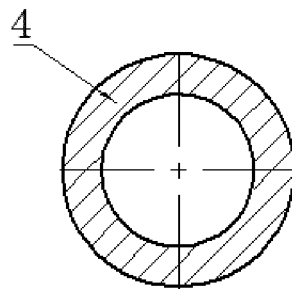


FIG. 6

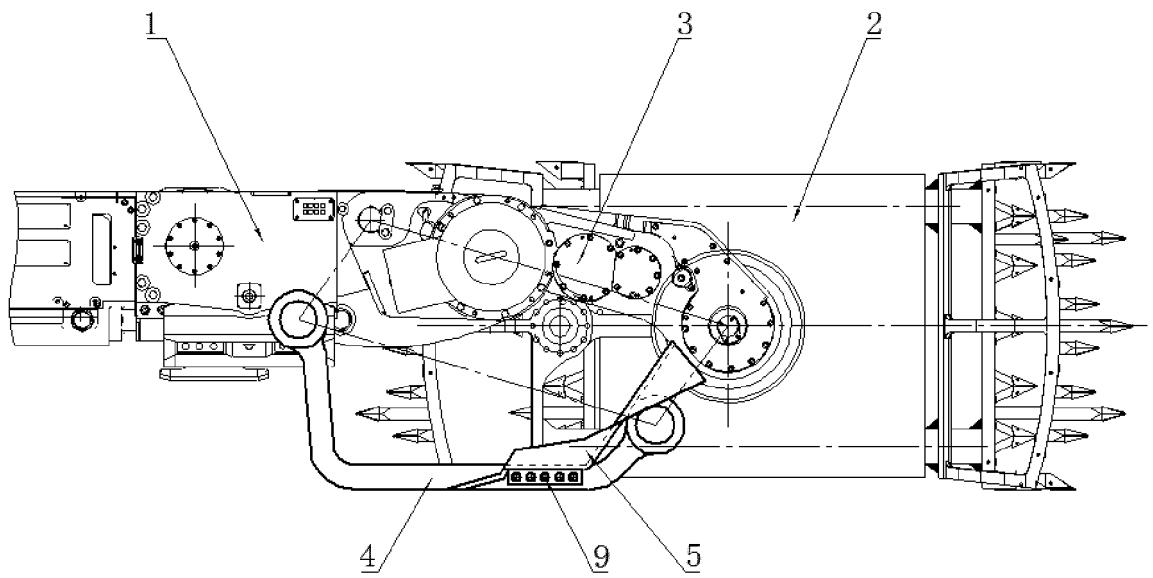


FIG. 7

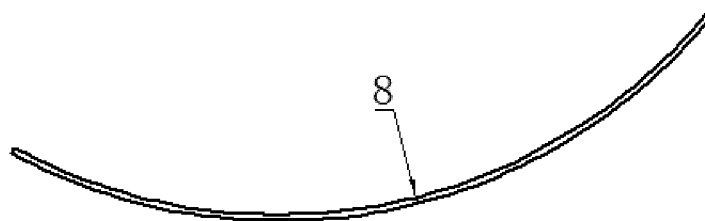


FIG. 8

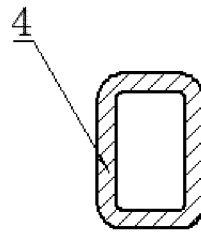


FIG. 9

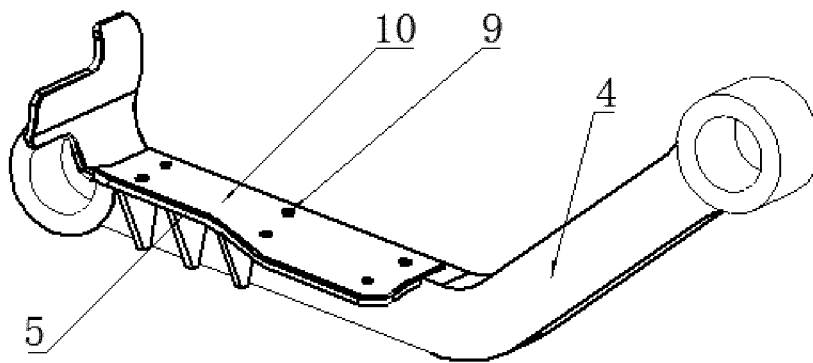


FIG. 10

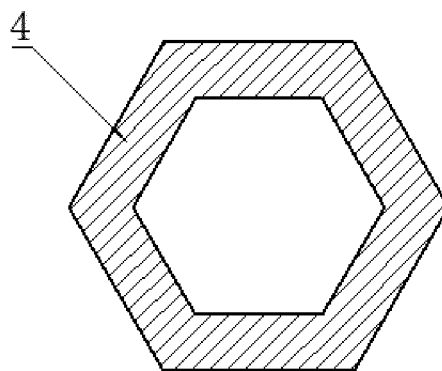


FIG. 11

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2014/000930

A. CLASSIFICATION OF SUBJECT MATTER

E21C 35/20 (2006.01) i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

E21C 35, E21C 25, E21C 27, E21D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CPRSABS, VEN, EPODOC, CNKI: rocker arm, load+, unload+, dig+, excavat+, arm+, bend+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 1163980 A (SHANXI MINING INSTITUTE), 05 November 1997 (05.11.1997), description, pages 6-7, and figures 3-4	1-14
A	CA 2203625 C (MINING TECHNOLOGIES INC.), 01 August 2000 (01.08.2000), the whole document	1-14
A	CN 101709647 A (HUANGSHAN CITY HUIZHOU ANHUA ENGINEERING MACHINERY CO., LTD.), 19 May 2010 (19.05.2010), the whole document	1-14
A	CN 201521297 U (HUANGSHAN CITY HUIZHOU ANHUA ENGINEERING MACHINERY CO., LTD.), 07 July 2010 (07.07.2010), the whole document	1-14
A	CN 102720494 A (LIU, Suhua), 10 October 2012 (10.10.2012), the whole document	1-14

☐ Further documents are listed in the continuation of Box C.
 ☒ See patent family annex.

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"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	"&" document member of the same patent family

Date of the actual completion of the international search 09 January 2015 (09.01.2015)	Date of mailing of the international search report 20 January 2015 (20.01.2015)
Name and mailing address of the ISA/CN: State Intellectual Property Office of the P. R. China No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088, China Facsimile No.: (86-10) 62019451	Authorized officer WANG, Yueting Telephone No.: (86-10) 62085151

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INTERNATIONAL SEARCH REPORT
 Information on patent family members

International application No.

PCT/CN2014/000930

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		ZA 9508543 A	10 May 1996
		AU 3831095 A	15 May 1996
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		CN 102733430 A	17 October 2012
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		CN 102678113 A	19 September 2012
		CN 102454418 A	16 May 2012
		CN 102677711 A	19 September 2012
		CN 102758626 A	31 October 2012

Form PCT/ISA/210 (patent family annex) (July 2009)