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(54) SLIDE FOR RAPID EVACUATION FROM TALL BUILDING

(57) A slide for rapid evacuation from a tall building is characterized in that chute bottom plates of a turning chute (7) comprise a chute bottom plate (20A) of a fan-shaped front turning section of the chute, a chute bottom plate (22A) of a rear turning section of the chute, and a chute bottom plate (21A) of a middle turning section of the chute, wherein the chute bottom plate (20A) of the front turning section of the chute is pivotally connected by two identical chute bottom plates; the upper end of the chute bottom plate (20A) of the front turning section of the chute is pivotally connected to the lower end of a chute bottom plate (2) of an upper level straight slide chute, with the bottom thereof being pivotally connected to the upper end of the chute bottom plate (21A) of the middle turning section of the chute; the inner end of the chute bottom plate (21 A) of the middle turning section of the chute (21) is pivotally connected to a wall protection board (3A) by a pivot (8) and the lower end thereof is pivotally connected to the upper end of the chute bottom plate (22A) of the rear turning section of the chute; and the lower end of the chute bottom plate (22A) of the rear turning section of the chute is connected in abutment to the upper end of the chute bottom plate (2) of a lower level straight slide chute. The slide for rapid evacuation from a tall building according to the present invention enables people to evacuate from a fire in a rapid, low-profile, convenient and safe way, thus saving lives.

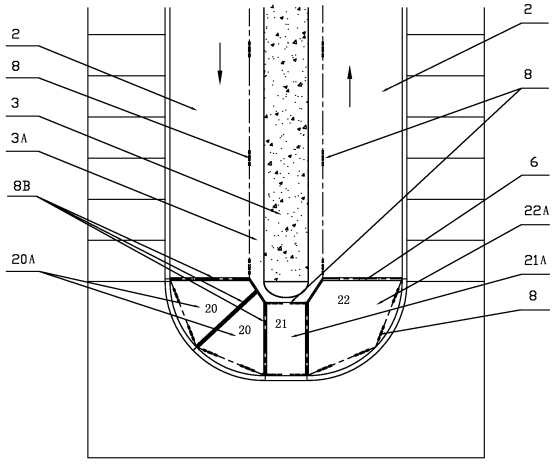

FIG. 1

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Description

[0001] The invention relates to a safeguard device applied in buildings, and more particularly to an escape chute. The invention is a later application of a Chinese prior application No. 201110065649.8 (called prior application for short hereinafter) titled an escape chute from skyscrapers.

[0002] With the rapid development of society and economy, the available building land is increasingly scarce, and thus to construct skyscrapers has become an inevitable trend. However, the skyscrapers generally have weak feedback mechanisms for disasters, for example, when fire disaster happens, how to escape from the skyscrapers becomes an international tough problem. Chinese prior application titled an escape chute from skyscrapers solves the problem to some extent. The prior application has the following characteristics: 1) in the non-disaster period, the chute can be erected up and leans against the middle standing wall of the stairs, thereby being free of interfering with the ordinary use of the stairs. When disaster occurs, the chute can be laid down to form a U-shaped sliding channel for people to escape. 2) The chute includes a mechanical interlocking device which can trigger a domino effect so that when one chute in a specific storey is turn over, the other downstream chutes automatically turn over whereby forming a continuous escape channel. 3) the escape chute includes a turning chute at the terrace of the stair. The turning chute includes a front section, a middle section, and a rear section, which are connected to the upper straight chute and the lower straight chute, respectively, to form an integrated structure. The turning chute has proper slope, gradient, and curvature and thus when evacuation people slide to the turning chute, the sliding speed is lowered but the sliding is still continuing, which ensures the sliding safety and improves the evacuation efficiency. The prior application effectively solves the problem of rapid escape from high rise in case of disaster.

[0003] It is one objective of the invention to perfect the types and shapes of an escape chute disclosed in the prior application titled an escape chute from skyscrapers. The new escape chute is convenient for use, safe and fast for people to evacuate, and is reasonably designed to save occupied space as much as possible when it is not used.

[0004] In this disclosure, both a turning chute 7 and a straight chute are components, which have the structure similar to the turning chute and the straight chute described in the prior application. For example, the straight chute comprises a chute base 2, a guard rail 2A, and a hand rail 1. The turning chute 7 comprises a front section 20 of the turning chute, a middle section 21 of turning chute, a rear section 22 of turning chute, all of which are also components, and further comprises a chute base 20A of the front section of the turning chute, a chute base 21 A of the middle section of the turning chute, a chute base 22A of the rear section of the turning chute, corresponding guard rails 2A, and hand rails 1 corresponding to the components of the straight chute.

[0005] The objective of the invention is achieved according to the following technical schemes. An escape chute comprises a straight chute and a turning chute 7. Each section of the turning chute 7 is connected with one another using corresponding chute bases thereof as connecting pieces. The escapes chute comprises a front section 20 of the turning chute, a middle section 21 of turning chute, a rear section 22 of turning chute. A guard plate 3A is arranged on a middle wall 3 of a stairway. Each chute base 2 of the upper straight chute and the lower straight chute is in hinge joint with the guard plate 3A of the middle wall 2 through a rotating axle 8.

[0006] The front 20, middle 21, and rear 22 sections of the turning chute are connected together through chute bases thereof. The chute base of the upper straight chute and the chute base of the lower straight chute are connected through the chute bases 20A, 21A, 22A of the front, the middle, and the rear sections 20, 21, 22.

[0007] The chute base of the turning chute 7 comprises: the chute base 20A of the front section 20 in a shape of a sector, the rear base 22A of the rear section 22 in a shape of a sector, and the chute base 21A of the middle section 21 in a shape of a rectangular. The chute base 20A of the front section 20 is formed by hinging two chute bases of the same shape together.

[0008] The chute base 20A of the front section 20 comprises: a front end being in hinge joint with a rear end of the chute base of the upper straight chute 2, and a rear end being in hinge joint with a front end of the chute base of the middle section. The chute base 21A of the middle section 21 comprises: an inner end being in hinge joint with the guard plate 3A of the middle wall via the second rotating axle 8, and a rear end being in hinge joint with a front end of the chute base of the rear section. A rear end of the chute base 22A of the rear section 22 is in butt joint with a front end of the chute base of the lower straight chute 2.

[0009] Each hinge joint between the chute bases of corresponding chutes is provided with a hinge roller 8B. Each butt joint is provided with a combined pulley 6.

[0010] The escape chute is also provided with a chute-linked wire rope 27, a laterally positioning wire rope 27A, a sliding hole 27B, a detachable device 27C, and a positioning hole 27D to realize the linkage of the chutes and to tie the guard rails 2A at a right angle to the corresponding chute bases.

[0011] To rotate the turning chute 7 upwardly toward the middle wall, two chute bases of the front section 20 are folded through the hinge roller 8B. The front section is rotated to a left side of the middle wall 3 and uprightly inserted into a space between the middle wall and the chute base 2 of the upper straight chute. After that, the upper straight chute is fixed on the middle wall by the upper spring hoop 17A. The middle section 21 of the turning chute is rotated uprightly to contact an end face of the middle wall. Meanwhile, the chute base of the rear

section and the chute base of the middle section 3 are folded through the hinge roller. The rear section is rotated to a right side of the middle wall and uprightly inserted into a space between the middle wall and the chute base of the lower straight chute. After that, the lower straight chute is fixed on the middle wall by the lower spring hoop 17.

[0012] In case of fire, the upper straight chute is rotated downward; the chute base of the upper straight chute and the chute base 20A of the front section 20 of the turning chute are unfolded and turned downwardly. Because the chute base 20A of the front section 20 is in high joint with the chute base 21A of the middle section 21, and the chute base of the middle section is in hinge joint with the chute base of the rear section, the chute base of the middle section and the chute base of the rear section are turned downwardly one after another. Meanwhile, the lower straight chute is turned downwardly drawn by the chute-linked wire rope, and the chute base of the rear section is allow to connect to the lower straight chute, thereby forming a continuous escape chute.

[0013] As an improvement of the invention, the chute base 20A of the front section 20 of the turning chute comprises a front part in a rectangular shape and a rear part in a sector shape. A front end of the chute base of the front section is in lap joint with a rear end of the chute base of the upper straight chute 2 and is disposed on a supporting plate 2F arranged on the rear end of the chute base of the upper straight chute 2. A rear end of the chute base of the front section is in lap joint with an upper end of the chute base 21A of the middle section 21 and is disposed on a supporting plate 21 B of the chute base 21 A of the middle section 21. The chute base of the middle section comprises: an inner end being in hinge joint with the middle wall 3 via the second rotating axle 8, and a rear end being in hinge joint with a front end of the chute base 22A of the rear section 22. A rear end of the chute base of the rear section is in butt joint with a front end of the chute base of the lower straight chute.

[0014] Each hinge joint between the chute bases of corresponding chutes is provided with a hinge roller 8B. Each butt joint and lap joint is provided with a combined pulley 6.

