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A Mine Safety Monitoring and Early Warning System Based On Mixed Driving of Data and Model.

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The invention discloses a mine safety monitoring and early warning system based on mixed driving of data and models, which comprises a main box body and an installation plate, wherein a touch screen is fixedly embedded at one side of the main box body, a power supply, a memory, a processor, a positioning module, a communication module and a vibration sensor are arranged in the main box body, an installation opening is arranged at the top of the main box body, a cover plate is rotatably connected in the installation opening through a rotating shaft, and a locking mechanism corresponding to the cover plate is fixedly connected at the top of the main box body; A telescopic cylinder is fixedly connected to the bottom of one end of the main box away from the touch screen. Through the arrangement of the signal monitoring module and the signal processing module, the system can timely and effectively monitor the mine safety and collect data, reveal the disaster-causing mechanism synchronously with the on-site rock mass response prediction, improve the accuracy of prediction and early warning, recognize the causes of disasters, and provide technical support for targeted disaster prevention measures.

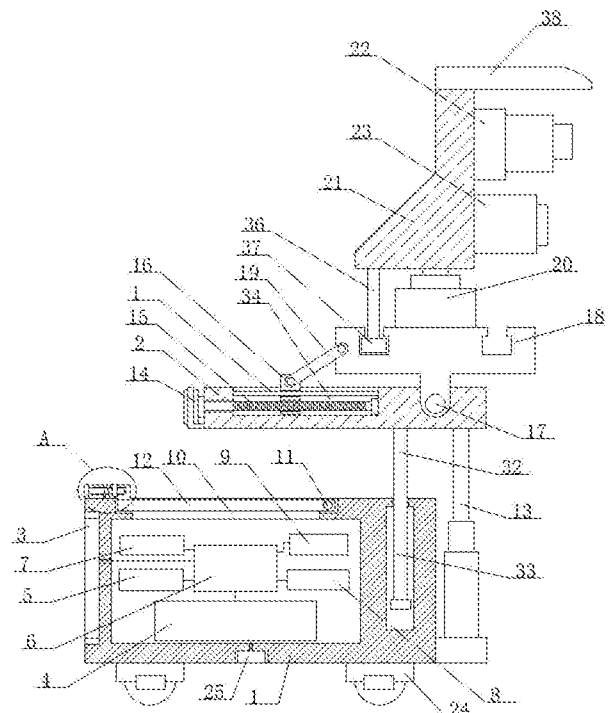


Fig. 1

A Mine Safety Monitoring and Early Warning System Based On Mixed Driving of Data and Model

TECHNICAL FIELD

5 The invention relates to the technical field of geological disaster early warning, in particular to a mine safety monitoring and early warning system driven by data and models.

BACKGROUND OF THE RELATED ART

10 With the rapid development of China's economy, the demand for mineral resources is increasing day by day, and the scale of mining development is gradually expanding. As a result, the safety problems of mine production have become increasingly prominent, and disasters such as rockburst, water seepage, roof fall and collapse have become increasingly prominent, resulting in frequent mine accidents. At present, there is still a lack of effective, stable and reliable mine disaster prediction and early warning methods at home and abroad.

15 On-site monitoring has always been one of the traditional methods to manage mine production and prevent mine disasters. This method has that advantage that: The sensor can know the real state of the mine in real time, continuously monitor and deal with abnormal phenomena in time and effectively. Moreover, with the continuous development of science and technology, more and more monitoring sensors emerge as the times require, and all
20 aspects meet the needs of mine site monitoring. Among them, the existing patent "CN201810223969.3" puts forward a method of mine disaster prediction and early warning that combines site monitoring with numerical simulation, by combining the numerical simulation method with the on-site monitoring method, it can not only reflect the on-site situation in real time, but also know the disaster occurrence process from the mechanism, it
25 can not only realize the advance prediction in time, but also achieve the overall grasp in space. Improve the time and space accuracy of early warning and prediction, realize the real-time and advance of early warning, and achieve the universality of early warning methods.

 However, the mine safety monitoring and early warning system in the prior art is relatively simple, and the mine safety monitoring and early warning system cannot timely and

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effectively monitor mine safety and collect data, thus affecting the accuracy of mine safety monitoring and early warning.

SUMMARY

5 1. Technical problems to be solved

The invention aims to solve the problems that the mine safety monitoring and early warning system in the prior art is relatively simple, and the mine safety monitoring and early warning system cannot monitor and collect data in time and effectively, and proposes a mine safety monitoring and early warning system based on data and model mixed driving.

