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Rebar cage module for beam reinforcement system and manufacturing method of beam reinforcement system

Abstract

The present invention provides a rebar cage module comprising a first opening rebar net and a second opening rebar net. The first opening rebar net extends from a central direction, and partially forms an elongated groove shape enclosing a first accommodating portion, and has a first opening. The second opening rebar net extends from the central direction, and partially surrounds the central direction to form an elongated groove shape, and has a second opening oriented to the opposite direction with the first opening. Wherein, the first opening rebar net at least partially covers the second opening rebar net, the first opening rebar net is at least partially distributed in the second opening, and the first opening rebar net extends at least partially through the second opening into the second accommodating portion, and making the first accommodating portion and the second accommodating portion at least partially overlap.

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Background/Summary

BACKGROUND OF THE INVENTION

1. Field of the Invention

(1) The present invention relates to a rebar cage module; specifically relates to a rebar cage module for beam reinforcement system and a manufacturing method of the beam reinforcement system.

2. Description of the Prior Art

(2) The current domestic stirrups are configured to be bonded on the main bars so as to form reinforcement structure in the structure of the reinforced concrete. Stirrups play a plurality of roles in the reinforced concrete such as resisting shear force, preventing main bars being buckled, and confining concretes in the core regions and the like. The stirrup structures in current technology can be disposed on the surface across the main bars, so that hooping force can be distributed evenly

across the cross-section of the beam. However, it is not convenient to add more main bars after the stirrups have been disposed and it takes longer time to do so. Therefore, it is essential to solve problems in the current arts so as to enhance convenience of construction and shortening its manufacturing time.

SUMMARY OF THE INVENTION

(3) The present invention mainly intends to provide a rebar cage module for beam reinforcement system to shorten the construction time of the beam reinforcement system. The rebar cage module of the present invention includes a first opening rebar net and a second opening rebar net. The first opening rebar net has a first opening, and the first opening rebar net extends along a central direction and partially surrounds the central direction to form an elongated groove shape enclosing a first accommodating portion. The second opening rebar net has a second opening, and the second opening rebar net extends along the central direction and partially surrounds the central direction to form an elongated groove shape enclosing a first accommodating portion. And the second opening and the opening are oriented in opposite directions. Wherein the first opening rebar net at least partially covers the second opening rebar net, the first opening rebar net is at least partially distributed on the second opening and extends into the second accommodating portion passing through the second opening, so that the first accommodating portion and the second accommodating portion are overlapped with each other.

(4) Another embodiment of the rebar cage module includes an upper-opening rebar net having an upper opening and a lower-opening rebar net having a lower opening. Wherein the upper opening and the lower opening are oriented in opposite directions. The upper-opening rebar net includes a plurality of upper-opening rebars arranged in parallel, a first traverse rib, and a second traverse rib. The first traverse rib is configured to connect one side of the plurality of upper-opening rebars. The second traverse rib is configured to connect to the other side of the plurality of upper-opening rebars opposite to the first traverse rib. A third traverse rib is configured to connect the plurality of upper-opening rebars and arranged in parallel with the first traverse rib.

(5) The lower-opening rebar net includes a plurality of lower-opening rebars arranged in parallel, a fourth traverse rib, and a fifth traverse rib. The fourth traverse rib is configured to connected to one side of the plurality of lower-opening rebars. The fifth traverse rib is configured to be connected to the other side of the plurality of lower-opening rebars opposite to the fourth rib, and arranged in parallel with the fourth traverse rib. Wherein the upper-opening rebars at least partially covers the lower-opening rebars, and the upper-opening rebars are at least partially distributed on the lower opening. The second traverse rib is arranged in parallel.