[0015] The escape chute is also provided with a chute-linked wire rope 27, a laterally positioning wire rope 27A, a sliding hole 27B, a detachable device 27C, and a positioning hole 27D to realize the linkage of the chutes and to tie the guard rails at a right angle to the corresponding chute bases.

[0016] When the upper straight chute is rotated downwardly, the chute base of the front section of the turning chute slides downwardly along with the supporting plate 2F of the chute base 2 of the upper straight chute and the supporting plate 21 B of the chute base 21 of the middle section. The chute base of the front section is then located at the guard rail 2A of the middle section, and fixed on the supporting plate 2F of the upper straight chute 20 and the supporting plate of the middle section, thereby forming the lap joint with the upper straight chute and the middle section, respectively.

[0017] Structures and embodiments of the structures of the guard rail are described below.

[0018] The guard rail 2A of the front section 20 comprises: a front part divided into two members of the same shapes and in hinge joint with the rectangular-shaped front chute base; and a rear part in hinge joint with the sector-shaped rear chute base. The upper end of the guard rail of the front section is connected with the guard rail of the upper straight chute, and the lower end of the guard rail of the front section is connected to guard rails 2A of the middle section, the rear section, and the guard rail 2A of the lower straight chute one after another.

[0019] Structures and embodiments of the guard rails 2A are the same those of first technical scheme, that is, the linkage of the guard rails and functions thereof are realized by using the sliding hole 27B, the detachable device 27C, the positioning hole 27D, and the laterally positioning wire rope 27.

[0020] As an improvement of the invention, the turning chute is provided with a lifting device comprising a lifting slide 32, a balance iron slide 33, a pulley 34, a hanging wire rope 35, and a balance iron 36. The hanging wire rope 35 comprises: one end fixed on the balance iron 36, and the other end is fixed on the turning chute 7 through the pulley 34. The turning chute 7 comprises a supporting plate 7A on a bottom, and the supporting plate 7A is able to support the turning chute 7 and drive the turning chute to move upwardly and downwardly inside the lifting slide 32. The balance iron 36 is disposed inside the balance iron slide 33 and is downwardly and upwardly movable in an opposite direction of the movement of the turning chute 1.

[0021] The straight chute are provided with two structures, that is, the chute base 2 and the guard rail 2A are in the form of a hinge joint, or in the form of integrally fixation. The turning chute of the continuous escape chute is also provided with two structures, that is, the integrally fixation or the hinge joint. Different structures of the straight chute and the turning chute are combined according to practical conditions of the building.

[0022] As an improvement of the invention, the escape chute further comprises a fire-proof ventilation device comprising a baffle 39, a ventilation pipe 41, a fume vent, and a fume extraction fan 42. The baffle 39 separates an upper stairway from a lower stairway from a middle position for allowing the fume to rise regularly. The fume vent and the fume extraction fan 42 are disposed on an outer wall of a top of each floor for allowing the fume of an inner side of the wall to communicate with the ventilation pipe arranged on an outer side of the wall. The ventilation pipe is disposed on an outer side of the wall from the top floor to the ground floor. When two ends of the ventilation pipe are open, a strong gas current is produced inside the ventilation pipe and a negative pressure is formed, so that the fume 43 is able to be extracted out from the stairway to the outdoor space through the ven-

tilation pipe 41 while the fume extraction fan is started to work. Once the fume is extracted out, the danger of the fire is largely lowered and is beneficial to the evacuation of the people.

[0023] The escape chute of the invention has a reasonable structure and low cost. It is convenient and safe in use, and is suitable for the high-stair buildings. For a building having thirty floors, the escape chute of the invention allows each person to take three seconds to slide over each floor and two minutes to the ground floor. If three persons slide down from each floor, the escape chute allows hundreds of people to evacuate simultaneously. It is preferable to use the escape chute combined with technics of the fire-proof ventilation device.

FIG.1 is a top view of connected chute bases of a turning chute 7 in accordance with one embodiment of the invention;

FIG. 2 is a front view of connected guard rail of a turning chute 7 in accordance with one embodiment of the invention;

FIG. 3 is a front view of a continuous escape chute being turned upwardly and fixed on a middle wall in accordance with one embodiment of the invention;

FIG. 4 is a front view of a linkage between an upper straight chute and a front section 20 of a turning chute in accordance with one embodiment of the invention;

FIG. 5 is a front view of a linkage between a middle section 21 of turning chute and a lower straight chute in accordance with one embodiment of the invention;

FIG. 6A is a top view of a chute base of the turning chute before a front section 20 is positioned in accordance with one embodiment of the invention; FIG. 6B is a top view of a chute base of the turning chute 7 after a front section 20 is positioned in accordance with one embodiment of the invention;

FIG. 7 is a front view of a turning chute 7 lifted to a top of a floor by a lifting device in accordance with one embodiment of the invention;

FIG. 8 is a front view of a turning chute 7 lowered to a stair landing 5 by a lifting device in accordance with one embodiment of the invention; and

FIG. 9 is front view of a fume vent, fume extraction fan 42, and a ventilation pipe 41 in accordance with one embodiment of the invention.

In the drawings, the following reference numbers are used: 1. Hand rail; 2. Chute base; 2A. Guard rail; 2C. Column base of turning chute; 2F. Supporting plate of middle section of turning chute 2; 3. Middle wall; 3A. Guard plate; 4. Sprinkler pipe; 5. Stairway; 5A. Stairway platform; 6. Combined pulley;7. Turning chute; 7A. Supporting plate of bottom of turning chute; 8. Second rotating axle; 8A. First rotating axle; 8B. Hinge roller; 9. Positioning recess; 10. Spring pin; 10A. slide; 11. Curved connecting piece; 12. Arc connection shaft; 13. Wire rope; 14. Ring; 15. Pull rod; 16. Push rod; 17. Lower spring hoop; 17A. Upper spring hoop; 18. Rear end of upper straight chute; 19. Front end of lower straight chute; 20. Front section of turning chute; 20A. Chute base of front section of turning chute; 21. Middle section of turning chute; 21A. Chute base of middle section of turning chute; 21 B. Supporting plate of chute base of middle section of turning chute 21; 22. Rear section of turning chute; 22A. Chute base of middle section of turning chute; 23. Turning mouth; 24. Third rotating axle; 25. First longitudinally positioning wire rope; 26. Second longitudinally positioning wire rope; 27. Chute-linked wire rope; 27A. Laterally positioning wire rope; 27B. Sliding hole; 27C. Detachable device; 27D. Positioning hole; 28. Upright rod; 29. Cross rod; 30. Arm rest; 31. Coupled device of upper straight chute and lifting device; 32. Lifting slide; 33. Balance iron slide; 34. Pulley; 35. Hanging wire rope; 36. Balance iron;37. Upper stairway; 38. Lower stairway; 39. Baffle; 40. Outer wall of building; 41.Ventilation pipe; 42. Fume extraction fan; and 43. Fume.

With reference to FIGS. 1 and 6, the straight chute at the left of the middle wall 3 is from the upper storey, and the straight chute at the right of the middle wall 3 extends downward. From the horizontal view angle, the left represents the front and the right represents the rear.

Example 1

[0024] As shown in FIG. 1, an escape chute comprises: an upper straight chute, a lower straight chute, and a turning chute 7 comprising a front section 20, a middle section 21, and a rear section 22. A guard plate 3A is arranged on a middle wall 3 of a stairway. The front, middle, and rear sections 20, 21, and 22 of the turning chute 7 are connected together through chute bases 20A, 21A, and 22A thereof. Each chute base 2 of the upper straight chute and the lower straight chute is in hinge joint with the guard plate 3A of the middle wall through a second rotating axle 8.

[0025] The chute base 2 of the upper straight chute and the chute base 2 of the lower straight chute are connected through the chute bases 20A, 21A, and 22A of the front, the middle, and the rear sections 20, 21, and 22 of the turning chute 7.

[0026] The chute base 2 of the turning chute 7 comprises: the chute base 20A of the front section 20 in a shape of a sector, the rear base 22A of the rear section22 in a shape of a sector, and the chute base 21 A of the

middle section 21 in a shape of a rectangular. The chute base 20A of the front section 20 is formed by hinging two chute bases of the same shape together.

[0027] The chute base 20A of the front section 20 comprises: a front end being in hinge joint with a rear end of the chute base 2 of the upper straight chute, and a rear end being in hinge joint with a front end of the chute base 21A of the middle section 21. The chute base 21A of the middle section 21 comprises: an inner end being in hinge joint with the guard plate 3A of the middle wall via the second rotating axle 8, and a rear end being in hinge joint with a front end of the chute base 22A of the rear section 22. A rear end of the chute base 22A of the rear section 22 is in butt joint with a front end of the chute base 2 of the lower straight chute.