10 2. Technical scheme

In order to achieve the above purpose, the invention adopts the following technical scheme:

The mine safety monitoring and early warning system based on mixed driving of data and model comprises a main box body and an installation plate, wherein one side of the main box body is fixedly embedded with a touch screen, a power supply, a memory, a processor, a positioning module, a communication module and a vibration sensor are arranged in the main box body, the top of the main box body is provided with an installation opening, a cover plate is rotatably connected in the installation opening through a rotating shaft, and the top of the main box body is fixedly connected with a locking mechanism corresponding to the cover plate;

The bottom of one end of the main box away from the touch screen is fixedly connected with a telescopic cylinder, the output end of the telescopic cylinder is fixedly connected with the bottom of the mounting plate, and the bottom of the mounting plate is fixedly connected with a supporting mechanism;

One end of the mounting plate is fixedly connected with a first motor, the top of the mounting plate is provided with a mounting groove, the output end of the first motor is fixedly connected with a screw, one end of the screw in the mounting groove is sleeved with a slide block in a threaded way, the top of the mounting plate is rotatably connected with a support plate through a rotating rod, the support plate and the slide block are connected through a connecting plate, and both ends of the connecting plate are rotatably connected

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with the slide block and the support plate respectively;

The top of the support plate is fixedly connected with a second motor, the output end of the second motor is fixedly connected with a fixed plate, and one side of the fixed plate is fixedly connected with a camera and a laser sensor, the output ends of the camera, the power supply, the laser sensor, the positioning module and the vibration sensor are all connected with the input ends of the processor, the output ends of the processor are respectively connected with the input ends of the memory, the first motor, the second motor and the telescopic cylinder, and the output ends of the communication module and the touch screen are bidirectionally connected with the input ends of the processor.

10 Preferably, the bottom of the main box body is rotatably connected with a plurality of universal self-locking wheels.

Preferably, the bottom of the main box body is fixedly inserted with a power connector, and the output end of the power connector is connected with the input end of the power supply.

15 Preferably, the locking mechanism comprises a clamping block and a clamping rod, the clamping rod is slidably inserted on the clamping block, the top of the cover plate is fixedly connected with a fixed block, and a clamping groove corresponding to the clamping rod is formed on the fixed block.

20 Preferably, one end of the clamping rod close to the fixing block is fixedly sleeved with a clamping sleeve, the other end of the clamping rod far from the clamping sleeve is fixedly connected with a pull rod, a spring is sleeved on the clamping rod, and two ends of the spring are fixedly connected with the clamping sleeve and the clamping block respectively.

25 Preferably, the supporting mechanism comprises a supporting rod, the top of the main box body is provided with a sliding cavity corresponding to the supporting rod, and the bottom of the supporting rod is fixedly connected with a limiting block.

Preferably, a slide bar is fixedly connected in the installation groove, and a through hole corresponding to the slide bar is formed on the slide bar.

30 Preferably, the bottom of the fixing plate is fixedly connected with a guide rod, the bottom of the guide rod is fixedly connected with a guide block, and the top of the supporting plate is provided with an annular slide rail corresponding to the guide block.

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Preferably, the top of the fixed plate is fixedly connected with a protective plate corresponding to the camera.

Preferably, the positioning module is a Beidou positioning module or a GPS positioning module.

5 3. Beneficial effects

Compared with the prior art, the invention has the advantages that:

(1) According to the invention, through the arrangement of the signal monitoring module and the signal processing module, the system can timely and effectively monitor the safety of the mine and collect data, reveal the disaster-causing mechanism synchronously with the
10 on-site rock mass response prediction, improve the accuracy of prediction and early warning, recognize the cause of the disaster, and provide technical support for targeted disaster prevention measures.

(2) In the invention, the positioning module can conveniently position the position of equipment, and the communication module can receive and send remote control signals, at
15 the same time, the vibration sensor can collect the vibration signals near the equipment, and the camera and laser sensor can monitor the outside of the mine.

(3) According to the invention, the height of the support plate can be conveniently adjusted by the telescopic cylinder, the first motor can drive the screw to rotate, so that the angle of the support plate can be adjusted by the slider; and meanwhile, the second motor can
20 drive the support plate to rotate and adjust the direction of the monitoring module.

(4) According to the invention, the universal self-locking wheel is arranged, so that equipment can be conveniently moved; meanwhile, the installation opening is arranged, so that the control element can be conveniently maintained; the cover plate can protect the control element, and the locking mechanism is arranged, so that the cover plate can be
25 conveniently fixed.

BRIEF DESCRIPTION OF THE FIGURES

Figure 1 is a structural schematic diagram of a mine safety monitoring and early warning system based on mixed driving of data and models.

