In the connection structure of tent poles, both ends of a connecting rod are inserted into opposing ends of a pair of tent poles to connect the tent poles and the connecting rod has an outer diameter corresponding to inner diameters of the tent poles. A widened tubular part is formed on at least one of ends of the tent poles and has a diameter larger than that of the end on which the widened tubular part is formed. An end of the connecting rod has an outer diameter corresponding to an inner diameter of the widened tubular part and is inserted and fixed into the widened tubular part. A magnitude of the moment of inertia of the connecting rod is 60% or more of the moment of inertia of the widened tubular part of the tent pole.
FIG. 1
(Prior Art)
FIG. 3
(Prior Art)
FIG. 4
(Prior Art)
CONNECTION STRUCTURE OF TENT POLES

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates to a connection structure of tent poles, and more particularly to a connection structure of tent poles capable of overcoming weakness of a connected part of the tent poles without increasing an overall weight of the tent poles when connecting the tent poles.

[0003] 2. Description of the Related Art

[0004] In general, a tent consists of waterproof cloth and a plurality of poles so that a user can temporarily reside at a camping place or outdoors. The user assembles the poles to form various shapes of the tent. In this case, the tent poles are a frame for forming a space in the tent by unfolding the waterproof cloth, and mostly constructed with a circular pipe.

[0005] FIG. 1 shows a connection structure of general tent poles having a same diameter. Referring to FIG. 1, only a part of a connecting rod 4 having a predetermined length is inserted into an end of a tent pole 2. At this time, the rod 4 is close to an inner surface of the tent pole 2 by a separate adhesive or press, and a part of the connecting rod 4 is protruded. The protruded end of the connecting rod 4 is inserted into an end of another tent pole 6 along an arrow direction, so that the tent poles 2, 6 are connected to each other. The connected tent poles 2, 6 are bended to an arch shape, so that they form a frame of a tent. Meanwhile, the connecting rod 4 is designed to have 60-80% of the moment of inertia, compared to those of the tent poles 2, 6.

[0006] FIG. 2 shows the tent poles 2, 6 applied with a bending stress. As shown in FIG. 2, when a bending stress acts on a connected part of the tent poles 2, 6, the tent poles 2, 6 are applied with tensile and contractile forces in a direction of an arrow B. In addition, both ends of the connecting rod 4 in the tent poles 2, 6 applies an additional force to parts abutting on inner surfaces of the tent poles 2, 6 in a direction of an arrow A.

[0007] In the above connection structure of the tent poles, if the connecting rod 4 is made to have the moment of inertia greater than 60-80% of the moments of inertia of the tent poles 2, 6 in order to prevent the connecting rod 4 from being damaged, the load acting on the direction of the arrow A becomes higher, so that the tent poles 2, 6 contacting with the both ends of the connecting rod 4 is broken. On the contrary, if the connecting rod 4 is made to have the moment of inertia much smaller than 60-80% of the moment of inertia of the tent poles 2, 6, a central part of the connecting rod 4 is broken.

[0008] To solve the above problems, a connection structure of tent poles as shown in FIG. 3 was suggested. Referring to FIG. 3, a thickness of the connecting rod 12 is thinned toward the both ends thereof so that the load acting on the inside of the tent poles 11, 13 is reduced. However, since there is a limitation of thinning the connecting rod 12 to a certain extent and it is impossible to prevent the central part of the connecting rod 12 from being damaged even though the connecting rod 12 is thinned toward the both ends, the above problems could not be completely overcome.

[0009] In the mean time, FIG. 4 shows a general connection structure of tent poles 14, 17 having different diameters. As shown in FIG. 4, when the diameters of the tent poles 14, 17 are different from each other, a reduced tubular part 15, which has a diameter equal to an inner diameter of an end of the tent pole 17 having a smaller diameter, is formed on an end of the tent pole 14 having a larger diameter, and both ends of the connecting rod 16 are inserted into ends of the tent poles 14, 17 so that the tent poles 14, 17 are connected to each other. In this case, if the moment of inertia of the connecting rod 16 is set on the basis of the tent pole 17 having the smaller diameter, since the moment of inertia of the tent pole 14 having the larger diameter is much greater than that of the connecting rod 16, the central part of the connecting rod 16 is damaged when the bending stress is applied. On the contrary, if the moment of inertia of the connecting rod 16 is set on the basis of the tent pole 14 having the larger diameter, the connecting rod 16 applies a load to the inside of the tent pole 17 in the direction of an arrow C when the bending stress acts. Accordingly, the tent pole 17 having the smaller diameter is damaged.