[0028] Each hinge joint between the chute bases of corresponding chutes is provided with a hinge roller 8B. Each butt joint is provided with a combined pulley 6.

[0029] The escape chute comprises a chute-linked wire rope for the linkage of guard rails 2A. As shown in FIGS. 1, 4, and 5, the guard rail 2A of the front section 20 and the guard rail 2A of the rear section 22 are both composed of two parts of the same shapes, and each part is provided with a sliding hole 27B arranged beneath a handrail 1 for allow a laterally positioning wire rope 27A to pass through. A detachable device 27C is disposed on one end of the upper straight chute beneath the handrail 1 to connect the laterally positioning wire rope 27A, the connection thereof is detachable. A positioning hole 27D is arranged beneath the handrail 1 of the middle section 21 of the turning chute for fixing one end of the laterally positioning wire rope 27A. The other end of the laterally positioning wire rope 27A passes through the sliding holes 27B of the front section 20 and connects to the detachable device 27C of the upper straight chute, the connection of herein is detachable. One end of the chute-linked wire rope 27 is fixed on one end of the lower straight chute close to the rear section 22 beneath the handrail 1, the other end thereof passes through sliding holes 27B beneath the handrail of the rear section 22 and connects to the positioning hole 27D beneath the handrail 1 of the middle section 21.

[0030] To turn downwardly the upper straight chute, the laterally positioning wire rope 27A passes through the sliding holes 27B beneath the handrail 1 of front section 20, draws the middle section 21 of the turning chute downwardly, and allows the chute bases 20 A, 21A to form right angles relative to the corresponding guard rails 2A. Meanwhile, the position of one end of the chute-linked wire rope 27 connected to the positioning hole 27D of the middle section 21 descends; because of the linkage of the sliding holes 27B on the rear section 22 beneath the handrail 1, the other end of the chute-liked wire rope 27 draws the lower straight chute downwardly and allows the guard rail 2A and the chute base 22A of the rear chute 22 to form a right angle. As the lower straight chute is turned downwardly, the spring pin 10 moves along the slide 10A until it is fixed in the positioning recess 9, thus, the chute-linked wire rope 27 is tightly fixed on the guard rails 2A.

[0031] As shown in FIG. 3, to rotate the turning chute 7 toward the middle wall, two chute bases 20A of the front section 20 are folded through the hinge roller 8B. The front section is rotated to a left side of the middle wall and uprightly inserted into a space between the middle wall 3 and the chute base 2 of the upper straight chute. After that, the upper straight chute is fixed on the middle wall by the upper spring hoop 17A. The middle section 21 of the turning chute is rotated uprightly to contact an end face of the middle wall. Meanwhile, the chute base 22A of the rear section 22 and the chute base 21A of the middle section 21 are folded through the hinge roller 8B. The rear section is rotated to a right side of the middle wall and uprightly inserted into a space between the middle wall 3 and the chute base 2 of the lower straight chute. After that, the lower straight chute is fixed on the middle wall by the lower spring hoop 17.

[0032] In case of fire, the upper straight chute is rotated downward, the chute base 2 of the upper straight chute and the chute base 20A of the front section 20 of the turning chute are unfolded and turned downwardly. Because the chute base 20A of the front section 20 is in high joint with the chute base 21A of the middle section 21, and the chute base 21A of the middle section 21 is in hinge joint with the chute base 22 of the rear section 21, the chute base 21A of the middle section 21 and the chute base 22A of the rear section 22 are turned downwardly one after another. Meanwhile, the lower straight chute is turned downwardly drawn by the chute-linked wire rope 27, and the chute base 22A of the rear section 22 is allow to connect to the lower straight chute, thereby forming a continuous escape chute.

Example 2

[0033] As shown in FIGS. 6A, 6B, the chute base 20A of the front section 20 of the turning chute comprises a front part in a rectangular shape and a rear part in a sector shape. A front end of the chute base 20A of the front section 20 is in lap joint with a rear end of the chute base 2 of the upper straight chute and is disposed on a supporting plate 2F arranged on the rear end of the chute base 2 of the upper straight chute. A rear end of the chute base 20A of the front section 20 is in lap joint with an upper end of the chute base 21A of the middle section 21 and is disposed on a supporting plate 21 B of the chute base 21 A of the middle section 21. The chute base 21A of the middle section 21 comprises: an inner end being in hinge joint with the middle wall via the second rotating axle 8, and a rear end being in hinge joint with a front end of the chute base 22A of the rear section 22. A rear end of the chute base 22A of the rear section 22 is in butt joint with a front end of the chute base 2 of the lower straight chute.

[0034] Each hinge joint between the chute bases of corresponding chutes is provided with a hinge roller 8B.

Each butt joint and lap joint is provided with a combined pulley 6.

[0035] As shown in FIGS. 2-5, the escape chute is also provided with a chute-linked wire rope 27, a laterally positioning wire rope 27A, a sliding hole 27B, a detachable device 27C, and a positioning hole 27D to realize the linkage of the chutes and to tie the guard rails 2A at a straight angle to the corresponding chute bases.

[0036] Structures and embodiments of the guard rails 2A are the same those of Example 1, that is, the linkage of the guard rails 2A and functions thereof are realized by using the sliding hole 27B, the detachable device 27C, the positioning hole 27D, and the laterally positioning wire rope 27A.

[0037] When the upper straight chute is rotated downwardly, the chute base 20A of the front section 20 of the turning chute slides downwardly along with the supporting plate 2F of the chute base 2 of the upper straight chute and the supporting plate 21 B of the chute base 21 of the middle section 21. The chute base 20A of the front section 20 is then located at the guard rail 2A of the middle section 21. Thus, the supporting plate 2F of the upper straight chute and the supporting plate 21 B of the middle section 21, thereby forming the lap joint with the upper straight chute and the middle section 21, respectively.

[0038] Structures of the guard rails are shown in FIGS. 2-6. The guard rail 2A of the front section 20 comprises: a front part divided into two members of the same shapes and in hinge joint with the rectangular-shaped front chute base; and a rear part in hinge joint with the sector-shaped rear chute base. The upper end of the guard rail 2A of the front section 20 is connected with the guard rail 2A of the upper straight chute, and the lower end of the guard rail 2A of the front section 20 is connected to guard rails of the middle section 21, the rear section 22, and the guard rail of the lower straight chute one after another.

Example 3

[0039] As shown in FIGS. 7-8, the turning chute 7 is provided with a lifting device comprising a lifting slide 32, a balance iron slide 33, a pulley 34, a hanging wire rope 35, and a balance iron36. One end of the hanging wire rope 35 is fixed on the balance iron36, and the other end of the hanging wire rope 35 is fixed on the turning chute 7 after passing through the pulley 34. The turning chute 7 comprises a supporting plate 7A on a bottom, and the supporting plate is able to support the turning chute and drive the turning chute to move upwardly and downwardly inside the lifting slide. The balance iron 36 is disposed inside the balance iron slide 33 and is downwardly and upwardly movable in an opposite direction of the movement of the turning chute.

[0040] The weight of the balance iron 36 is relatively light to the weight of the turning chute 7. When the upper straight chute is turned downwardly, the supporting plate 7A of the turning chute 7 is removed from being supported by the coupling devices, thereby sliding downwardly at a uniform velocity under the force of the self-gravity and the drag of the balance iron 36. A preferable weight difference between the turning chute 7 and the balance iron 36 is 3 Kg, thereby ensuring that persons will not hurt when they are hit by the descending turning chute. As shown in FIG. 7, the turning chute 7 employs an integrated structure, the lifting device is arranged on the end face of the middle wall for integrally raising or lowering the turning chute. The turning case can be lifted and fixed at a top of the stairway. In case of fire, the turning chute is dragged downwardly by the upper straight chute on the stair landing 5A, and draws the lower straight chute to descend, thus, a continuous escape chute is formed.

Example 4

[0041] As shown in FIG. 9, the escape chute further comprises a fire-proof ventilation device comprising a baffle 39, a ventilation pipe 41, a fume vent, and a fume extraction fan 42. The baffle 39 separates an upper stairway 37 from a lower stairway 38 from a middle position for allowing the fume to rise regularly. The fume vent and the fume extraction fan 42 are disposed on an outer wall of a top of each floor for allowing the fume of an inner side of the wall to communicate with the ventilation pipe 41 arranged on an outer side of the wall. The ventilation pipe41 is disposed on an outer side of the wall from the top floor to the ground floor. When two ends of the ventilation pipe are open, a strong gas current is produced inside the ventilation pipe and a negative pressure is formed, so that the fume is able to be extracted out from the stairway to the outdoor space through the ventilation pipe while the fume extraction fan is started to work. Once the fume is extracted out, the danger of the fire is largely lowered and is beneficial to the evacuation of people.