30 Figure 2 is a schematic plan view of the supporting plate of the mine safety monitoring

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and early warning system based on mixed driving of data and model.

Figure 3 is a schematic diagram of the structure at A in Figure 1;

Figure 4 is a schematic diagram of the control system of the mine safety monitoring and early warning system based on the hybrid drive of data and model.

5 In the picture: 1 main box, 2 mounting plates, 3 touch screens, 4 power supplies, 5 memories, 6 processors, 7 positioning modules, 8 communication modules, 9 vibration sensors, 10 mounting ports, 11 rotating shafts, 12 cover plates, 13 telescopic cylinder, 14 first motor, 15 screw, 16 slider, 17 rotary rod, 18 supporting plate, 19 connecting plate, 20 second motor, 21 fixed plate, 22 camera, 23 laser sensor, 24 universal self-locking wheel, 25 power
10 connector, 26 clamping block, 27 clamping rod, 28 fixing block, 9 clips, 30 pull rods, 31 springs, 32 support rods, 33 limit blocks, 34 mounting slots, 35 slide rods, 36 guide rods, 37 guide blocks and 38 protective plates.

DESCRIPTION OF THE INVENTION

15 The technical solutions in the embodiments of the present invention will be clearly and completely described below with reference to the figures in the embodiments of the present invention. Obviously, the described embodiments are only part of the embodiments of the present invention, but not all of them.

Example 1:

20 Referring to Figure 1-4, the mine safety monitoring and early warning system based on data and model hybrid driving includes a main box 1 and an installation plate 2, the bottom of the main box 1 is rotatably connected with a plurality of universal self-locking wheels 24 to facilitate the movement of the main box 1, and a touch screen 3 is fixedly embedded at one side of the main box 1 to facilitate the input of control instructions and the display of
25 monitoring data, the main box 1 is internally provided with a power supply 4, memory 5, processor 6, positioning module 7, communication module 8 and vibration sensor 9. The positioning module 7 is Beidou positioning module or GPS positioning module, which enhances the positioning accuracy of the positioning module 7, a power connector 25 is fixedly inserted into the bottom of the main box body 1, and the output of the power
30 connector 25 is connected with the input of the power supply 4, which is convenient for

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charging the power supply 4;

According to the invention, the top of the main box body 1 is provided with an installation opening 10, a cover plate 12 is rotatably connected in the installation opening 10 through a rotating shaft 11 to protect control elements, and the top of the main box body 1 is
5 fixedly connected with a locking mechanism corresponding to the cover plate 12, for fixing the cover plate 12, the locking mechanism comprises a clamping block 26 and a clamping rod 27, the clamping rod 27 is slidably inserted on the clamping block 26, and the top of the cover plate 12 is fixedly connected with a fixing block 28 for fixing the cover plate 12;

According to the invention, the fixing block 28 is provided with a clamping groove
10 corresponding to the clamping rod 27, one end of the clamping rod 27 close to the fixing block 28 is fixedly sleeved with a clamping sleeve 29 to prevent the clamping rod 27 from falling off the clamping block 26, one end of the clamping rod 27 far away from the clamping sleeve 29 is fixedly connected with a pull rod 30, and a spring 31 is sleeved on the clamping rod 27, and both ends of the spring 31 are fixedly connected with the clamping sleeve 29 and
15 the clamping block 26, respectively, so that the clamping rod 27 is elastically supported;

In the invention, the bottom of one end of the main box body 1 far away from the touch screen 3 is fixedly connected with a telescopic cylinder 13 for adjusting the height of the mounting plate 2, the output end of the telescopic cylinder 13 is fixedly connected with the bottom of the mounting plate 2, and the bottom of the mounting plate 2 is fixedly connected
20 with a support mechanism, which comprises a support rod 32 for supporting the mounting plate 2, the top of the main box body 1 is provided with a sliding cavity corresponding to the support rod 32, and the bottom of the support rod 32 is fixedly connected with a limiting block 33 to prevent the support rod 32 from falling out of the sliding cavity;

In the invention, one end of the mounting plate 2 is fixedly connected with the first
25 motor 14 for driving the screw 15 to rotate, the top of the mounting plate 2 is provided with a mounting groove 34, the output end of the first motor 14 is fixedly connected with the screw 15 for driving the slider 16 to slide, and one end of the screw 15 located in the mounting groove 34 is screwed with the slider 16, and a sliding bar 35 is fixedly connected in the mounting groove 34 for supporting the slider 16;

