

SELF-PROPELLED EMERGENCY ESCAPE LADDER

BACKGROUND OF THE INVENTION

1. Field of the Invention:

The present invention relates to emergency escape ladder
5 technology and more particularly, to a self-propelled emergency
escape ladder erected inside or outside a tall building.

2. Description of the Related Art:

Since the current cities where humans live are narrow and
densely populated, and land prices are becoming increasingly
10 expensive, high-rise buildings on urban areas are extremely
common. According to the current fire protection regulations,
high-rise buildings must also have safety-related escape equipment
as a benchmark! In Taiwan, there will always be building fire
accidents where people are not rushed to escape from the building
15 and cause heavy casualties, and the main cause of serious deaths
and injuries is mostly insufficient escape measures. In addition to
incomplete implementation of public safety inspections, the
building itself is to be blamed for inadequate escape measures. In
the recent fire accident in Carnival Building in Chiayi City, some
20 of the victims were killed in a hurry by jumping off the building
because they could not escape. Therefore, how to deal with various
unexpected disasters such as fires, earthquakes and other unwarned
disasters, the escape of the residents living on the high floors is

obviously the people in the building should face squarely. Among the current general high-rise building escape equipment, the most commonly used are rope-type vertical landing equipment and emergency escape ladders. The rope-type vertical landing
5 equipment is often difficult to operate and shakes when climbing, which makes people afraid to try, and not everyone can apply it. This equipment is especially difficult for the elderly, the sick, the disabled and the children to provide quick and safe escape protection. In fact, most people have no experience in using a
10 rope-type vertical landing equipment, and it is often impossible to activate it immediately in an emergency, and most people do not dare to directly descend to a high altitude in an unfamiliar situation, and improperly operated fall accidents may also occur.

Moreover, everyone knows that fire and water are ruthless,
15 especially incidents of building fires are not uncommon. When a fire occurs, in addition to fatal crises such as flames and thick smoke, the darkness created after the loss of power is a big killer that hinders escape, and when the power is lost, the elevator that can quickly take people out of the fire is useless. In view of this,
20 general fire escape equipment must comply with the principle of no power available. Therefore, there is the birth of non-powered escape equipment such as escape descending pipe (rescue bag) and slow descending machine. There is a deceleration regulator inside

the slow descending machine to achieve the effect of emergency escape. The principle is the same as the ancient pulley-type ancient well. It uses a pulley device and a centrifugal brake to control the descent speed. The equipment cost is low, but its operation is more complicated, and you must keep in mind the mantras such as “hang, drop, set, tie, push”. During operation and use, the user must hang and slow down outside the outer wall of the high-rise building. The user is directly exposed to extremely high environments and is easily affected by height fear. On the other hand, the operating procedures and mantras are too complicated. It is not easy to operate unless you are well trained (e.g. firefighters). Moreover, the personnel escape efficiency is low (only one person can use), so the use effect is not good.

From the above, the structure of the rescue bag for the escape equipment is the simplest. It is to install a funnel-shaped ring belt with elastic effect in a high-tensile cloth tube in an appropriate position. The ring belt has a slow descending effect. Personnel can quickly drill from the top of the high-tensile cloth tube to slide to the bottom of the high-tensile cloth tube to escape. Although the escape efficiency of the rescue bag is higher than that of the slow descending machine, the descent speed difference caused by the body size and motor nerves may cause collisions between the escape personnel. On the other hand, if the high-tensile

cloth tube installation position is too close to the wall, the escape personnel may hit the wall and be injured. For escape personnel with limited mobility, it is difficult to use a rescue bag to escape, so there are still shortcomings in the use of rescue bags.

5 SUMMARY OF THE INVENTION

Therefore, in view of the above-mentioned existing problems and deficiencies, the inventor of the present invention collected relevant information through multiple evaluations and considerations and used years of research and development
10 experience engaged in this industry to make continuous trials and modifications, and this self-propelled emergency escape ladder was born. In order to achieve the above purpose, the technical solution adopted by the present invention is described hereinafter.