SUMMARY OF THE INVENTION

[0010] Accordingly, the present invention has been made to solve the above-mentioned problems occurring in the prior art. The object of the present invention is to provide a connection structure of tent poles capable of preventing a connected part of the tent poles from being damaged and overcoming weakness of the connected part without increasing an overall weight of the tent pole by forming a widened tubular part on at least one of ends of the tent poles abutting on each other and connecting the tent poles with a connecting rod having the moment of inertia corresponding to 60% or more of the moment of inertia of the widened tubular part.

[0011] In order to accomplish this object of the present invention, there is provided a connection structure for connecting a pair of tent poles, the connection structure comprising:

[0012] a connecting rod having an outer diameter corresponding to inner diameter of the tent poles, both ends of the connecting rod being inserted into opposing ends of the tent poles to connect the tent poles; and

[0013] a widened tubular part formed on at least one end of the tent poles and having a diameter larger than that of the end on which the widened tubular part is formed,

[0014] wherein one end of the connecting rod has an outer diameter corresponding to an inner diameter of the widened tubular part and is inserted and fixed into the widened tubular part, and a magnitude of the moment of inertia of the connecting rod is 60% or more of the moment of inertia of the widened tubular part of the tent pole.

[0015] Preferably, the magnitude of the moment of inertia of the connecting rod is 60-80% of the moment of inertia of the widened tubular part of the tent pole.

[0016] Meanwhile, a diameter increment of the widened tubular part is 10% or less for the diameter of the tent pole to which the widened tubular part is formed.

[0017] Also, the tent poles have same diameters and the widened tubular part is respectively formed on opposing ends of the tent poles.
Preferably, the tent poles have different diameters and the widened tubular part has a diameter equal to that of the tent pole having a larger diameter and is formed on an end of the tent pole having a smaller diameter.

Also, the tent poles have different diameters an end of the tent pole having a larger diameter is formed with a reduced tubular part having a diameter smaller than that of the tent pole having the larger diameter, and the widened tubular part having a diameter equal to the reduced tubular part is formed on an end of the tent pole having a smaller diameter.

BRIEF DESCRIPTION OF THE DRAWINGS

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

FIG. 1 is a sectional view showing a connection structure of general tent poles;

FIG. 2 is a sectional view illustrating tent poles, which are shown in FIG. 1, applied with a bending stress;

FIG. 3 is a sectional view of a connection structure of tent poles according to the prior art for solving the problems of the connection structure of the tent poles shown in FIG. 1;

FIG. 4 is a sectional view showing a connection structure of tent poles having different diameters according to the prior art;

FIG. 5 is a perspective view illustrating a connection structure of tent poles according to a preferred embodiment of the invention;

FIG. 6 is a view sectioned along a line VI-VI' in FIG. 5 (a connecting rod and another tent pole are not connected in FIG. 5, but FIG. 6 shows a connected state for ease of explanations);

FIG. 7 is a sectional view showing a connection structure of tent poles according to another preferred embodiment of the invention; and

FIG. 8 is a sectional view illustrating a connection structure of tent poles according to another preferred embodiment of the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Hereinafter, preferred embodiments of the present invention will be described with reference to the accompanying drawings. In the following description of the present invention, a detailed description of known functions and configurations incorporated herein will be omitted when it may make the subject matter of the present invention rather unclear.

FIG. 5 is a perspective view illustrating a connection structure of tent poles according to a preferred embodiment of the invention and FIG. 6 is a view sectioned along a line VI-VI' in FIG. 5. It is shown in FIG. 5 that an extruded end of a connecting rod 40 and a widened tubular part 26 of a tent pole 22 are not connected to each other. However, FIG. 6 shows a connected state for ease of explanations.

Referring to FIGS. 5 and 6, according to the invention, widened tubular parts 26, 36 are respectively formed on abutting ends of a pair of tent poles 22, 32 which will be connected. The widened tubular parts 26, 36 are connected to the tent poles 22, 32 with inclined parts 24, 34. An end of a connecting rod 40, which has an outer diameter corresponding to inner diameters of the widened tubular parts 26, 36, is inserted into the widened tubular part 36 of the other tent pole 32 by a predetermined length and then fixed. The other end of the connecting rod 40 is inserted into the widened tubular part 26 of the other tent pole 22, so that the tent poles 22, 32 are connected to each other.