30 In the invention, the slide block 16 is provided with a through hole corresponding to the

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slide bar 35, the top of the mounting plate 2 is rotatably connected with a support plate 18 through a rotating rod 17, and the support plate 18 is connected with the slide block 16 through a connecting plate 19 for driving the support plate 18 to rotate, and both ends of the connecting plate 19 are rotatably connected with the slide block 16 and the support plate 18
5 respectively;

In the invention, the top of the supporting plate 18 is fixedly connected with the second motor 20 for driving the fixed plate 21 to rotate, the output end of the second motor 20 is fixedly connected with the fixed plate 21, and the bottom of the fixed plate 21 is fixedly connected with the guide rod 36, For supporting the fixed plate 21, the bottom of the guide
10 rod 36 is fixedly connected with a guide block 37, the top of the support plate 18 is provided with an annular slide rail corresponding to the guide block 37, and the top of the fixed plate 21 is fixedly connected with a protective plate 38 corresponding to the camera 22 to protect the camera 22;

In the invention, one side of the fixed plate 21 is fixedly connected with a camera 22 and
15 a laser sensor 23 for monitoring the external information of the mine, and the outputs of the camera 22, the power supply 4, the laser sensor 23, the positioning module 7 and the vibration sensor 9 are all connected with the inputs of the processor 6, Used to send monitoring data to the processor 6, the output of the processor 6 is connected with the input of the memory 5, the first motor 14, the second motor 20 and the telescopic cylinder 13, and
20 used to control the first motor 14, the second motor 20 and the telescopic cylinder 13, and the output of the communication module 8 and the touch screen 3 are connected with the input of the processor 6 in two directions.

According to the invention, by starting the telescopic cylinder 13, the mounting plate 2 can be driven to move up and down to adjust the height of the supporting plate 18, and then
25 the first motor 14 can drive the screw 15 to rotate, so that the angle of the supporting plate 18 can be adjusted by the action of the slider 16 and the rotating rod 17. Meanwhile, the second motor 20 can drive the supporting plate 18 to rotate and adjust the direction of the monitoring module.

According to the invention, through the arrangement of the camera 33 and the laser
30 sensor 23, the external information of the mine can be collected, and then the monitored

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information is sent to the processor 6, after the processor 6 processes the collected data, it is sent to the remote control center through the communication module 8.

5 According to the invention, through the arrangement of the signal monitoring module and the signal processing module, the system can timely and effectively monitor the safety of the mine and collect data, reveal the disaster-causing mechanism synchronously with the on-site rock mass response prediction, improve the accuracy of prediction and early warning, recognize the cause of the disaster, and provide technical support for targeted disaster prevention measures.

10 The above are only the preferred embodiments of the present invention, but the scope of protection of the present invention is not limited to this. Anyone who is familiar with the technical field, within the technical scope disclosed by the present invention, can equivalently replace or change according to the technical scheme and inventive concept of the present invention, and should be covered in the scope of protection of the present invention.

CLAIMS

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1. A mine safety monitoring and early warning system based on mixed driving of data and model includes a main box body (1) and a mounting plate (2), characterized in that one side of the main box body (1) is fixedly embedded with a touch screen (3), and a power supply (4), a memory (5), a processor (6), a positioning module (7), A communication module (8) and a vibration sensor (9), wherein the top of the main box body (1) is provided with an installation opening (10), a cover plate (12) is rotatably connected in the installation opening (10) through a rotating shaft (11), and a locking mechanism corresponding to the cover plate (12) is fixedly connected to the top of the main box body (1);

The bottom of one end of the main box body (1) far away from the touch screen (3) is fixedly connected with a telescopic cylinder (13), the output end of the telescopic cylinder (13) is fixedly connected with the bottom of the mounting plate (2), and the bottom of the mounting plate (2) is fixedly connected with a supporting mechanism;

One end of the mounting plate (2) is fixedly connected with a first motor (14), the top of the mounting plate (2) is provided with a mounting groove (34), the output end of the first motor (14) is fixedly connected with a screw (15), and one end of the screw (15) located in the mounting groove (34) is screwed with a slide block (16), The top of the mounting plate (2) is rotatably connected with a support plate (18) through a rotating rod (17), and the support plate (18) is connected with the slider (16) through a connecting plate (19), and both ends of the connecting plate (19) are rotatably connected with the slider (16) and the support plate (18) respectively;

The top of the support plate (18) is fixedly connected with a second motor (20), the output end of the second motor (20) is fixedly connected with a fixed plate (21), one side of the fixed plate (21) is fixedly connected with a camera (22) and a laser sensor (23), and the camera (22), the power supply (4), The output ends of the laser sensor (23), the positioning module (7) and the vibration sensor (9) are all connected with the input ends of the processor (6), and the output ends of the processor (6) are respectively connected with the memory (5), The input ends of the first motor (14), the second motor (20) and the telescopic cylinder (13) are connected, and the output ends of the communication module (8) and the touch screen (3) are bidirectionally connected with the input ends of the processor (6).