The self-propelled emergency escape ladder comprises a
15 gravity deceleration device, a drive unit and a plurality of bearing seats. The gravity deceleration device comprises a body, a transmission shaft extended from the body, and a pair of gears mounted on two opposite ends of the transmission shaft. The drive unit comprises two roller chain loops respectively meshed with the
20 gears, and a pair of ring sleeves respectively surrounding the roller chain loops. Each ring sleeve defines therein an endless guide channel. Each roller chain loop is driven by the respective gear to make a cyclic rotation in the endless guide channel of the

respective ring sleeve. The bearing seats are connected to the roller chain loops of the drive unit. Each bearing seat comprises a pair of first axles and a pair of second axles connected to the roller chain loops, two short bars pivoted on two opposite lateral sides thereof
5 through pivots, and two long bars respectively coupled to the short bars. Each long bar has a guide slot. Each short bar has a gear shaft coupled to the guide slot of one respective long bar. When the gear shafts of the short bars slide in a straight line in the guide slots of the respective long bars, the short bars and the long bars are
10 respectively overlapped or stretched, and the short bars and the long bars are relatively rotatable through the respective gear shafts to make a horizontal and vertical flip between the bearing seats and the pair of roller chain loops.

Preferably, the first axles are installed on the two opposite
15 lateral sides of the bearing seats, and the second axles are installed on one end of the respective long bars.

Preferably, a part of each long bar at the guide slot is provided with a toothed edge, which is engaged with the respective gear shaft to reduce the turning speed of the bearing seats and the
20 roller chain loops.

Preferably, each ring sleeve is provided with a first corner and a second corner. The angle of the first corner is 90 degrees, and the angle of the second corner ranges from 90 degrees to 145

degrees.

Preferably, the ring sleeves are externally fixed with a plurality of reinforcement columns to reinforce the structure of the ring sleeves and provide lock points.

5 Preferably, the self-propelled emergency escape ladder further comprises a plurality of clamps provided at the bottom side of the reinforcement columns.

 Preferably, the self-propelled emergency escape ladder further comprises a cover mounted on the reinforcement columns at
10 the top side.

 Preferably, the self-propelled emergency escape ladder further comprises a plurality of spacer hoops arranged between the ring sleeves to keep the spacing between the ring sleeves in position.

15 Preferably, each bearing seat is provided with a counterweight at the bottom side thereof.

 Preferably, each bearing seat comprises a bearing surface adapted for carrying an escape person or objects only when the bearing surface and the roller chain loops are at a vertical angle.

20 When the escaped person or objects leave the respective bearing seat, the short bars and the long bars of the respective bearing seat are stretched and rotated by the roller chain loops to produce a 180-degree turn, and the bearing surface of the respective bearing

seat faces an outer side of the roller chain loops and then the respective bearing seat is continuously driven by the roller chain loops to rotate upward in a loop.

The main advantage of the present invention is to provide a self-propelled emergency escape ladder erected through the inside or outside of a tall building, which comprises a gravity deceleration device, a drive unit with two roller chain loops connected to the gravity deceleration device, and bearing seats mounted to the roller chain loops for carrying escape persons. The weight of the escaped persons is used to drive the roller chain loops and the bearing seats to move down. The gravity deceleration device is used to slow down the descending speed of the bearing seats with the escaped persons. The descending speed within the load-bearing range is constant and stable to achieve stable and reliable escape. It ensures the purpose of safe escape for the public and people with disabilities on the high floors.

Another advantage of the present invention is that the bearing seat can carry people or objects only when the bearing surface of the bearing seat and the roller chain loops are at a vertical angle. When the escaped person or objects leave the bearing seat, the short bars and the long bars are stretched and rotated by the roller chain loops to produce a 180-degree turn, and the bearing surface of the bearing seat faces the outer side of the

roller chain loops, and then the bearing seat is continuously driven by the roller chain loops to rotate upward in a loop.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an oblique top elevational view of a self-propelled
5 emergency escape ladder in accordance with the present invention.