As shown in Figs., when the tent poles 22, 32 having a same diameter are assembled each other, the widened tubular parts 26, 36 are formed on both ends of the tent poles 22, 32 abutting on each other, and the inner diameters of the widened tubular parts 26, 36 of the tent poles 22, 32 are made to be equal. The one end of the connecting rod 40 is inserted into the widened tubular part 36 of the one tent pole 32 and then fixed. The connecting rod 40 has an outer diameter equal to the inner diameter of the widened tubular part 36. Preferably, the connecting rod 40 has an outer diameter smaller than the inner diameter of the widened tubular part 36 by about 0.1 mm in order to be inserted into the widened tubular part 36 of the one tent pole 32 smoothly. The connecting rod 40 is inserted into the widened tubular part 36 of the tent pole 32 by a predetermined length and can be fixed to an inner surface of the widened tubular part 36 by a separate adhesive, although it is not shown. The extruded end of the connecting rod 40 is inserted into the widened tubular part 22 of the other tent pole 22, thereby connecting the tent poles 22, 32 each other.

In the mean time, the moment of inertia of a tube such as the tent poles 22, 32 is expressed by a following equation 1.

\[ I = MR^2 \]  

[Equation 1]

In the equation 1, I is the moment of inertia, M is mass, and R is a radius of the inside of the tube. The moment of inertia of a tube such as the tent poles 22, 32 increases as the radius increases.

Accordingly, when the widened tubular parts 26, 36 are formed on the ends of the tent poles 22, 32, the moments of inertia of the widened tubular parts 26, 36 are increased as a diameter is increased, compared to a tent pole which is not widened. In this case, the connecting rod 40 has preferably 60% or more, and more preferably 60-80% of the moment of inertia on the basis of the moment of inertia of the widened tubular parts 26, 36 rather than the tent pole 22, 32 which are not widened. When the moment of inertia of the connecting rod 40 is set on the basis of the tent poles 22, 32 which are not widened, the connecting rod 40 is deficient in the moment of inertia and can be thus damaged when a bending stress is applied. Meanwhile, when the moments of inertia of the widened tubular parts 26, 36 and the connecting rod 40 are increased as the diameter increases, a bending rigidity is also increased. Accordingly, when the widened tubular parts 26, 36 are formed on the ends of the tent poles
22, 32 and the connecting rod 40 is provided in the widened tubular parts 26, 36 to connect the tent poles 22, 32 each other, it is possible to prevent the connecting rod 40 or the tent poles 22, 32 from being damaged due to the increased bending rigidity.

Table 1 shows a combination of outer diameters, inner diameters and thicknesses of the tent pole, the widened tubular part and the connecting rod according to the abovementioned conditions, and the moments of inertia of the tent pole, the widened tubular part and the connecting rod.

<table>
<thead>
<tr>
<th>Outer diameter (mm)</th>
<th>Inner diameter (mm)</th>
<th>Thickness (mm)</th>
<th>Moments of Inertia</th>
<th>Ratio 1 of the moments of inertia (%)</th>
<th>Ratio 2 of the moments of inertia (%)</th>
<th>Weight per length (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tent pole</td>
<td>9.00</td>
<td>7.80</td>
<td>0.60</td>
<td>140.3</td>
<td>74.5</td>
<td>44.0</td>
</tr>
<tr>
<td>Widened tubular part</td>
<td>9.00</td>
<td>7.80</td>
<td>0.60</td>
<td>140.3</td>
<td>74.5</td>
<td>44.0</td>
</tr>
<tr>
<td>Connecting rod</td>
<td>7.70</td>
<td>6.10</td>
<td>0.80</td>
<td>104.5</td>
<td>29.4</td>
<td>3.6</td>
</tr>
<tr>
<td>Tent pole</td>
<td>9.00</td>
<td>7.80</td>
<td>0.60</td>
<td>140.3</td>
<td>79.9</td>
<td>44.0</td>
</tr>
<tr>
<td>Widened tubular part</td>
<td>9.20</td>
<td>8.00</td>
<td>0.60</td>
<td>150.5</td>
<td>45.0</td>
<td>4.0</td>
</tr>
<tr>
<td>Connecting rod</td>
<td>7.90</td>
<td>6.33</td>
<td>0.783</td>
<td>112.1</td>
<td>2.9</td>
<td>3.1</td>
</tr>
<tr>
<td>Tent pole</td>
<td>9.00</td>
<td>7.80</td>
<td>0.60</td>
<td>140.3</td>
<td>85.6</td>
<td>44.0</td>
</tr>
<tr>
<td>Widened tubular part</td>
<td>9.40</td>
<td>8.20</td>
<td>0.60</td>
<td>161.2</td>
<td>46.1</td>
<td>2.6</td>
</tr>
<tr>
<td>Connecting rod</td>
<td>8.10</td>
<td>6.56</td>
<td>0.768</td>
<td>120.1</td>
<td>2.9</td>
<td>2.2</td>
</tr>
<tr>
<td>Tent pole</td>
<td>9.00</td>
<td>7.80</td>
<td>0.60</td>
<td>140.3</td>
<td>91.5</td>
<td>44.0</td>
</tr>
<tr>
<td>Widened tubular part</td>
<td>9.60</td>
<td>8.40</td>
<td>0.60</td>
<td>172.4</td>
<td>47.1</td>
<td>5.0</td>
</tr>
<tr>
<td>Connecting rod</td>
<td>8.30</td>
<td>6.79</td>
<td>0.754</td>
<td>128.4</td>
<td>3.0</td>
<td>2.5</td>
</tr>
<tr>
<td>Tent pole</td>
<td>9.00</td>
<td>7.80</td>
<td>0.60</td>
<td>140.3</td>
<td>97.8</td>
<td>44.0</td>
</tr>
<tr>
<td>Widened tubular part</td>
<td>9.80</td>
<td>8.60</td>
<td>0.60</td>
<td>184.2</td>
<td>48.2</td>
<td>4.0</td>
</tr>
<tr>
<td>Connecting rod</td>
<td>8.50</td>
<td>7.02</td>
<td>0.742</td>
<td>137.2</td>
<td>3.0</td>
<td>1.6</td>
</tr>
<tr>
<td>Tent pole</td>
<td>9.00</td>
<td>7.80</td>
<td>0.60</td>
<td>140.3</td>
<td>101.0</td>
<td>44.0</td>
</tr>
<tr>
<td>Widened tubular part</td>
<td>9.90</td>
<td>8.70</td>
<td>0.60</td>
<td>190.2</td>
<td>48.7</td>
<td>3.0</td>
</tr>
<tr>
<td>Connecting rod</td>
<td>8.60</td>
<td>7.13</td>
<td>0.736</td>
<td>141.7</td>
<td>3.0</td>
<td>1.6</td>
</tr>
</tbody>
</table>