2. The mine safety monitoring and early warning system based on data and model hybrid

CLAIMS

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driving according to claim 1 is characterized in that the bottom of the main box body (1) is rotatably connected with a plurality of universal self-locking wheels (24).

3. The mine safety monitoring and early warning system based on mixed driving of data and model according to claim 1 is characterized in that the bottom of the main box body (1) is
5 fixedly inserted with a power connector (25), and the output end of the power connector (25) is connected with the input end of the power supply (4).

4. The mine safety monitoring and early warning system based on mixed driving of data and model according to claim 1 is characterized in that the locking mechanism comprises a clamping block (26) and a clamping rod (27), The clamping rod (27) is slidably inserted on
10 the clamping block (26), the top of the cover plate (12) is fixedly connected with a fixing block (28), and the fixing block (28) is provided with a clamping groove corresponding to the clamping rod (27).

5. The mine safety monitoring and early warning system based on data and model hybrid driving according to claim 4 is characterized in that one end of the clamping rod (27) close to
15 the fixed block (28) is fixedly sleeved with a clamping sleeve (29), One end of the clamping rod (27) far from the clamping sleeve (29) is fixedly connected with a pull rod (30); a spring (31) is sleeved on the clamping rod (27); and two ends of the spring (31) are fixedly connected with the clamping sleeve (29) and the clamping block (26) respectively.

6. The mine safety monitoring and early warning system based on mixed driving of data
20 and model according to claim 1 is characterized in that the supporting mechanism comprises a supporting rod (32), the top of the main box body (1) is provided with a sliding cavity corresponding to the supporting rod (32), and the bottom of the supporting rod (32) is fixedly connected with a limiting block (33).

7. The mine safety monitoring and early warning system based on mixed driving of data
25 and model according to claim 1 is characterized in that a slide bar (35) is fixedly connected in the installation groove (34), and a through hole corresponding to the slide bar (35) is formed on the slide block (16).

8. The mine safety monitoring and early warning system based on mixed driving of data and model according to claim 1 is characterized in that the bottom of the fixed plate (21) is
30 fixedly connected with a guide rod (36), the bottom of the guide rod (36) is fixedly connected

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with a guide block (37), and the top of the support plate (18) is provided with an annular slide rail corresponding to the guide block (37).

9. The mine safety monitoring and early warning system based on data and model hybrid driving according to claim 1 is characterized in that the top of the fixed plate (21) is fixedly
5 connected with a protective plate (38) corresponding to the camera (22).

10. The mine safety monitoring and early warning system based on data and model hybrid driving according to claim 1 is characterized in that the positioning module (7) is a Beidou positioning module or a GPS positioning module.

REVENDICATIONS

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1. Le système de surveillance de la sécurité minière et d'alerte précoce basé sur un entraînement mixte de données et de modèles, comprend un corps de boîtier principal (1) et une plaque de montage (2), caractérisé en ce que, un écran tactile (3) est intégré de manière fixe sur un côté du corps de boîtier principal (1), une alimentation électrique (4), une mémoire (5), un processeur (6), un module de positionnement (7), un module de communication (8) et un capteur de vibration (9) sont disposés dans le corps de boîtier principal (1), un orifice de montage (10) est agencé au dessus du corps de boîtier principal (1), une plaque de couverture (12) est connectée en rotation par l'intermédiaire un arbre rotatif dans l'orifice de montage (10), et un mécanisme de verrouillage correspondant à la plaque de couverture (12) est reliée de manière fixe au dessus du corps de boîtier principal (1) ;

Un cylindre télescopique (13) est relié de manière fixe au bas d'une extrémité du corps de boîtier principal (1) éloignée de l'écran tactile (3), l'extrémité de sortie du cylindre télescopique (13) est reliée de façon fixe au fond de la plaque de montage (2), et le fond de la plaque de montage (2) est relié de manière fixe à un mécanisme de support ;