FIG. 2 is an exploded view of the self-propelled emergency escape ladder in accordance with the present invention.

FIG. 3 is a detailed structural view of the bearing seat.

FIGS. 4-7 illustrate the action of the bearing seat turning
10 over 180 degrees.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIGS. 1-3, an oblique top elevational view of a self-propelled emergency escape ladder, an exploded view of the self-propelled emergency escape ladder and a detailed structural
15 view of the bearing seat of the self-propelled emergency escape ladder are shown. As illustrated, the self-propelled emergency escape ladder mainly comprises a gravity deceleration device **1**, a drive unit **2** and a plurality of bearing seats **3**.

The gravity deceleration device **1** comprises a body **11**, a
20 pair of gears **13**, and a transmission shaft **12** connected with the gears **13**. The function of the gravity deceleration device **1** is to slow down the descent speed of the escaped person, and the descent speed is fixed and stable within the weight range. When the body

11 is actually produced, it is composed of an alternating current (AC) motor, a driver (AC in/AC out and DC in/AC out), and a direct current (DC) battery pack or generator.

The drive unit **2** comprises a pair of roller chain loops **21**
5 meshed with the gears **13** respectively. The roller chain loops **21** are respectively accommodated in an endless guide channel **221** in a respective ring sleeve **22**. The roller chain loop **21** makes a cyclic rotation in the endless guide channel **221** of the respective ring sleeve **22**. The ring sleeve **22** is provided with a first corner **222**
10 and a second corner **223**. The angle of the first corner **222** is 90 degrees, and the angle of the second corner **223** ranges from 90 degrees to 145 degrees. With the settings of the first corner **222** and the second corner **223** and the connection structure of short bars **33** and long bars **34** of the bearing seats **3**, the bearing seats **3** can be
15 turned 180 degrees.

The pair of ring sleeves **22** are externally fixed with a plurality of reinforcement columns **41** to reinforce the structure of the ring sleeves **22** and provide lock points. The bottom side of the reinforcement columns **41** is provided with clasps **44**. The opposing
20 top side of the reinforcement columns **41** is provided with a cover **45**. A plurality of spacer hoops **42** are arranged between the pair of ring sleeves **22** to keep the spacing between the pair of ring sleeves **22** in position.

The plural bearing seats **3** are connected to the pair of roller chain loops **21** of the drive unit **2** through first axles **31** and second axles **32** on both sides thereof. Short bars **33** are pivoted on both sides of each bearing seat **3** through pivots **331**. Each short bar **33** has a gear shaft **332** coupled to a guide slot **341** of one respective long bar **34**. When the gear shaft **332** of the short bar **33** slides in a straight line in the guide slot **341** of the respective long bar **34**, the short bar **33** and the long bar **34** are overlapped or stretched. The short bars **33** and the long bars **34** can be relatively rotated through the respective gear shafts **332** to make a horizontal and vertical flip between the bearing seats **3** and the pair of roller chain loops **21**. Furthermore, the bottom side of each bearing seat **3** is provided with a counterweight **35**.

The first axles **31** are installed on the two sides of the bearing seats **3**, and the second axles **32** are installed on one end of the long bars **34**. A part of each long bar **34** at the guide slot **341** is provided with a toothed edge **342**, which is engaged with the respective gear shaft **332** to reduce the turning speed of the plurality of bearing seats **3** and the pair of roller chain loop **21**.