In the embodiments of the invention, in order to check increments of the moments of inertia of the widened tubular parts and the connecting rod provided in the widened tubular parts when the widened tubular parts are formed on the tent poles, it was observed changes of the moments of inertia while increasing the outer diameters of the widened tubular parts and the connecting rod by a predetermined amount.

A basic tent pole has 9 mm outer diameter and 0.6 mm thickness, and a connecting rod has 7.7 mm outer diameter, 0.8 mm thickness and 80 mm length. The outer diameters of the basic tent pole and the connecting rod were increased by 0.2 mm, and the moments of inertia were measured until an outer diameter of a widened tubular became 9.90 mm. At this time, when the outer diameter of the widened tubular part becomes overly larger, an external appearance of the assembled tent is poor and it is also difficult to assemble the tent poles to the waterproof cloth. Accordingly, it is preferred that the outer diameter of the widened tubular part is not larger over 10% for the outer diameter of the tent pole having the widened tubular part.

Meanwhile, according to the embodiment, it was maintained a ratio of the moments of inertia of the connecting rod and the widened tubular parts to be 74.5%. When the moment of inertia of the connecting rod exceeds the ratio, the load applied to the inner surface of the tent pole at the both ends of the connecting rod is increased as described above, so that the tent pole may be damaged. When the moment of inertia of the connecting rod is smaller than the ratio, a central part of the connecting rod may be damaged when the bending stress is applied.

Referring to Table 1, it can be seen that the moments of inertia of the widened tubular part and the connecting rod increase as the outer diameters of the widened tubular part and the connecting rod becomes larger. When the outer diameter of the widened tubular part becomes 9.90 mm and thus is increased by 10% compared to the tent pole, it can be seen that the ratio of the moments of inertia of the connecting rod and the tent pole is 101%, i.e., exceeds 100%. In other words, this means that the moment of inertia of the connecting rod is larger than that of the tent pole. Accordingly, the connecting rod is not damaged until the tent pole is damaged even though the bending stress acts on the connected part of the tent poles. The ratio of the moments of inertia of the connecting rod and the widened tubular part was constant to be 74.5%, thereby preventing the damage of the tent pole due to the load concentrated on the both ends of the connecting rod.

In the mean time, it is possible to reduce the thickness of the connecting rod so that the ratio of the moments of inertia of the connecting rod and the widened tubular part is maintained to be 74.5% as the outer diameter of the connecting rod increases. Accordingly, the overall weight is little changed even when the moment of inertia of the connecting rod is increased.