(6) In order to achieve the aforementioned purposes, the manufacturing method of the beam reinforcement system of the present invention includes following steps: providing two first main bars in parallel; hanging a plurality of stirrups on the two first main bars, wherein the stirrups include two erect bar portions in parallel, and a bottom rib connecting bottom ends of two erect bar portions; providing the first opening rebar net of the rebar cage module on the plurality of bottom ribs; providing a plurality of second main bars on the plurality of bottom ribs and the first bottom ribs of the first opening rebar net via the first opening, and housing it in the plurality of second main bars via the accommodating portion of first opening rebar net; wherein the plurality of second main bars and the plurality of third traverse ribs are arranged in parallel; providing a plurality of third main bars on a top portion of the second opening rebar net; wherein the two first main bars and the plurality of third main bars are arranged in parallel, and the two first main bars are hooked on the plurality of third main bars transversely via a hanging portion the second opening rebar net; providing the second opening rebar net covered with the first opening rebar net each other; and providing a plurality of stirrup caps on the first opening rebar net; wherein the stirrup caps are disposed corresponding to the plurality of openings.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

(1) FIG. **1** is a perspective view of the first embodiment of the rebar cage module of the present invention.

(2) FIG. **2** is a side view of the first embodiment of the rebar cage module of the present invention.

(3) FIG. **3** is a side view of the second embodiment of the rebar cage module of the present invention.

(4) FIG. **4** is a side view of the third embodiment of the rebar cage module of the present invention.

(5) FIG. **5** is a diagram of main steps of an exemplary manufacturing method of the beam reinforcement system.

(6) FIG. **6** shows the state in the main step 1 of the exemplary manufacturing method of the present invention.

(7) FIG. **7** shows the state in the main step 2 of the exemplary manufacturing method of the present invention.

(8) FIG. **8** is a flowchart of the detailed steps of the exemplary manufacturing method of the beam reinforcement system of the present invention.

(9) FIG. **9** shows the state in the detailed step of the exemplary manufacturing method of the present invention.

(10) FIG. **10** shows the state in the main step 3 of the exemplary manufacturing method of the present invention.

(11) FIG. **11** shows the state in the main step 4 of the exemplary manufacturing method of the present invention.

(12) FIG. **12** shows the state in the main step 5 of the exemplary manufacturing method of the present invention.

(13) FIG. **13** shows the state in the main step 6 of the exemplary manufacturing method of the present invention.

(14) FIG. **14** shows the state in the main step 7 of the exemplary manufacturing method of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

(15) In order to make people skilled in the art further understand the purposes, the structures, and the effects of the present invention, the present invention will be described in detail using preferred embodiments with reference to drawings.

(16) The present invention provides rebar cage module for beam reinforcement system and the manufacturing method thereof. Firstly, FIG. **1** and FIG. **2** illustrates a first embodiment of the structure of the rebar cage module of the present invention.

First Embodiment

(17) As illustrated in FIG. **1** and FIG. **2**, a rebar cage module **100** of the present invention includes a first opening rebar net **10** and a second opening rebar net **20**. The first opening rebar net **10** includes a first body **101**, a first traverse rib **12**, a second traverse rib **13**, and a third traverse rib **14**. The first body **101** extends along a central direction X and partially surrounds the central direction X to form an elongated groove shape to enclose a first accommodating portion **102**, and has a first opening **11**. Specifically, the first opening **11** is located on a surface of the first opening rebar net **10** facing the second opening rebar net **20**, and located on a plane where the central direction X and a radial direction Y illustrated in FIG. **1** exist. It can immediately extend into the first accommodating portion **102** after passing through the first opening **11**. The first traverse rib **12** is configured connect one side of the first opening rebar net **10**, for example as illustrated in FIG. **1**, extends along the central direction X to be provided on the first accommodating portion **102** of the first body **101**; specifically provided on the bottom portion of the first accommodating portion **102**

opposite to the first opening **11**; the second traverse rib **13** is configured to connect the other side of the first opening rebar net **10**, for example, as illustrated in FIG. **1**, extends along the central direction X to be provided on a side portion of the first accommodating portion **102** of the first body **101**; and the third traverse rib **14** is configured to connect the one side of the first opening rebar net **10** and is arranged in parallel with the first traverse rib **12**; that is, the third traverse rib **14** and the first traverse rib **12** are arranged in parallel on the same side of the first opening rebar net **10**. In addition, the third traverse rib **14** and the first traverse rib **12** are arranged in parallel on the plane where the central direction X and the radial direction Y exist.