Claims

1. An escape chute, comprising:

a) an upper straight chute;
b) a lower straight chute;
c) a turning chute (7), the turning chute comprising a front section (20), a middle section (21), and a rear section (22); and
d) a rotating axle (8);

characterized in that
the upper straight chute and the lower straight chute are connected via the turning chute (7);
each chute comprises a chute base (2);
a guard plate (3A) is arranged on a middle wall (3) of a stair, and the chute bases (2) of the upper straight chute and the lower straight chute are in hinge joint with the guard plate (3A) via the rotating axle (8);
the front section (20), the middle section (21), the rear section (22) of the turning chute (7) are connect-

ed via corresponding chute bases thereof;
the chute base (2) of the upper straight chute and the chute base (2) of the lower straight chute are connected through the chute bases (20A, 21A, and 22A) of the front, the middle, and the rear sections (20, 21, and 22) of the turning chute (7).

2. The escape chute of claim 1, **characterized in that** the chute base of the turning chute (7) comprises: the chute base (20A) of the front section (20) in a shape of a sector, the rear base (22A) of the rear section (22) in a shape of a sector, and the chute base (21A) of the middle section (21) in a shape of a rectangular; the chute base (20A) of the front section (20) is formed by hinging two chute bases of the same shape together;
the chute base (20A) of the front section comprises: a front end being in hinge joint with a rear end of the chute base (2) of the upper straight chute, and a rear end being in hinge joint with a front end of the chute base (21A) of the middle section (21);
the chute base (21A) of the middle section (21) comprises: an inner end being in hinge joint with the guard plate (3A) of the middle wall via the second rotating axle (8), and a rear end being in hinge joint with a front end of the chute base (22A) of the rear section (22); and
a rear end of the chute base (22A) of the rear section (22) is in butt joint with a front end of the chute base (2) of the lower straight chute.

3. The escape chute of claim 2, **characterized in that** each hinge joint between the chute bases of corresponding chutes is provided with a hinge roller (8B); and each butt joint is provided with a combined pulley (6).

4. The escape chute of claim 2 or 3, **characterized in that** the escape chute is also provided with a chute-linked wire rope (27), a laterally positioning wire rope (27A), a sliding hole (27B), a detachable device (27C), and a positioning hole (27D) to realize the linkage of the chutes and to tie the guard rails (2A) at a right angle to the corresponding chute bases.

5. The escape chute of claim 1, **characterized in that** the chute base (20A) of the front section (20) of the turning chute comprises: a front part in a rectangular shape, and a rear part in a sector shape;
a front end of the chute base (20A) of the front section (20) is in lap joint with a rear end of the chute base (2) of the upper straight chute and is disposed on a supporting plate (2F) arranged on the rear end of the chute base (2) of the upper straight chute; a rear end of the chute base (20A) of the front section (20) is in lap joint with an upper end of the chute base (21 A) of the middle section (21) and is disposed on a supporting plate (21 B) of the chute base (21A) of the middle section (21);
the chute base (21A) of the middle section (21) comprises: an inner end being in hinge joint with the middle wall (3) via the second rotating axle (8), and a rear end being in hinge joint with a front end of the chute base (22A) of the rear section (22); and
a rear end of the chute base (22A) of the rear section (22) is in butt joint with a front end of the chute base (2) of the lower straight chute.

6. The escape chute of claim 5, **characterized in that** each hinge joint between the chute bases of corresponding chutes is provided with a hinge roller (8B); and each butt joint is provided with a combined pulley (6).

7. The escape chute of claim 5 or 6, **characterized in that** the escape chute is also provided with a chute-linked wire rope (27), a laterally positioning wire rope (27A), a sliding hole (27B), a detachable device (27C), a positioning hole (27D) to realize the linkage of the chutes and to tie the guard rails (2A) at a right angle to the corresponding chute bases.

8. The escape chute of claim 1, **characterized in that** the turning chute (7) is an integrally fixed chute;
the turning chute(7) is provided with a lifting device comprising a lifting slide (32), a balance iron slide (33), a pulley (34), a hanging wire rope (35), and a balance iron (36);
the hanging wire rope (35) comprises: one end fixed on the balance iron (36), and the other end passing through the pulley (34) and fixed on the turning chute (7) after;
the turning chute (7) comprises a supporting plate (7A) disposed inside the lifting slide (32);
the balance iron (36) is disposed inside the balance iron slide (33);
the upper straight chute and the lower straight chute employs a structure comprising a hinge joint between the chute base (2) and the guard rail (2A), or a structure of integrally fixation.

9. The escape chute of claim 1, **characterized in that** the escape chute further comprises a fire-proof ventilation device comprising a baffle (39), a ventilation pipe (41), and a fume extraction fan (42);
the baffle (39) separates an upper stairway (37) from a lower stairway (38); and
the fume extraction fan (42) is disposed on an outer wall of a top of each floor for allowing the fume of an inner side of the wall to communicate with the ventilation pipe (41) arranged on an outer side of the wall.

