

LIGHTWEIGHT LADDER WITH ANTI-SLIPPAGE FUNCTION

BACKGROUND OF THE INVENTION

5 Field of the Invention

The present invention relates generally to ladders, and more particularly to a lightweight ladder with anti-slippage function, which is provided on its rungs with a plurality of perforations and projections, thereby reducing its weight and
10 preventing slippage of a user's foot from the rungs.

Description of the Prior Art

In general, ladders are widely used in afforestation, construction, civil engineering, landscape gardening and the
15 like. Such ladders are generally fabricated by positioning a plurality of rungs between two long side rails and fixedly attaching the rungs to the side rails. The ladders are used while being erected, and are freely movable. The materials used for the fabrication of the ladders include wood, rope,
20 light metal and the like.

A wood ladder is made by positioning a number of rungs between two long poles (square bars) at intervals and then securing rungs to the pillars using nails or grooves. A rope ladder is mainly used for military purposes or as ships'
25 fittings, and made by binding rungs to ropes instead of poles.

A metal ladder is usually made by a welding or riveting process using aluminum, stainless steel or other metals. Particularly, the metal ladders made of metals other than aluminum and stainless steel are widely utilized because they
5 are strong and can be easily mass-produced.

Such metal ladder 1 is described in detail with reference to the accompanying drawings. Fig. 1 is a perspective view of a conventional metal ladder, and Fig. 2 is a left side view of Fig. 1 with its rungs cut.

10 As shown in the drawings, the conventional metal ladder is comprised of two relatively long side rails 2, and a plurality of rungs 4 positioned between and connected to the side rails 2 by a welding or riveting process. The side rails 2 and the rungs 4 are generally composed of round metal pipes.
15 Further, the mechanical strength of the side rails 2 and the rungs 4 is properly set in consideration of the weight of the user who ascends and descends the metal ladder 1.

However, the above-described metal ladder 1 has the following problems. First, the side rails 2 and the rungs 4,
20 the principal elements of the convention metal ladder, are all made of metal, and, thus, are heavy in weight. Accordingly, excessive force is required to move the conventional metal ladder to a desired location.

Of course, ladders made of relatively lightweight
25 aluminum and stainless steel are known, but these ladder have

poor welding property that causes an increase in its manufacturing costs. Particularly, the ladder made of aluminum has lower mechanical strength than the metal ladder. Therefore, it is not preferred because breakage, such as
5 warping or bending, easily occurs.

Additionally, the outer surfaces of the rungs 4 are round and smooth, so there occurs a problem that a user's foot may easily slip from the outer surface of the rung 4. That is, there is a high danger of an accident in which the user falls
10 by slippage when ascending and descending the ladder.

Of course, there are disclosed schemes in which a plurality of protrusions are projected from the outer surface of each rung or separate anti-slippage members are attached to the outer surfaces of the rungs. However, those schemes are
15 not desirable because they cause the weights of the ladders to be weighty.

SUMMARY OF THE INVENTION

20 Accordingly, the present invention has been made keeping in mind the above problems occurring in the prior art, and an object of the present invention is to provide a lightweight ladder with anti-slippage function, which is made of metal having superior mechanical strength, thereby being capable of
25 reducing its weight and effectively preventing a user's

slippage.

In order to accomplish the above object, the present invention provides a lightweight ladder with anti-slippage function, including two long side rails, and a plurality of
5 rungs fixed between the side rails, characterized in that: each of the rungs is provided with a plurality of perforations and formed in the shape of an downwardly curved plate, and the perforations are provided on their peripheral edges with anti-slippage projections projected above the outer surface of the
10 rungs.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objects, features and other
15 advantages of the present invention will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawings, in which:

Fig. 1 is a perspective view of a conventional metal ladder;

20 Fig. 2 is a left side view of the conventional metal ladder of Fig. 1 with its rungs cross-sectioned;

Fig. 3 is a perspective view showing a metal ladder in accordance with the present invention;

Fig. 4 is a left side view of the metal ladder of Fig. 3
25 with the rung of a first embodiment cross-sectioned;

Fig. 5 is a left side view of the metal ladder of Fig. 3 with the rung of a second embodiment cross-sectioned;

Fig. 6 is a view showing a steel plate in which arcuate notches, perforations and anti-slippage projections are
5 formed;

Fig. 7 is a front view showing a rung of the metal ladder of the present invention, which is fabricated by curving the plate of Fig. 6 around its longitudinal axis;

Fig. 8 is a perspective view showing the metal ladder of
10 the present invention that is used while being secured to a ship; and

Fig. 9 is a perspective view showing the metal ladder of the present invention that is used to be movable.