(18) the second opening rebar net **20** includes a second body **201**, a fourth traverse rib **22**, and a fifth traverse rib **23**. The second body **201** extends along the central direction X and partially surrounds the central direction X to form an elongated groove shape to enclosing a second accommodating portion **202**. Specifically, the second opening **21** is located on a surface of the second opening rebar net **20** facing the first opening rebar net **10**, and is located on a plane where the central direction X and the radial direction Y illustrated in FIG. **1** exist. It can immediately extend into the second accommodating portion **202** after passing through the second opening **21**. In addition, the second opening **21** and the first opening **11** are oriented in opposite directions each other.

(19) As illustrated in FIG. **1** and FIG. **2**, the fourth traverse rib **22** is configured to connect one side of the second opening rebar net **20**, for example, as illustrated in FIG. **1**, extends along the central direction X to be provides on a side portion of the second body **201**; the fifth traverse rib **23** is provided on the other side opposite to the fourth traverse rib **22**, for example, as illustrated in FIG. **1**, extends along the central direction X to be provided on a side of the second body **201** opposite to the fourth traverse rib **22**, so that the fifth traverse rib **23** and the fourth traverse rib **22** are respectively provided on side portions of the second body **201**. In addition, the fifth traverse rib **23** and the fourth traverse rib **22** are arranged in parallel on the same plane along the radial direction Y. A hanging portion **24** is located on a bottom portion of the second body **201** and is configured to be hooked on at least one main bar. Preferably, each of the traverse ribs is connected to the first body **101** or the second body **201** by spot welding, but not limited thereto.

(20) The first opening rebar net **10** at least partially covers the second opening rebar net **20** to be at least partially distributed on the second opening **21**. In addition, the second traverse rib **13** and the fifth traverse rib **23** are arranged in parallel. Specifically, as illustrated in FIG. **2**, when the first body **101** at least partially covers the second body **201**, the first body **101** at least partially passes through the second body **201** to extend into the second accommodating portion **202**, so that the first accommodating portion **102** and the second accommodating portion **202** are at least partially overlapped with each other.

(21) In the embodiment illustrated in FIG. **2**, each of the first traverse rib **12**, the second traverse rib **13**, and the third traverse rib **14** is provided on inner side of the first body **101**; each of the fourth traverse rib **22** and the fifth traverse rib **23** is provided on an outer side of the second body **201**. Specifically, when the first body **101** at least partially covers the second body **201**, the first traverse rib **12**, the second traverse rib **13**, and the third traverse rib **14** of the first body **101** is provided on a space surrounded by the first body **101** and the second body **201**; each of the fourth traverse rib **22** and the fifth traverse rib **23** of the second body **201** is outside the space surrounded by the first body **101** and the second body **201**, so that the second traverse rib **13** of the first body **101** and the fifth traverse rib **23** of the second body **201** are arranged in parallel. Through such an arrangement, interfacing between each traverse ribs at assembling can be reduced so as to enhance convenience of assembling.

(22) Furthermore, as illustrated in FIG. **1** and FIG. **2**, the first opening **11** of the first opening rebar net **10** may be an upper opening; the second opening **21** of the second opening rebar net **20** may be a lower opening. The first body **101** may include a plurality of upper-opening rebars **19**. In addition, each of the upper-opening rebars **19** includes a first erect bar portion **16**, a first bottom

erect bar portion **17**, and a second erect bar portion **18**. The first erect bar portion **16** has a first bend portion **161**; the first bottom rib **17** is bended from the first bend portion **161** relative to the first erect bar portion **16** and extends into a second bend portion **171**. The second erect bar portion **18** is bended from the second bend portion relative to the first bottom rib **17**, and is arranged in parallel with the first erect bar portion **16**. Wherein the upper opening **11** is an opening formed on an end opposite to the first bottom rib **17**. On the other and, the first accommodating portion **102** is surrounded by the first erect bar portion **16**, the first bottom rib **17**, and the second erect bar portion **18**.