Une extrémité de la plaque de montage (2) est reliée de manière fixe à un premier moteur (14), le dessus de la plaque de montage (2) est pourvu d'une rainure de montage (34), l'extrémité de sortie du premier moteur (14) est reliée de manière fixe à une tige filetée (15), une extrémité de la tige filetée (15) dans la rainure de montage (34) est filetée avec un coulisseau (16), la partie supérieure de la plaque de montage (2) est reliée en rotation à une plaque de support (18) par l'intermédiaire d'une tige rotative (17), la plaque de support (18) est reliée au coulisseau (16) par l'intermédiaire d'une plaque de liaison (19), et les deux extrémités de la plaque de liaison (19) sont reliées en rotation au coulisseau (16) et la plaque de support (18) respectivement ;

Le dessus de la plaque de support (18) est relié de manière fixe à un deuxième moteur (20), l'extrémité de sortie du deuxième moteur (20) est reliée de manière fixe à une plaque de fixation (21), un côté de la plaque de fixation (21) est relié de manière fixe à une caméra (22) et à un capteur laser (23), les extrémités de sortie de la caméra (22), l'alimentation électrique (4), le capteur laser (23), le module de positionnement (7) et le système de vibration capteur

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(9) sont tous reliés aux extrémités d'entrée du processeur (6), les extrémités de sortie du processeur (6) sont respectivement reliées aux extrémités d'entrée de la mémoire (5), le premier moteur (14), le deuxième moteur (20) et le cylindre télescopique (13), et les extrémités de sortie du module de communication (8) et l'écran tactile (3) sont connectés de
5 manière bidirectionnelle avec les extrémités d'entrée du processeur (6).

2. Le système de surveillance de la sécurité minière et d'alerte précoce basé sur un entraînement mixte de données et de modèles selon la revendication 1, caractérisé en ce qu'une pluralité de roues universelles autobloquantes (24) sont reliées en rotation au bas du corps de boîtier principal (1).

10 3. Le système de surveillance de la sécurité minière et d'alerte précoce basé sur un entraînement mixte de données et de modèles selon la revendication 1, caractérisé en ce qu'un connecteur d'alimentation électrique (25) est inséré de manière fixe au bas du corps de boîtier principal (1), et l'extrémité de sortie du connecteur d'alimentation électrique (25) est connecté à l'extrémité d'entrée de l'alimentation électrique (4).

15 4. Le système de surveillance de la sécurité minière et d'alerte précoce basé sur un entraînement mixte de données et de modèles selon la revendication 1, caractérisé en ce que le mécanisme de verrouillage comprend un bloc de serrage (26) et une tige de serrage (27), la tige de serrage (27) est coulissée et insérée sur le bloc de serrage (26), le dessus de la plaque de couverture (12) est relié de manière fixe à un bloc de fixation (28), et le bloc de fixation
20 (28) est pourvu d'une rainure de serrage correspondant à la tige de serrage (27).

5. Le système de surveillance de la sécurité minière et d'alerte précoce basé sur un entraînement mixte de données et de modèles selon la revendication 4, caractérisé en ce qu'une extrémité de la tige de serrage (27) proche du bloc de fixation (28) est gainée de manière fixe avec un manchon de serrage (29), une extrémité de la tige de serrage (27)
25 éloignée du manchon de serrage (29) est reliée de manière fixe à une tige de traction (30), un ressort (31) est emmanché sur la tige de serrage (27), et les deux les extrémités du ressort (31) sont reliées de manière fixe au manchon de serrage (29) et au bloc de serrage (26) respectivement.

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6. Le système de surveillance de la sécurité minière et d'alerte précoce basé sur un entraînement mixte de données et de modèles selon la revendication 1, caractérisé en ce que le mécanisme de support comprend une tige de support (32), le dessus du corps de boîtier principal (1) est pourvu d'un coulisseau cavité correspondant à la tige de support (32), et le
5 bloc de position limitée (33) est relié de manière fixe au bas de la tige de support (32).

7. Le système de surveillance de la sécurité minière et d'alerte précoce basé sur un entraînement mixte de données et de modèles selon la revendication 1, caractérisé en ce qu'une barre coulissante (35) est reliée de manière fixe à l'intérieur de la rainure de montage (34), et le coulisseau (16) est pourvu d'un orifice traversant correspondant à la barre
10 coulissante (35).

8. Le système de surveillance de la sécurité minière et d'alerte précoce basé sur un entraînement mixte de données et de modèles selon la revendication 1, caractérisé en ce qu'une tige de guidage (36) est reliée de manière fixe au bas de la plaque de fixation (21), un bloc de guidage (37) est relié de manière fixe au bas de la tige de guidage (36), et le dessus de
15 la plaque de support (18) est pourvu d'un rail de coulissement annulaire correspondant au bloc de guidage (37).