15 DESCRIPTION OF THE PREFERRED EMBODIMENTS

Reference now should be made to the drawings, in which the same reference numerals are used throughout the different drawings to designate the same or similar components.

20 Fig. 3 is a perspective view showing a metal ladder in accordance with the present invention. As shown in the drawing, the general structure of the ladder, which is composed of two relatively long side rails 20 and a plurality of rungs 30 attached to the side rails 20 by a welding or
25 riveting process, is the same as that of the prior art.

The ladder 10 of the present invention is characterized in that its rungs 30 are formed in the shape of downwardly curved plates.

The preferred embodiments of the rungs 30 are shown in detail in Figs. 4 and 5. That is, if the rungs 30 are formed to have semicircular cross-sections each of which can be formed by cutting a circle into two, their bending strength is deteriorated in comparison with that of rungs having round cross-sections as in the prior art. It is preferable to solve this problem as follows.

The rung 310 of one embodiment is shown in Fig. 4, and has an approximately "U" shaped cross-section wherein both lower ends of a semicircular section are downwardly extended to a certain length in parallel with the lengths of the side rails 20.

The rung 320 of another embodiment is shown in Fig. 5, and has a shape wherein both ends of an arcuate cross-section having a curvature of θ are extended downwardly to a certain length in parallel with the lengths of the side rails 20.

A plurality of perforations 312 and 322 are regularly formed on the rungs 310 and 320, and, thereby, can reduce the weight of the ladder.

Additionally, the perforations 312 and 322 may be formed in the shape of a circle, oval, or slit of a certain length. In consideration of ease of manufacture and an aesthetic

aspect, the perforations 312 and 322 are preferably circularly shaped.

Further, a plurality of anti-slippage projections 314 and 324 are formed by projecting a plurality of circular portions
5 of the rungs 310 and 320, surrounding the perforations 312 and 322, above the outer surface of the rungs 310 and 320.

The size, number and positions of the perforations 312 and 322, the size, number and positions of the rungs 310 and 320 and the projected amount of the anti-slippage projections
10 314 and 324 need to be properly determined. The matters to be considered in this regard are as follows.

First, as the area and number of the perforations 312 and 322 are increased, the weight of the ladder is desirably reduced, but the mechanical strength of the rungs 310 and 320
15 is undesirably decreased. On the other hand, as the size and number of the perforations 312 and 320 are decreased, the mechanical strength of the rungs 312 and 322 desirably increased, but the entire weight of the ladder is undesirably increased.

20 The perforations 312 and 322 and the anti-slippage projections 314 and 324 need to be regularly formed in the longitudinal direction of the rungs 310 and 320. At the same time, the perforations 312 and 322 and the anti-slippage projections 314 and 324 need to be regularly formed in the
25 circumferential direction of the rungs 310 and 320. That is,

in consideration of the foot of the user, more strictly, the width of the shoe, the intervals of the anti-slippage projections 314 and 324 in the longitudinal direction of the rungs 310 and 320 are preferably established so that at least
5 one of the anti-slippage projections 314 and 324 can be positioned under the bottom of the user's shoe. Additionally, the positions of the anti-slippage projections 314 and 324 in the circumference direction of the rungs 310 and 320 are preferably situated at the uppermost edge when the ladder is
10 erected, at the uppermost and lowermost edges when the ladder is laid down horizontally, and at the intermediate portion therebetween. Additionally, first anti-slippage projections 314 and 324 formed at the uppermost edge when the ladder is erected and second anti-slippage projections 314 and 324
15 formed at the uppermost and lowermost edges when the ladder is laid down horizontally are formed with the corresponding pair of anti-slippage projections 314 and 424 positioned at the same position with respect to the longitudinal direction of the rungs 310 and 320. Third anti-slippage projections 314
20 and 324 are preferably formed to be positioned between the first and second anti-slippage projections 314 and 324 with respect to the longitudinal direction of the rungs 310 and 320.

Additionally, if the anti-slippage projections 314 and
25 324 are protruded excessively, these projections 314 and 324

are difficult to form and likely to cause injury to the user. On the other hand, if the anti-slippage projections 314 and 324 are insufficiently protruded, these projections 314 and 324 are likely to lower the anti-slippage function.

5 One method of manufacturing the rungs 310 and 320 in accordance with the present invention is described in detail with reference to Figs. 6 and 7. The rungs may be manufactured by another method, not the method disclosed herein. It is natural that ladders manufactured by various
10 methods to have the technical concept of the present invention fall under the scope of the present invention.

First, a steel plate having the same thickness as that of each of the rungs 310 and 320 is provided.