(23) The second body **201** includes a plurality of lower-opening rebars **28**, and the lower-opening levers **28** include a third erect bar portion **25**, a second bottom rib **26**, and a fourth erect bar portion **27**. The third erect bar portion **25** has a third bend portion **251**; the second bottom rib **26** is bended from the third bend portion **251** relative to the third erect bar portion **25** and extend into the fourth bend portion **261**. The fourth erect bar portion **27** is bended from the fourth bend portion **261** relative to the second bottom rib **2**, and is arranged in parallel with the third erect bar portion **25**. Wherein the lower opening **21** is an opening formed on an end opposite to the second bottom rib **26**. On the other hand, the second bottom rib **26** may form a hanging portion configured to be hooked on at least one main bar transversely. The aforementioned erect bar portions, the bottom ribs, and the connections therebetween are integrally formed by bending single piece of steel bar and each of the traverse ribs and each of the erect bar portions or bottom ribs are preferably connected by spot welding, but not limited thereto.

Second Embodiment

(24) As illustrated in FIG. **3**, the second embodiment is different from the first embodiment in the way of covering between the first opening rebar net **10** and the second opening rebar net **20**. Wherein each of the first traverse rib **12** and the third traverse rib **14** is provided inside the first opening rebar net **10**; the second traverse rib **13** is provided outside the upper-opening rebars **19**; each of the fourth traverse rib **22** and the fifth traverse rib **23** is disposed inside the second opening rebar net **20**. Specifically, when the first opening rebars **19** and the second opening rebars **28** are overlapped with each other, the second traverse rib **13** is provided outside the space surrounded by the first opening rebars **19** and the second opening rebars **28**. Each of the first traverse rib **12**, the third traverse rib **14**, the fourth traverse rib **22**, and the fifth traverse rib **23** is inside the space surrounded by the first opening rebars **19** and the second opening rebars **28**.

Third Embodiment

(25) As illustrated in FIG. **4**, third embodiment is different from the first embodiment in the covering way between the upper-opening rebar net **10** and the lower-opening rebar net **20**. The first traverse rib **12** and the third traverse rib **14** are provided inside the first opening rebars **19**, the second traverse rib **13** is provide outside the first opening rebars **19**; the fourth traverse rib **22** is provided outside the second opening rebars **28**, the fifth traverse rib **23** is provided inside the second opening rebars **28**. Specifically, when the first opening rebars **19** at least partially cover the second opening rebars **28**, the second traverse rib **13** and the fourth traverse rib **22** are provided outside the space surrounded by the first opening rebars **19** and the second opening rebars **28**. The first traverse rib **12**, the third traverse rib **14**, and the fifth traverse rib **23** are provided outside the space surrounded by the first opening rebars **19** and the second opening rebars **28**.

(26) Please refer to FIG. **5** illustrating main steps of an exemplary manufacturing method of the beam reinforcement system of the present invention, and the first embodiment of the present invention for example.

(27) The exemplary manufacturing method of the present embodiment starts at step S**501**: providing two first main bars **30** in parallel. Specifically, as illustrated in FIG. **6**, the two first main bars **30** are provided to pass through the vertical reinforcing steel body P in a parallel direction, and the two first main bars **30** are parallel with each other in the traverse surface.

(28) Then the method is proceeded to step S**502**: hanging a plurality of stirrups **40** on the two first

main bars **30** one by one, wherein the stirrup **40** includes two erect bar portions **41** arranged in parallel and a bottom rib **42** connecting the two erect bar portions. Specifically, as illustrated in FIG. **7**, the stirrup **40** further includes hook ends **43** and a stirrup opening **44**. The hook ends **43** extend at top ends of the two erect bar portions **41** arranged in parallel, so that the plurality of stirrups **40** are hooked on the first main bars **30** via the hook ends **43**, so that the plurality of stirrups **40** are hanged on the two first main erect bar portions **30**. The stirrup opening **44** are formed on an end opposite to the bottom rib **42** for providing rebar cage module **100**.

(29) In addition, the exemplary manufacturing method of the beam reinforcement system of the present invention further includes detailed steps illustrated in FIG. **8**. The exemplary manufacturing method of the present invention is proceeded to detailed step S**801**: hanging the plurality of stirrups **40** on a first section **31** and a second section **32**. Specifically, as illustrated in FIG. **8** and FIG. **9**, the stirrups **40** are hanged on the first section **31** and the second section **32** of the first main bars **30** in advance.