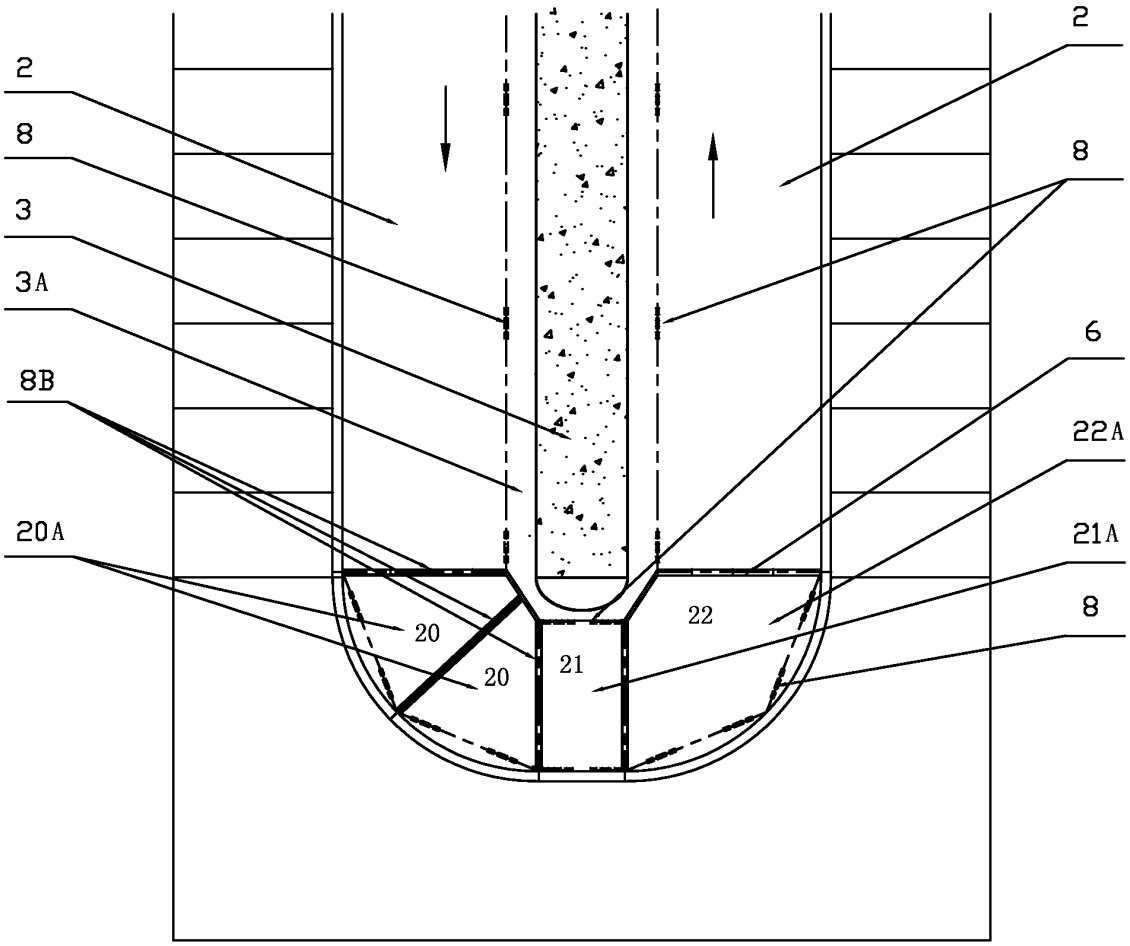

FIG. 1

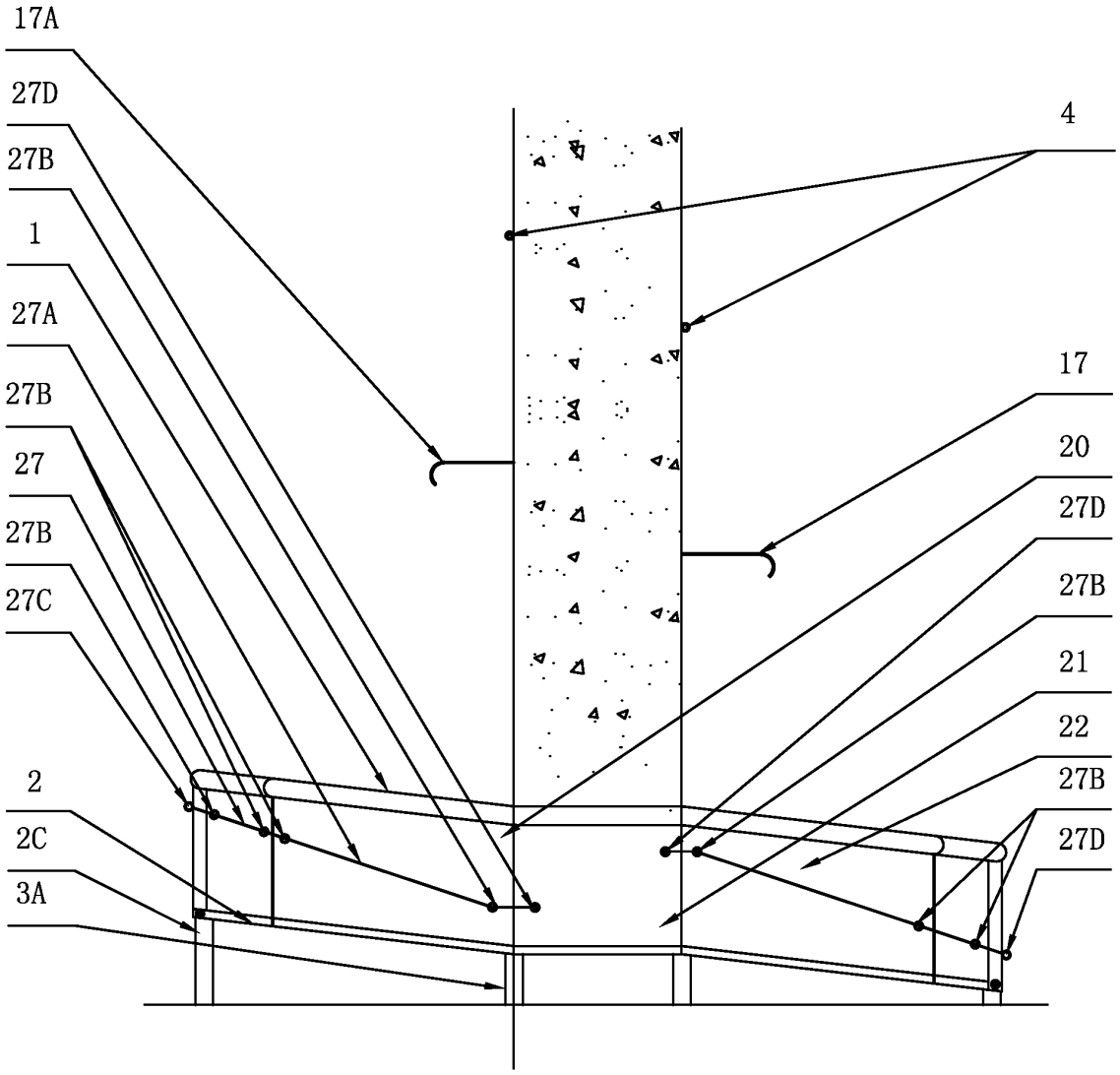
17A
27D
27B
1
27A
27B
27
27B
27C
2
2C
3A
4
17
20
27D
27B
21
22
27B
27D