9. Le système de surveillance de la sécurité minière et d'alerte précoce basé sur un entraînement mixte de données et de modèles selon la revendication 1, caractérisé en ce que le dessus de la plaque de fixation (21) est relié de manière fixe à une plaque de protection (38)
20 correspondant à une caméra (22).

10. Le système de surveillance de la sécurité minière et d'alerte précoce basé sur un entraînement mixte de données et de modèles selon la revendication 1, caractérisé en ce que le module de positionnement (7) est un module de positionnement Beidou ou un module de positionnement GPS.
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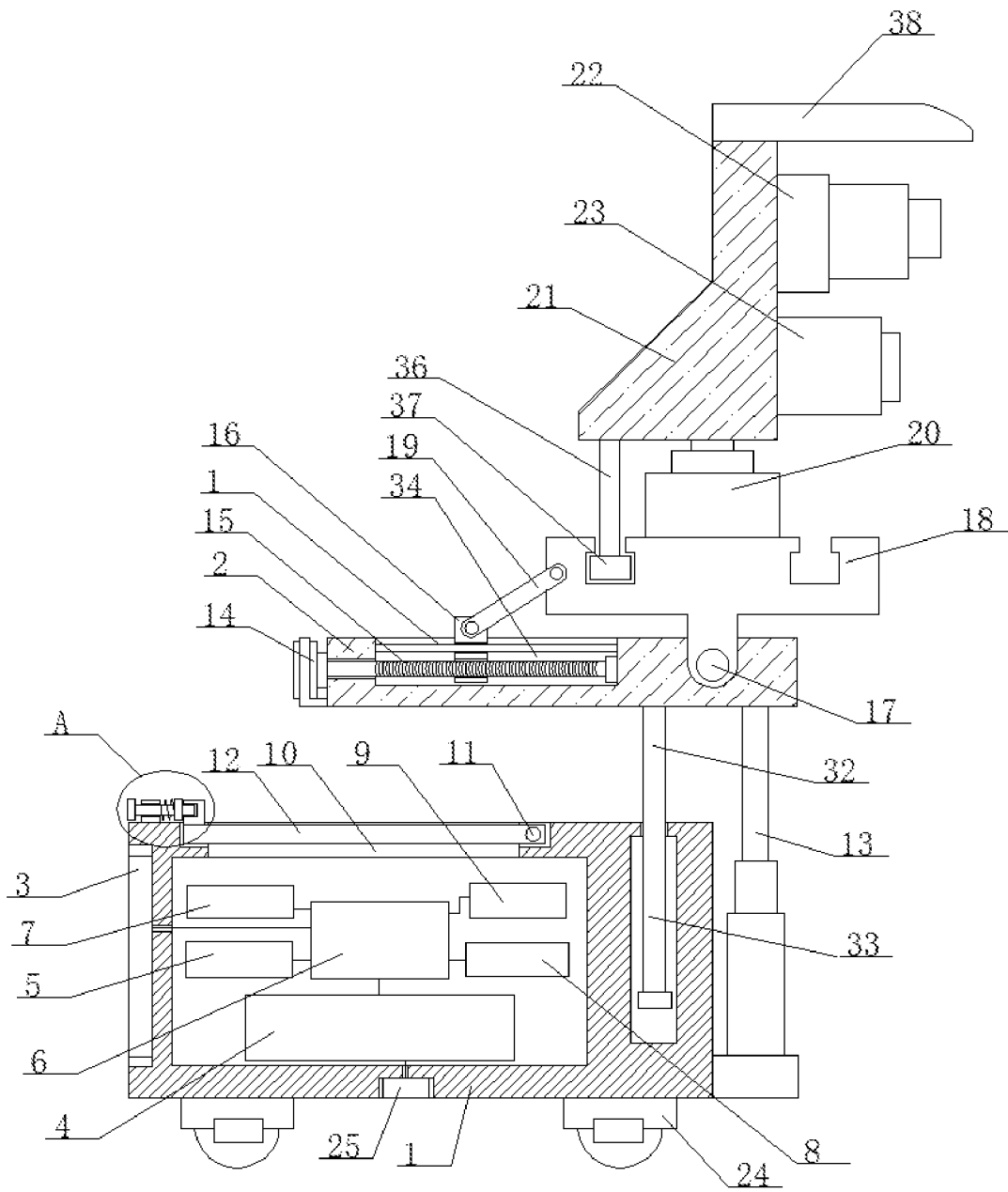