(30) Then the method is proceeded to detailed step S**802**: providing the plurality of rebar cage module **100** on the second section **32**. Specifically, as illustrated in FIG. **9**, the rebar cage module **100** is provided inside the stirrups **40** via the stirrup openings **44**, and the rebar cage module **100** is provided on the second section **32**.

(31) The exemplary manufacturing method is proceeded to step S**503**: providing the first opening rebar net **10** of the rebar cage module **100** on the plurality of bottom ribs **42**. Specifically, as illustrated in FIG. **10**, the first opening rebar net **10** is provided on the plurality of bottom ribs **42** in advance and they are bonded and fixed on the plurality of stirrups **40** via fixed members. The fixed members in the preferred embodiment of the present invention are iron wires; however, materials and appearances of the fixed members are not limited thereto in the actual application. Please further refer to FIG. **8**, the step S**503** may include detailed step S**801**: hanging the plurality of stirrups **40** on the first section **31** and the second section **32**. Specifically, as illustrated in FIG. **9**, the rebar cage module **100** is hanged on the second section **32** of the first main bars. The first section **31** and the second section **32** in the present embodiment respectively correspond to a plastic region and non-plastic region in the actual application. The second section **32** is a section closed to the vertical reinforcing steel body P, and make the hooping force of the main bars of the bean reinforcement system of the present invention along a vertical direction be distributed evenly.

(32) Then the exemplary manufacturing method is proceeded to step S**504**: providing a plurality of second main bars **50** via the first opening **11** and housing it on the plurality of second main bars **50** in the first accommodating portion **102** of the first opening rebar net **10**. Specifically, as illustrated in FIG. **11**, when the second main bars **50** can pass through the vertical reinforcing steel body P, the second main bars **50** are provided on the first accommodating portion **102** of the first opening rebar net **10** and are arranged on the first bottom rib **17**. In addition, some of the second main bars **50** are provided on the bottom rib **42** via a gap between the stirrups **40** and the first opening rebar net **10**.

(33) Then, the exemplary manufacturing method is proceeded to step S**505**: providing a plurality of third main bars **60** corresponding to the first opening **11**. Wherein the two first main bars **30** and the plurality of third main bars **60** are arranged in parallel, the plurality of second main bars **50** and the plurality of third main bars **60** are arranged in parallel. Specifically, as illustrated in FIG. **12**, the plurality of third main bars **60** can pass through the vertical reinforcing steel body P, and they are bonded thereon via the fixed members. In addition, they are arranged in parallel with the first main bars **30** each other on the same traverse surface.

(34) Then, the exemplary manufacturing method is proceeded to step S**506**: at least partially covering the first opening rebar net **10** by the second opening rebar net **20** of the rebar cage module **100**, and hooking the second opening rebar net **20** on the plurality of third main bars **60** via the hanging portion **24** of the second opening rebar net **20** transversely. Specifically, as illustrated in FIG. **13**, the second opening rebar net **20** is hooked on the plurality of third main bars **60** located on the second section **32** via the hanging portion **24**, so that the second opening rebar net **20** and the

first opening rebar net **10** may be covered with each other.
(35) Finally, the exemplary manufacturing method of the present invention is proceeded to step S**507**: providing a plurality of stirrup caps **70** on the second opening rebar net **20** and the stirrups **40**. Wherein the stirrup caps **70** are provided corresponding to the openings. Specifically, the stirrup caps **70** will be provided corresponding to the stirrup openings **44** of the stirrups **40** and the second bottom rib **26** of the second opening rebar net **20**. Finally, please refer to FIG. **14**, illustrating a diagram of the completed beam reinforcement system of the present invention.
(36) The first opening of the first opening rebar net and the second opening of the second opening rebar net for the beam reinforcement system of the present invention are covered with each other, so that it is more convenient to provide main bars so as to shorten the construction time of the exemplary manufacturing the rebar cage module.
(37) The aforementioned embodiments of present invention can be modified by people skilled in the art, these modification does not exceed over the scope of the present disclosure disclosed in attached claims. Therefore, equivalent variations and modifications based on the contents of claims and specification of the present invention should belong to the scope of the present invention.