FIG. 2

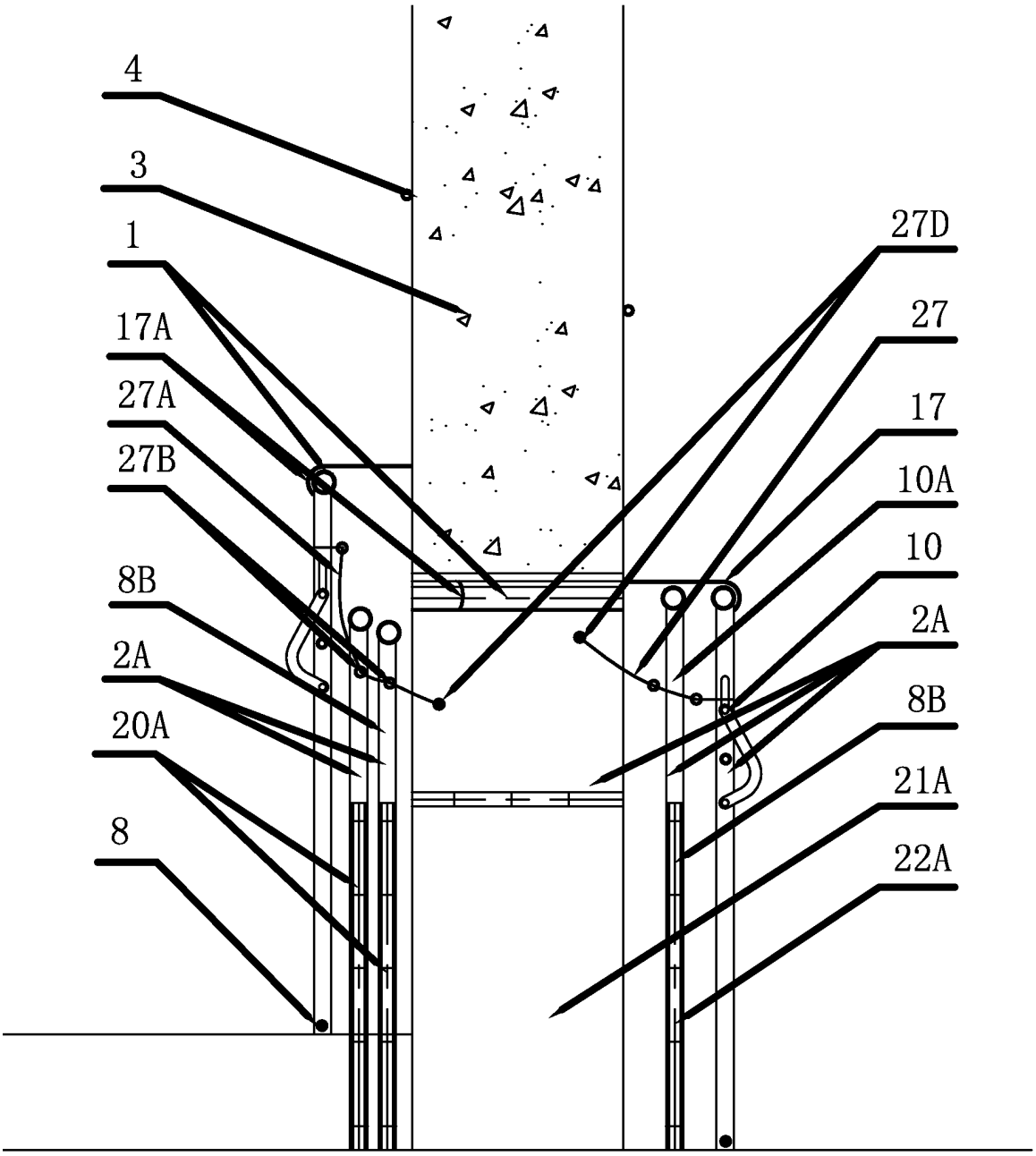

FIG. 3

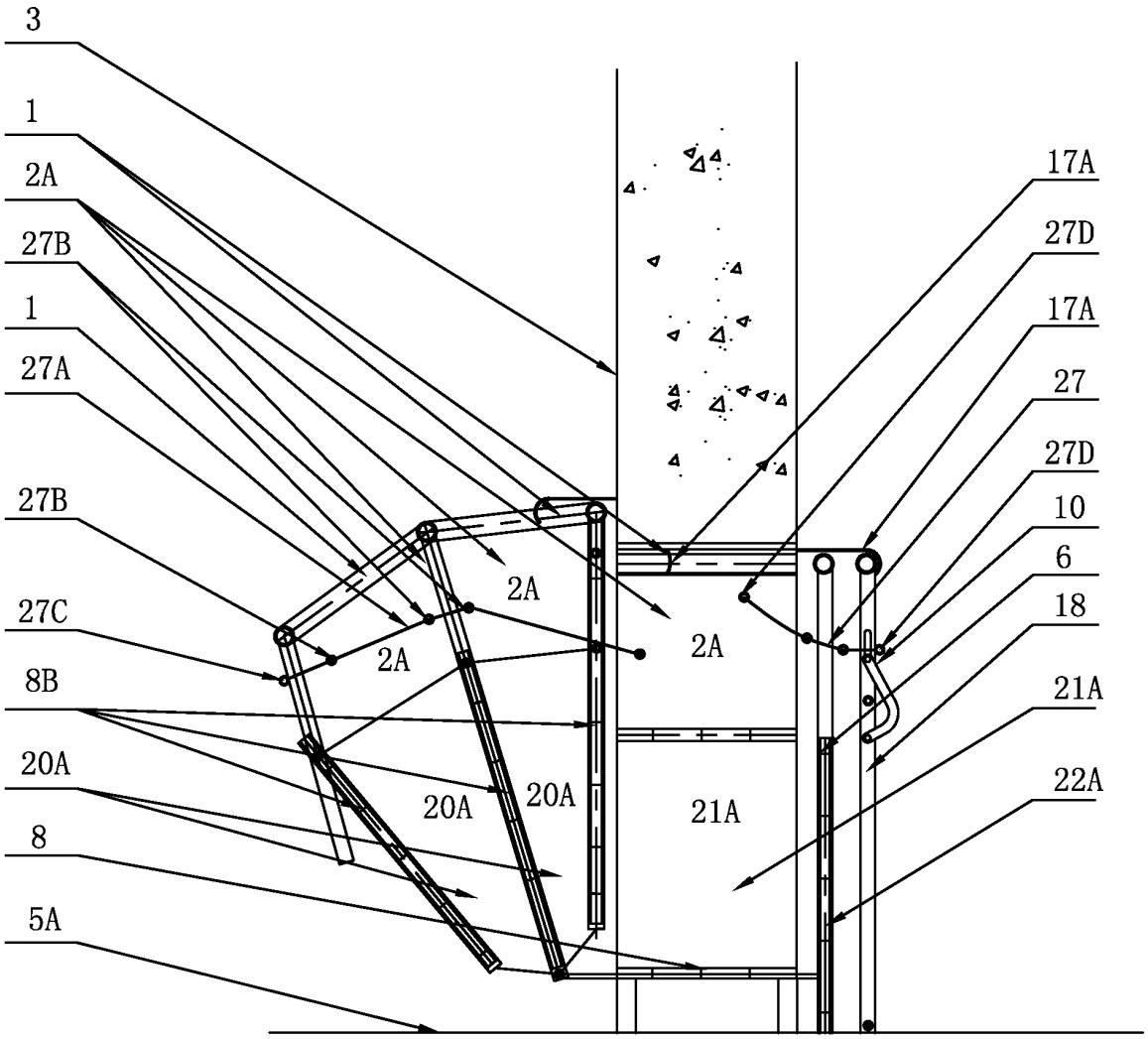
3
1
2A
27B
1
27A
27B
27C
8B
20A
8
5A
2A
2A
2A
20A
20A
21A
17A
27D
17A
27
27D
10
6
18
21A
22A