When you want to assemble the self-propelled emergency escape ladder, position the body **11** of the gravity deceleration device **1** first, then install the two gears **13** on the two ends of the transmission shaft **12**, and then connect one end of the transmission

shaft **12** to the body **11** of the gravity deceleration device **1**, and then affix the other end of the transmission shaft **12** to an axle hole **431** of a fixing plate **43**, and then mount the roller chain loops **21** on the gears **13** respectively, and then mount the gears **13** and the roller chain loops **21** in the endless guide channels **221** of the ring sleeves **22** respectively so that two roller chain loops **21** can be rotated in a circle in the respective endless guide channels **221**, and then mount the reinforcement columns **41** externally on the ring sleeves **22** to give support to the gravity deceleration device **1** and the drive unit **2**, and then fasten the spacer hoops **42**, the fixing plate **43**, the clasps **44** and the cover **45** to the lock points of the reinforcement columns **41**, and then affix the first axles **31** and second axles **32** of the bearing seats **3** to the roller chain loops **21**. The number of the bearing seats **3** is proportional to the height of the building and the number of floors. A ramp **5** is provided at the entrance of the self-propelled emergency escape ladder on each floor, so that an emergency personnel in a wheelchair can enter the bearing seat **3** smoothly.

FIGS. 4-7 illustrate the action of the bearing seat turning over 180 degrees. The bearing seat **3** can carry people or objects only when the bearing surface **36** of the bearing seat **3** and the roller chain loops **21** are at a vertical angle. When the escaped person or objects leave the bearing seat, the short bars **33** and the

long bars **34** are stretched and rotated by the roller chain loops **21** to produce a 180-degree turn, and the bearing surface **36** of the bearing seat **3** faces the outer side of the roller chain loops **21** and then the bearing seat **3** is continuously driven by the roller chain
5 loops **21** to rotate upward in a loop.

Please observe the detailed action from FIG. 4. When the escaped person leaves the bearing seat **3**, the bearing seat **3** is in a horizontal state and the bearing surface **36** is facing upwards, the first axles **31** are located at the first corner **222**, the short bars **33**
10 connected to the bearing seat **3** extend diagonally from the southeast to the northwest, and the long bars **34** are fully extended and connected along the extension direction of the short bars **33** by the gear shafts **332**, and the roller chain loops **21** continue to turn counterclockwise. As shown in FIG. 5, when the roller chain loops
15 **21** connected to the first axles **31** of the bearing seat **3** are rotated to the second corner **223**, the bearing seat **3** is turned counterclockwise so that the bearing surface **36** faces southwest, the long bars **34** and the bearing seat **3** are crossed in an X shape, and the short bars **33** are connected to the bearing seat **3** and the
20 long bars **34** in an oblique direction. As shown in FIG. 6, when the first axles **31** connected to the bearing seat **3** pass through the second corner **223**, the bearing surface **36** has been turned to the southeast, the long bars **34** and the bearing seat **3** are crossed in an

X shape, and the short bars **33** are connected to the bearing seat **3** and the long bars **34** in a nearly vertical direction. As shown in FIG. 7, when the first axles **31** connected to the bearing seat **3** continue to be pulled up by the roller chain loops **21** in the counterclockwise direction, the bearing surface **36** has been turned to the east, the long bars **34** and the bearing seat **3** are crossed in an X shape, and the short bars **33** are connected to the bearing seat **3** and the long bars **34** in a nearly horizontal direction. When the bearing seat **3** continues to be pulled up by the roller chain loops and overlaps with the roller chain loops **21**, the bearing surface **36** completely faces the east, and the long bars **34** and the short bars **33** overlap the two opposite lateral sides of the bearing seat **3** (as shown in FIG. 3), the bearing seat **3** will rotate in the counterclockwise direction with the roller chain loops **21** to complete the overall operation of personnel escape, thereby achieving the purpose of quick and safe escape for the public and people with limited mobility

For residents on high floors, most of the garbage collection sites in the building are located on the first floor or basement, which causes a lot of inconvenience. For those who are familiar with this technique, they can also place objects on the bearing seats during normal use. The bearing seats only need about 15 kilograms to produce operation (that can be activated by electronic control to produce operation), so as to facilitate the delivery of high-floor

objects to the first floor, which can save manpower and frequent use of building elevators, thereby achieving energy conservation and environmental protection.