Thereafter, the steel plate 40 is cut so as to have
15 appropriate width and length. Of course, the width and length of such steel plate are determined depending upon the shape and length of the above rungs 310 and 320.

Thereafter, the cut steel plate 40 is provided on the centers of its both side portions with two arcuate notches 42
20 so as to allow both side ends of each of the rungs 310 and 320 to be brought into close contact with the outer surfaces of the side rails 20. Accordingly, the rungs 310 and 320 can be desirably welded to the outer surfaces of the side rails 20, so welding failure can be prevented.

25 Thereafter, unfinished perforations are formed on the

steel plate 40 at regular intervals. The size of the unfinished perforations is smaller than the size of the perforations 312 and 322 of the finished rungs 310 and 320.

Thereafter, a pin having a diameter larger than that of
5 the unfinished perforations is forcibly inserted into the unfinished perforations formed in the steel plate 40, so the size of the unfinished perforations is increased and the finished perforations 312 and 322 and the anti-slippage projections 314 and 324 are formed. The steel plate 40,
10 manufactured in the above-described manner, is shown in Fig. 6.

Then, the rungs 310 and 320 are finished by bending the steel plate 40 using a suitable jig. The finished rungs 310 and 320 are shown in Fig. 7. Of course, the rungs 310 and 320
15 finished as described above are attached to side rails 20 by a welding process, etc, thus finishing the ladder of the present invention. If necessary, the rungs 310 and 320 and/or the side rails 20 may be coated with paint. Additionally, caps made of rubber or plastic (not shown) can be put on ends of
20 the side rails 20.

The ladder 10 manufactured as described above may be utilized while being secured to a construction, such as a ship
50 as shown in Fig. 8. On the other hand, as shown in Fig. 9, the ladder 10 may be used while leaning against a building or
25 construction 60 after being moved to a desirable location.

As described above, the ladder of the present invention is provided on its rungs with a plurality of perforations, so the entire weight of the ladder is lightened. When the ladder is used while being secured to a ship or cargo truck, the entire weight of the ship or cargo truck is lightened, thereby saving fuel used in the ship or cargo truck. When the ladder is used while leaning against a building or construction after being moved to a desirable location, a large amount of force is not required to move the ladder, thereby allowing the ladder to be conveniently utilized.

Additionally, in the ladder of the present invention, its rungs are provided with a plurality of anti-slippage projections, so falling accidents can be prevented by preventing a slippage when the user ascends and descends the ladder. Furthermore, such anti-slippage projections will enable the user to ascend and descend the ladder rapidly.

Additionally, even when a certain work is carried out in a state in which the ladder is laid down horizontally or slightly inclined, the effect of preventing the slippage of a user can be achieved by anti-slippage projections formed on several portions of the rungs.

Although the preferred embodiments of the present invention have been disclosed for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing

from the scope and spirit of the invention as disclosed in the accompanying claims.

WHAT IS CLAIMED IS:



1. A lightweight ladder with anti-slippage function,
including two long side rails, and a plurality of rungs fixed
5 between the side rails, characterized in that:

each of said rungs is provided with a plurality of
perforations and formed in the shape of an downwardly curved
plate, and said perforations are provided on their peripheral
edges with anti-slippage projections projected above an outer
10 surface of the rungs.

2. The lightweight ladder with anti-slippage function
according to claim 1, wherein said rungs are each comprised of
an arcuate portion and two extended portions, said extended
15 portions being each extended in the same direction as a
direction of lengths of said side rails to enhance bending
strength of the rungs.

3. The lightweight ladder with anti-slippage function
20 according to claim 1, wherein said rungs are each provided on
center portions of their both sides with two arcuate notches
so as to allow the rungs to be brought into close contact with
outer surfaces of said side rails.

25 4. The lightweight ladder with anti-slippage function



according to claim 1, wherein said perforations and said anti-slippage projections are spaced and arranged at intervals with respect to the longitudinal direction of the rungs so that at least one perforation and one anti-slippage projection are
5 positioned under a user's foot.

5. The lightweight ladder with anti-slippage function according to claim 4, wherein said perforations and said anti-slippage projections are arranged on a center portion, both
10 edge portions and portions among them with respect to a width direction of said rungs, respectively.

6. The lightweight ladder with anti-slippage function according to claim 5, wherein first and second perforations
15 and anti-slippage projections, which are positioned at a center portion and both edge portions with regard to a widthwise direction of said rungs, are arranged in the same positions with respect to a longitudinal direction of said rungs, while third perforations and anti-slippage projections
20 are arranged among said first and second perforations and anti-slippage projections with respect to a longitudinal direction of said rungs.