FIG. 7 is a sectional view showing a connection structure of tent poles according to another preferred embodiment of the invention.
As shown in FIG. 7, when the tent poles 52, 54 having different diameters are connected, a widened tubular part 56 is formed on an end of the tent pole 54 having a smaller diameter, and inner diameters of the tent pole 52 having a larger diameter and the widened tubular part 56 are made to be same. An end of a connecting rod 58 is inserted into the widened tubular part 56 to a predetermined length extent and fixed, and the other end of the connecting rod 58 is inserted into an end of the other tent pole 52, so that the tent poles 52, 54 are connected. In this case, the moment of inertia of the connecting rod 58 is preferably 60% or more, and more preferably 60%-80% of the moment of inertia of the widened tubular parts 56 formed on the end of the tent pole 54 having the smaller diameter. When the widened tubular part 56 is formed on the tent pole 54 having the smaller diameter and an outer diameter thereof is properly increased, the diameter of the connecting rod 58 is also increased as described above, so that the moment of inertia of the connecting rod 58 becomes larger than that of the tent pole 54 having the smaller diameter and thus the connection structure of the tent poles can bear the load applied up to a limit of the tent pole 54 having the smaller diameter. In other words, when the moment of inertia of the connecting rod 58 is set on the basis of the widened tubular part 56 formed on the end of the tent pole 54 having the smaller diameter, the central part of the connecting rod or the tent pole is not damaged contrary to the prior art, and the connecting rod 58 can bear the load up to the limit of the tent pole 54 having the smaller diameter.

FIG. 8 is a sectional view illustrating a connection structure of tent poles according to another preferred embodiment of the invention.

As shown in FIG. 8, when the tent poles 62, 64 having much different diameters are connected, the widened tubular part 66 is formed on the end of the tent pole 64 having a smaller diameter and a reduced tubular part 63 is formed on the end of the tent pole 62 having a larger diameter, so that the inner diameters of the widened tubular part 66 and the reduced tubular part 63 are equal to each other and they are connected by the connecting rod 68. In this case, as described above, the moment of inertia of the connecting rod 68 is preferably 60% or more, and more preferably 60%-80% of the moment of inertia of the widened tubular parts 66 formed on the end of the tent pole 64 having the smaller diameter. Since the widened tubular part 66 is formed on the tent pole 64 having the smaller diameter and the moment of inertia of the connecting rod 68 is set on the basis of the widened tubular part 66 of the tent pole 64 having the smaller diameter, the connection structure of the tent poles can bear the applied load up to the limit increased bending rigidity of the connected part is increased, and it is possible to easily transport and assemble a tent.

Further, according to the invention, when the tent poles to be connected have different diameters, the widened tubular part is formed on the end of the tent pole having the smaller diameter and the moment of inertia of the connecting rod is set to be 60% or more of the moment of inertia of the widened tubular part formed on the tent pole having the smaller diameter so that the connected part of the tent poles can bear the applied load up to the limit of the tent pole having the smaller diameter.

While the invention has been shown and described with reference to certain preferred embodiments thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the invention as defined by the appended claims.

What is claimed is:

1. A connection structure for connecting a pair of tent poles comprising:
   a connecting rod having an outer diameter corresponding to inner diameter of the tent poles, both ends of the connecting rod being inserted into opposing ends of the tent poles to connect the tent poles; and
   a widened tubular part formed on at least one end of the tent poles and having a diameter larger than that of the end on which the widened tubular part is formed,

   wherein one end of the connecting rod has an outer diameter corresponding to an inner diameter of the widened tubular part and is inserted and fixed into the widened tubular part, and a magnitude of the moment of inertia of the connecting rod is 60% or more of the moment of inertia of the widened tubular part of the tent pole.

2. The connection structure as claimed in claim 1, wherein the magnitude of the moment of inertia of the connecting rod is 60%-80% of the moment of inertia of the widened tubular part of the tent pole.

3. The connection structure as claimed in claim 1, wherein a diameter increment of the widened tubular part is 10% or less for the diameter of the tent pole to which the widened tubular part is formed.

4. The connection structure as claimed in claim 1, wherein a diameter increment of the widened tubular part is 10% or less for the diameter of the tent pole to which the widened tubular part is formed.

5. The connection structure as claimed in claim 1, wherein the tent poles have same diameters, and the widened tubular part is respectively formed on opposing ends of the tent poles.

6. The connection structure as claimed in claim 1, wherein the tent poles have different diameters, and the widened tubular part has a diameter equal to that of the tent pole having a larger diameter and is formed on an end of the tent pole having a smaller diameter.

   * * * * *