With the disclosure of FIGS. 1 to 7, we can understand that
5 the present invention is a self-propelled emergency escape ladder erected through the inside or outside of a tall building, which comprises a gravity deceleration device, a drive unit with two roller chain loops connected to the gravity deceleration device, and bearing seats mounted to the roller chain loops for carrying escape
10 persons. The weight of the escaped persons is used to drive the roller chain loops and the bearing seats to move down. The gravity deceleration device is used to slow down the descending speed of the bearing seats with the escaped persons. The descending speed within the load-bearing range is constant and stable to achieve
15 stable and reliable escape.

Although a particular embodiment of the invention has been described in detail for purposes of illustration, various modifications and enhancements may be made without departing from the spirit and scope of the invention. Accordingly, the
20 invention is not to be limited except as by the appended claims.

Claims:

1. A self-propelled emergency escape ladder, comprising:

a gravity deceleration device comprising a body, a transmission shaft extended from said body and a pair of gears mounted on two opposite ends of said transmission shaft;

a drive unit comprising two roller chain loops respectively meshed with said gears and a pair of ring sleeves respectively surrounding said roller chain loops, each said ring sleeve defining therein an endless guide channel, each said roller chain loop being driven by the respective said gear to make a cyclic rotation in the said endless guide channel of the respective said ring sleeve; and

a plurality of bearing seats connected to said roller chain loops of said drive unit, each said bearing seat comprising a pair of first axles and a pair of second axles connected to said roller chain loops, two short bars pivoted on two opposite lateral sides thereof through pivots and two long bars respectively coupled to said short bars, each said long bar comprising a guide slot, each said short bar comprising a gear shaft coupled to the said guide slot of one respective said long bar;

wherein when said gear shafts of said short bars slide in a straight line in the said guide slots of the respective said long bars, said short bars and said long bars are respectively overlapped or stretched, and said short bars and said long bars are relatively

rotatable through the respective said gear shafts to make a horizontal and vertical flip between said bearing seats and said pair of roller chain loops, and

wherein said first axles are installed on the two opposite lateral sides of said bearing seats and said second axles are installed on one end of the respective said long bars.

2. The self-propelled emergency escape ladder as claimed in claim 1, wherein a part of each said long bar at said guide slot is provided with a toothed edge, which is engaged with the respective said gear shaft to reduce the turning speed of said bearing seats and said roller chain loops.

3. The self-propelled emergency escape ladder as claimed in claim 1, wherein each said ring sleeve is provided with a first corner and a second corner, the angle of said first corner being 90 degrees, and the angle of said second corner ranging from 90 degrees to 145 degrees.

4. The self-propelled emergency escape ladder as claimed in claim 1, wherein said ring sleeves are externally fixed with a plurality of reinforcement columns to reinforce the structure of said ring sleeves and provide lock points.

5. The self-propelled emergency escape ladder as claimed in claim 4, further comprising a plurality of clamps provided at a bottom side of said reinforcement columns.

6. The self-propelled emergency escape ladder as claimed in claim 4, further comprising a cover mounted on said reinforcement columns at a top side.

7. The self-propelled emergency escape ladder as claimed in claim 1, further comprising a plurality of spacer hoops arranged between said ring sleeves to keep the spacing between said ring sleeves in position.

8. The self-propelled emergency escape ladder as claimed in claim 1, wherein each said bearing seat is provided with a counterweight at a bottom side thereof.

9. The self-propelled emergency escape ladder as claimed in claim 1, wherein each said bearing seat comprises a bearing surface adapted for carrying an escape person or objects only when said bearing surface and said roller chain loops are at a vertical angle; when the escaped person or objects leave the respective said bearing seat, said short bars and said long bars of the respective said bearing seat are stretched and rotated by said roller chain loops to produce a 180-degree turn, and the said bearing surface of the respective said bearing seat faces an outer side of said roller chain loops and then the respective said bearing seat is continuously driven by said roller chain loops to rotate upward in a loop.