Fig. 1

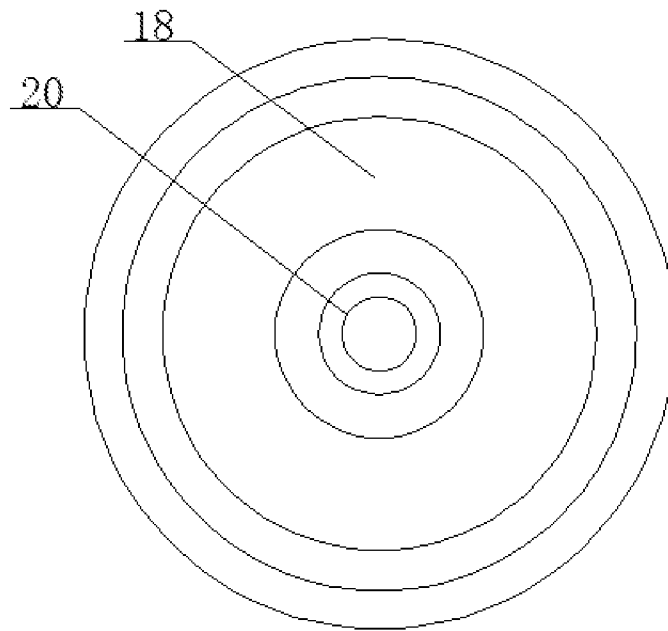


Fig. 2

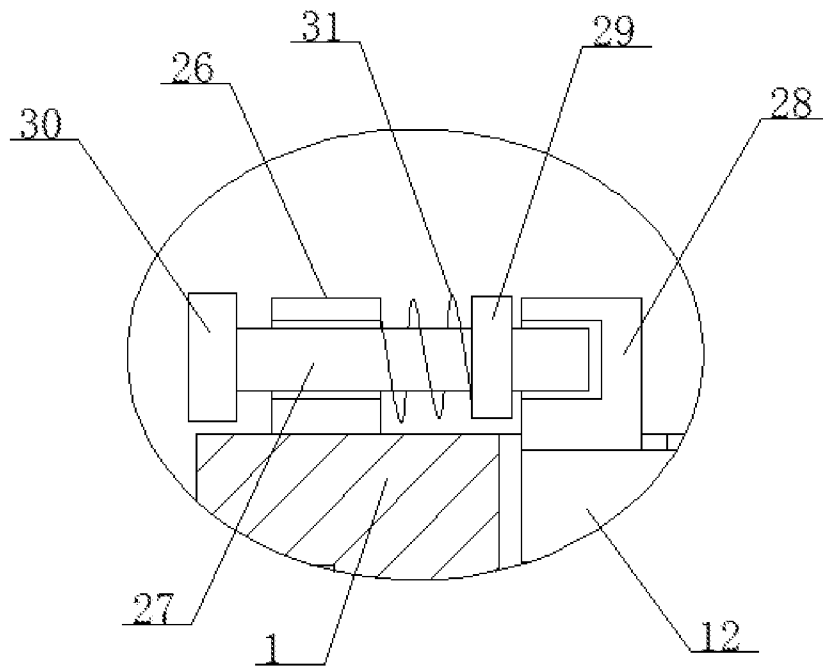


Fig. 3

DRAWINGS

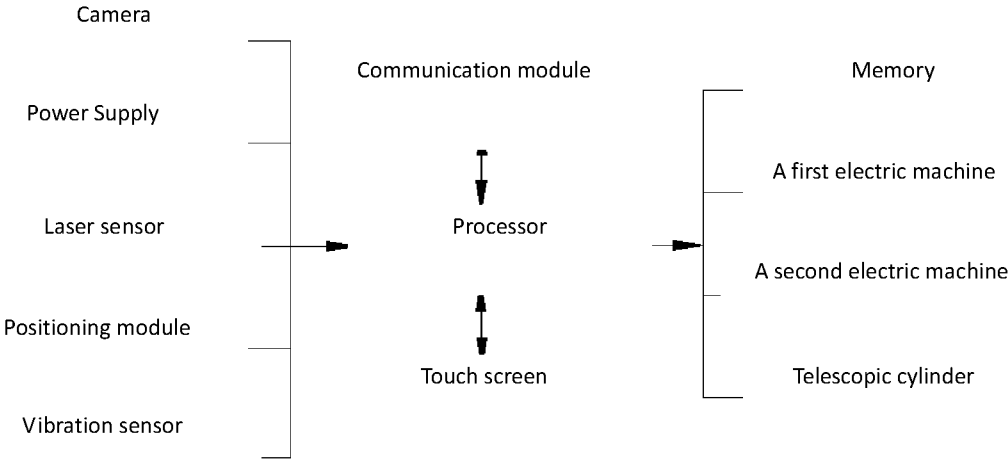


Fig. 4