FIG. 4

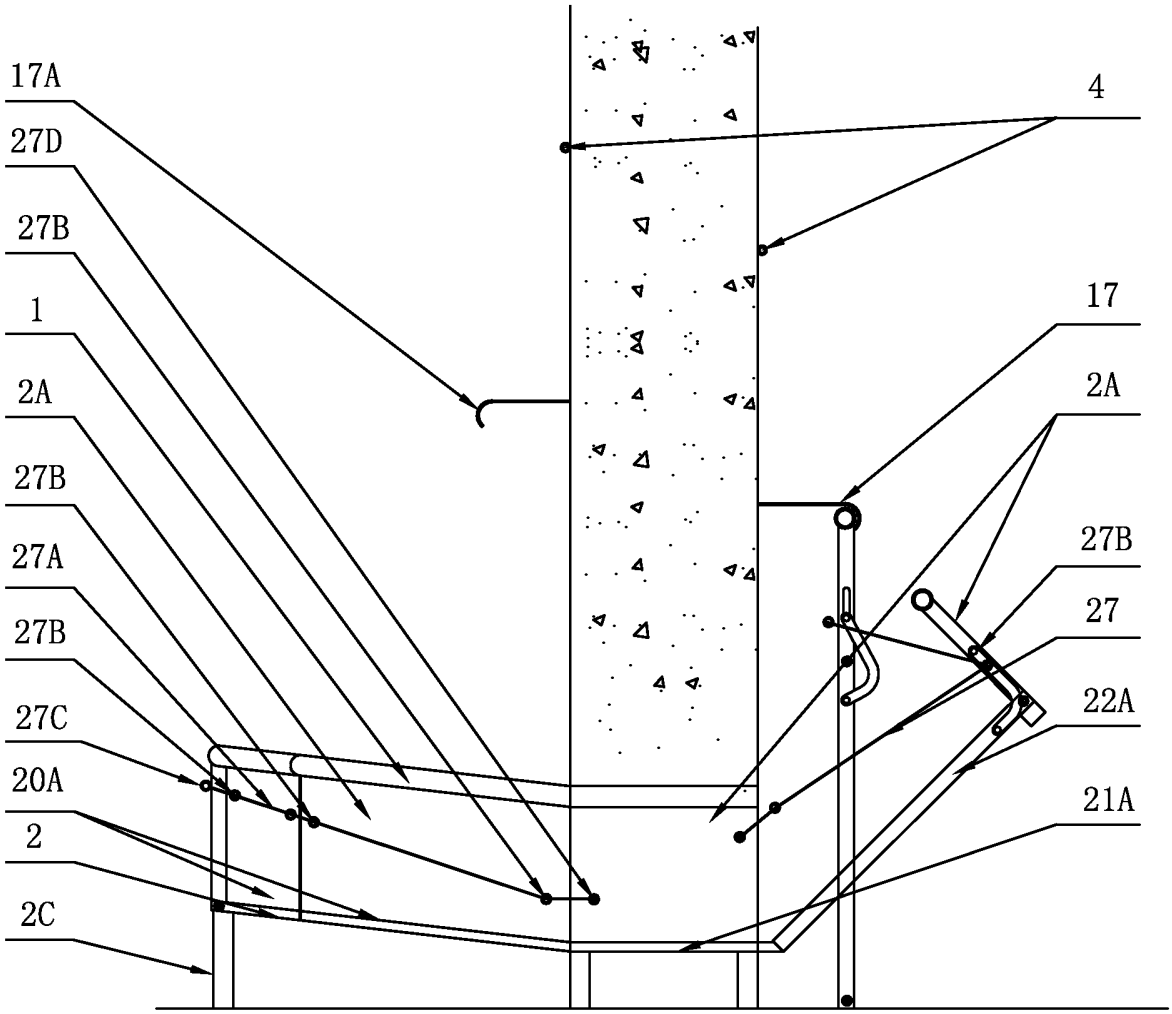

FIG. 5

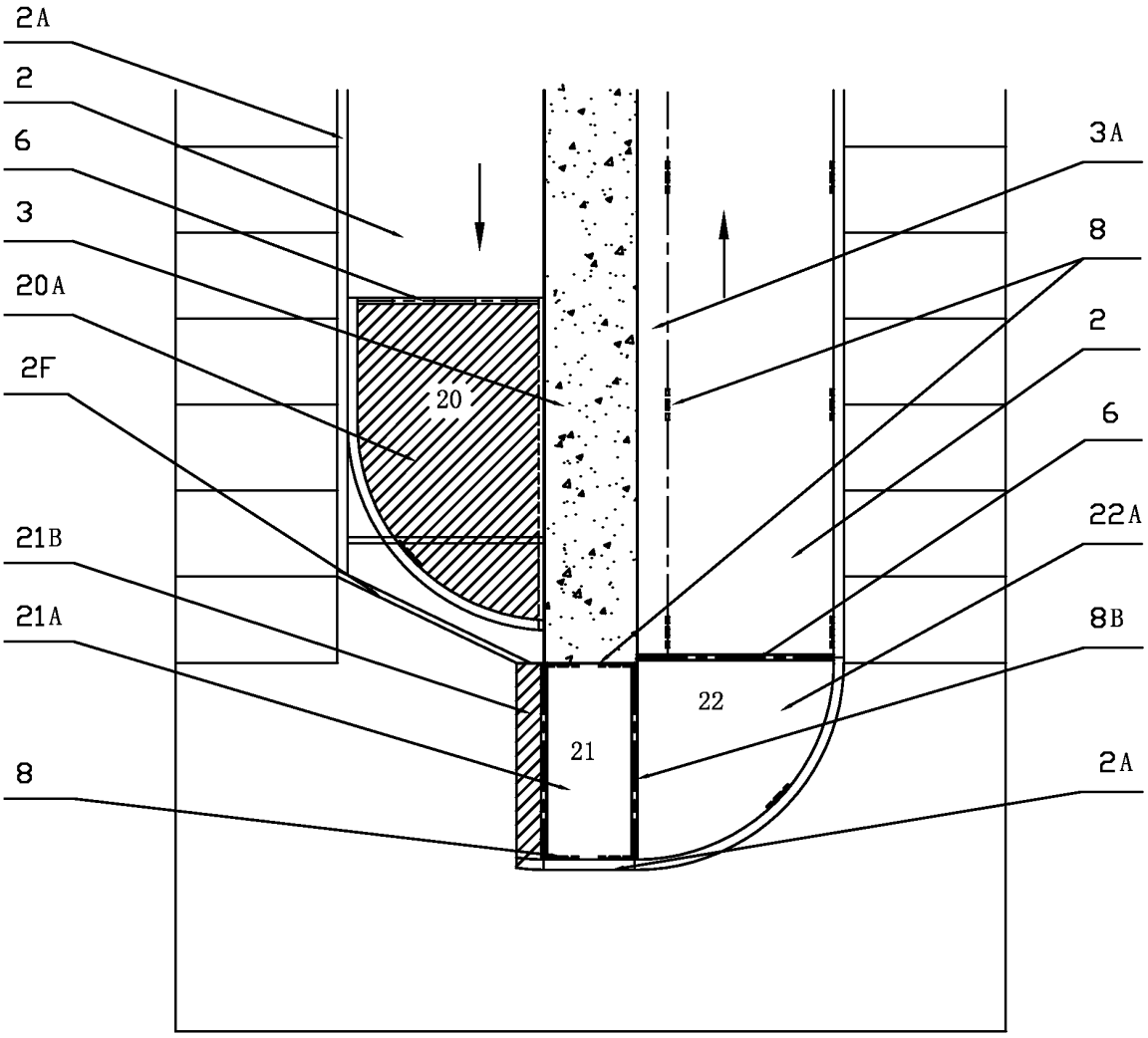

FIG. 6A

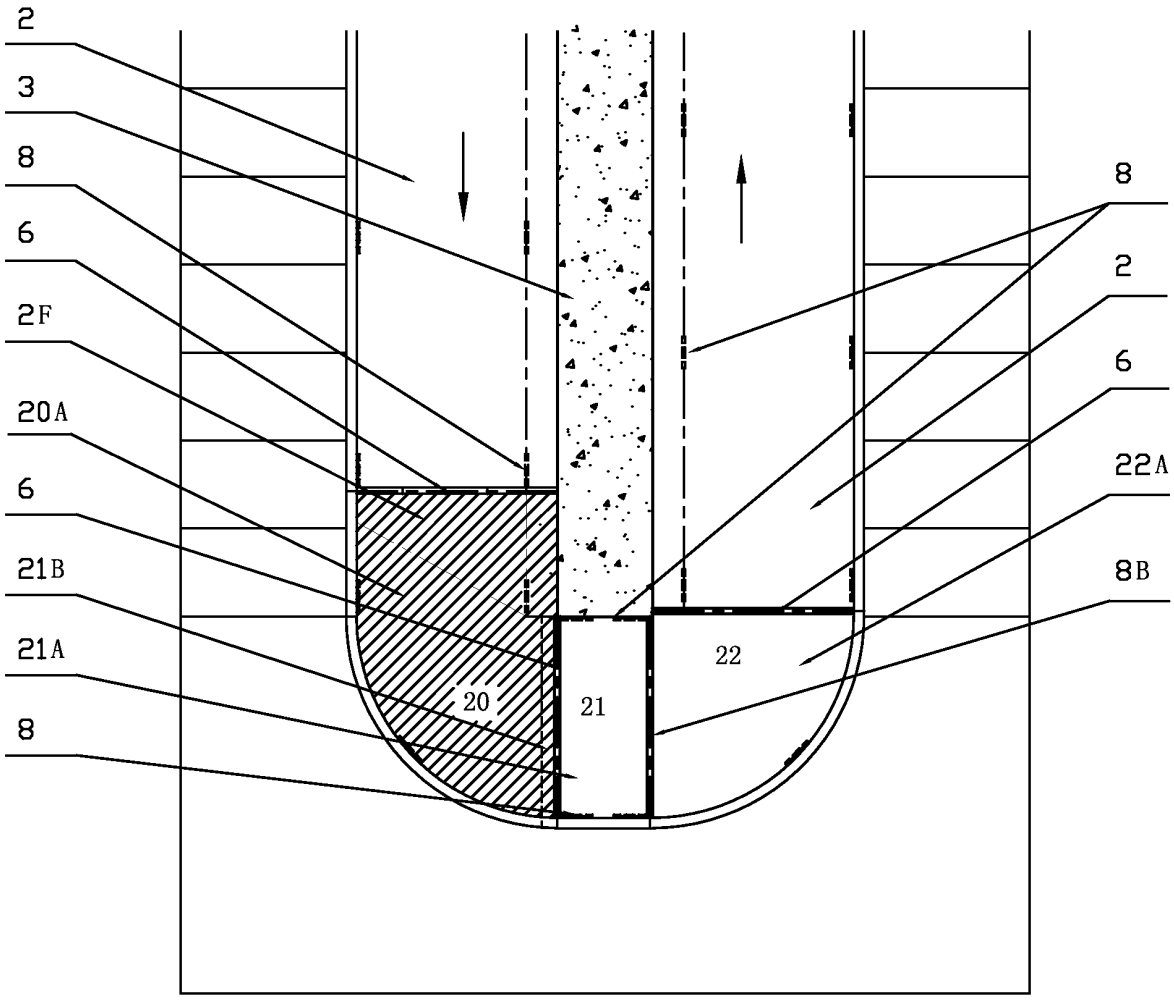

FIG. 6B

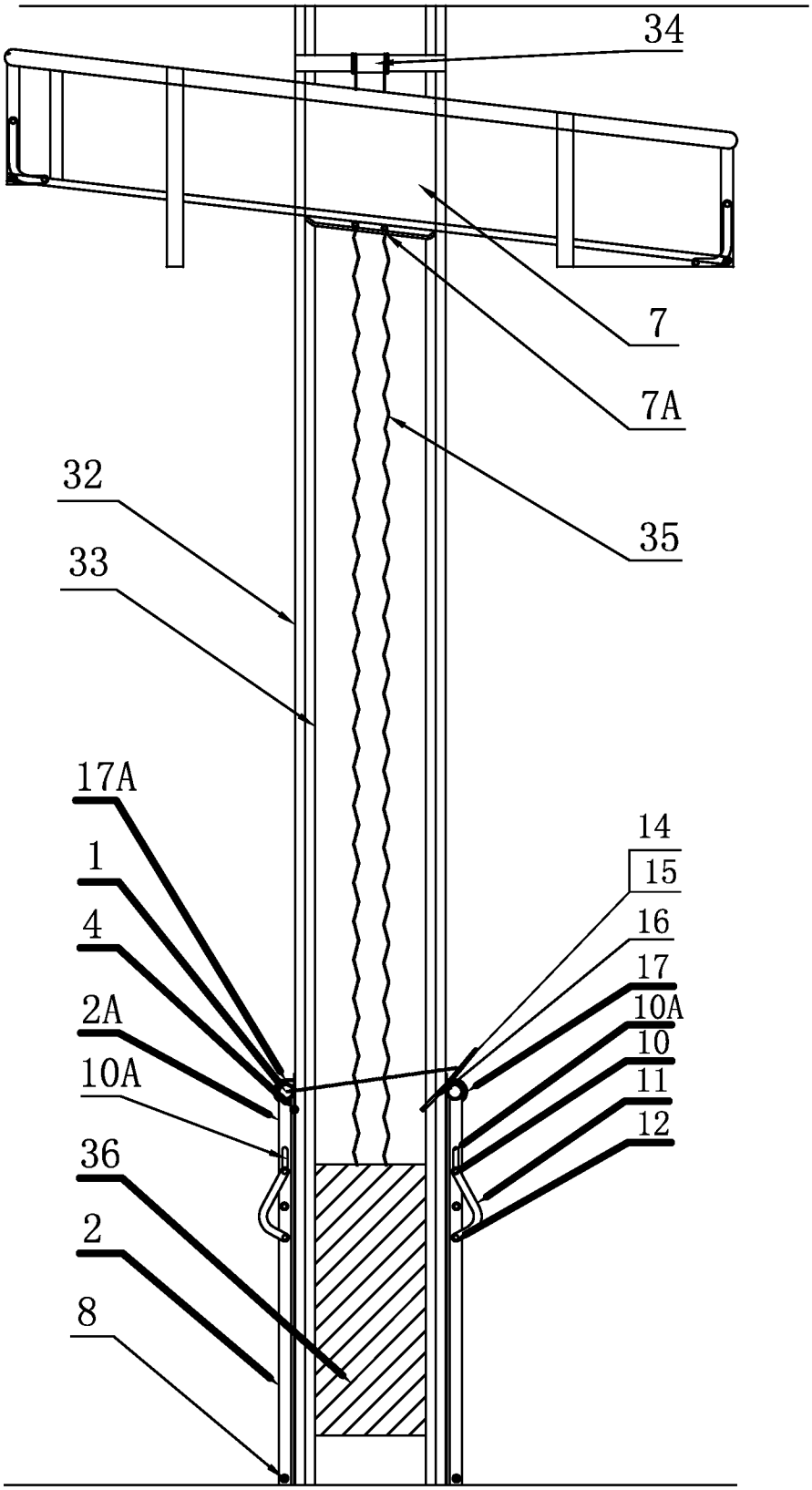

FIG. 7

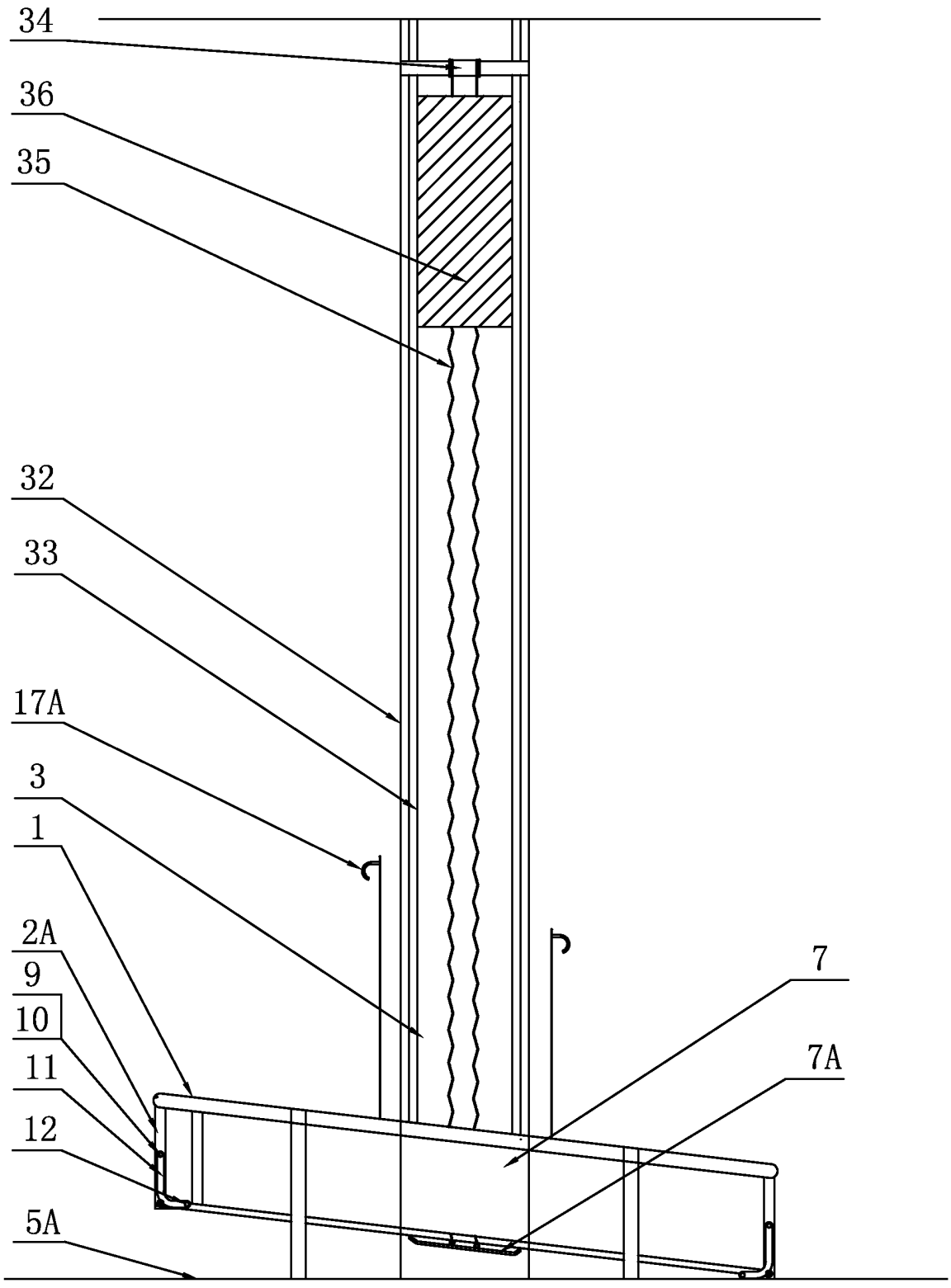

FIG. 8

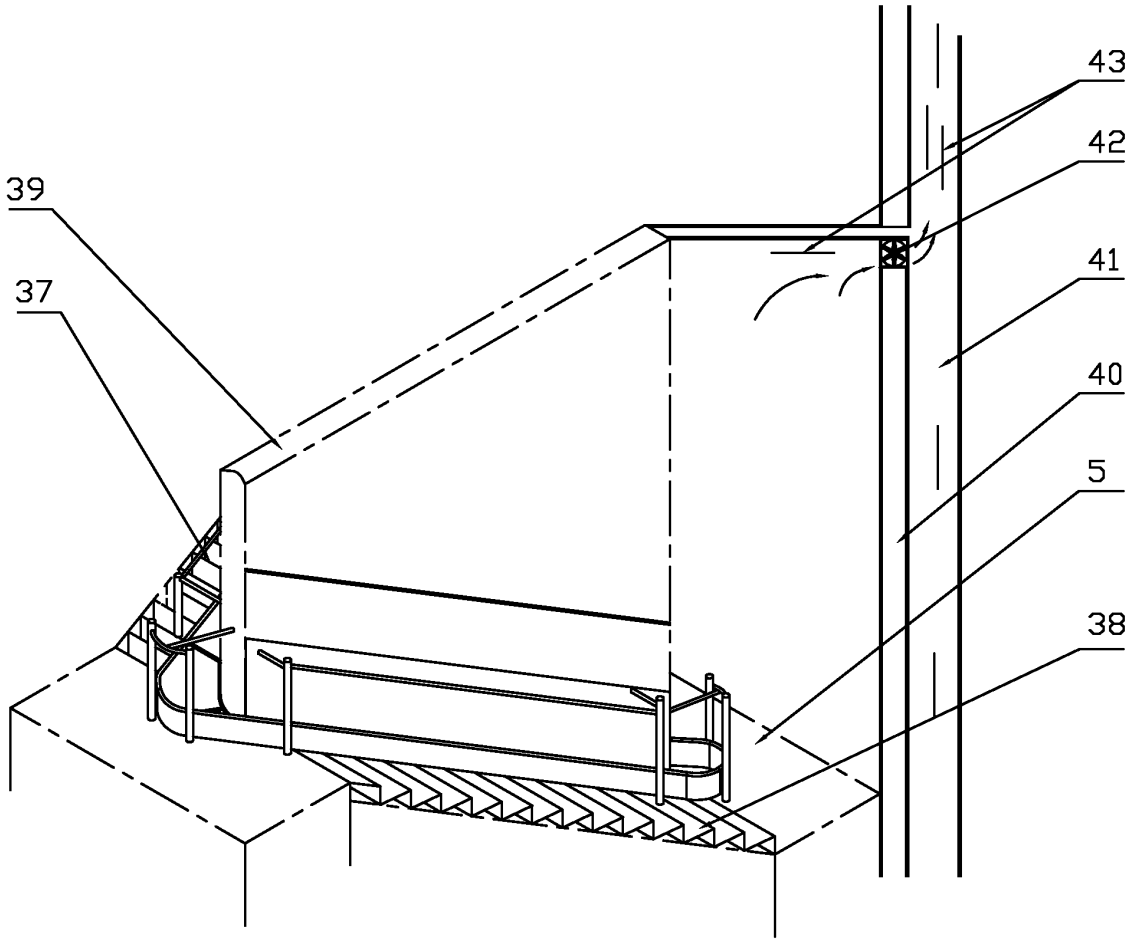

FIG. 9

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2012/079273

A. CLASSIFICATION OF SUBJECT MATTER

A62B 1/20 (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)

IPC: A62B 1/-

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)

CNPAT, EPODOC, WPI: fold+, unfold+, gemel, hinge, wall, corridor, building, floor, stair+, pivot+, corner, turning, spindle, slide, escape, lifesaving, fire fighting, bend

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 102526904 A (ZHOU, Miaorong), 04 July 2012 (04.07.2012), claims 1-9	1-9
A	CN 102114311 A (ZHOU, Miaorong), 06 July 2011 (06.07.2011), description, paragraphs [0004]-[0008], and figures 1-12	1-9
A	US 5535848 A (GIULIANO, P.S. et al.), 16 July 1996 (16.07.1996), description, column 2, lines 10-30	1-9
A	US 4498557 A (HORNE, J.B.), 12 February 1985 (12.02.1985), the whole document	1-9

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

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"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

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
17 October 2012 (17.10.2012)	**01 November 2012 (01.11.2012)**
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 **BAI, Ying** Telephone No.: (86-10) **62084625**

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2012/079273

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN 102526904 A	04.07.2012	None	
CN 102114311 A	06.07.2011	WO 2012126273 A1	27.09.2012
US 5535848 A	16.07.1996	None	
US 4498557 A	12.02.1985	None	

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

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- CN 201110065649 **[0001]**