Claims

1. A rebar cage module, comprising: an upper-opening rebar net having an upper opening, comprising: a plurality of upper-opening rebars respectively arranged in parallel, wherein each of the upper-opening rebars includes: a first erect bar portion having a first bend portion; a second erect bar portion having a second bend portion and arranged in parallel with the first erect bar portion; and a first bottom rib extending from the first erect bar portion to the second erect bar portion; a first traverse rib configured to connect one side of the plurality of upper-opening rebars; a second traverse rib configured to connect the other side of the plurality of upper-opening rebar; and a third traverse rib configured to connect the plurality of upper-opening rebars and arranged in parallel with the first traverse rib; a lower-opening rebar net having a lower opening oriented to a direction opposite to the upper opening, the lower-opening rebar net comprising: a plurality of lower-opening rebars respectively arranged in parallel, the plurality of lower-opening rebars and the plurality of upper-opening rebars are disposed to be overlapped with each other, wherein each of the lower-opening rebars includes: a third erect bar portion having a third bend portion; a fourth erect bar portion having a fourth bend portion and arranged in parallel with the third erect bar portion; and a second bottom rib extending from the third erect bar portion to the fourth erect bar portion; a fourth traverse rib configured to connect one side of the plurality of lower-opening rebars; and a fifth traverse rib configured to connect the other side of the plurality of lower-opening rebars opposite to the fourth traverse rib, the fifth traverse rib and the fourth traverse rib arranged in parallel; wherein the upper-opening rebars are disposed to be overlapped with the lower-opening rebars, and wherein the first erect bar portion reaches the third bend portion, the second erect bar portion reaches the fourth bend portion, the third erect bar portion reaches the first bend portion, and the fourth erect bar portion reaches the second bend portion.
2. The rebar cage module of claim 1, wherein the upper opening is formed at the end opposite to the first bottom rib.
3. The rebar cage module of claim 1, wherein the first erect bar portion, the first bottom rib, and the second erect bar portion are configured to form a first accommodating portion, the first accommodating portion is configured to receive at least one main bar.
4. The rebar cage module of claim 1, wherein the lower opening is formed at the and opposite to the second bottom rib.
5. The rebar cage module of claim 1, wherein the second bottom rib is configured to form a hanging portion, the hanging portion is configured to hook at least one main bar transversely.
6. The rebar cage module of claim 1, wherein each of the first traverse rib, the second traverse rib,

and the third traverse rib is provided on an inner side of the upper-opening rebars; wherein each of the fourth traverse rib and the fifth traverse rib is provided on an outer side of the lower-opening rebars.

7. The rebar cage module of claim 1, wherein each of the first traverse rib and the third traverse rib is provided on an inner side of the upper-opening rebars; wherein the second traverse rib is provided on an outer side of the upper-opening rebars; wherein each of the fourth traverse rib and the fifth traverse rib is disposed on an inner side of the lower-opening rebars.

8. The rebar cage module of claim 1, wherein each of the first traverse rib and the third traverse rib is disposed on an inner side of the upper-opening rebars; wherein the second traverse rib is disposed on an outer side of the upper-opening rebars; wherein the fourth traverse rib is disposed on an outer side of the lower-opening rebars; wherein the fifth traverse rib is disposed on an inner side of the lower-opening rebars.

9. A manufacturing method of a beam reinforcement system, comprising the following steps: providing two first main bars in parallel; hanging a plurality of stirrups on the two first main bars, wherein the stirrups include two erect bar portions arranged in parallel and a bottom rib connecting bottom ends of the two erect bar portions; providing the first opening rebar nets of the rebar cage module of claim 1 on the plurality of bottom ends; providing a plurality of second main bars to the first accommodating portion via the first opening; providing a plurality of third main bars in parallel corresponding to the first opening and arranged in parallel with the two first main bars; at least partially covering the first opening rebar net by the second opening rebar net of the rebar cage module of claim 1 and hooking the second opening rebar net on the plurality of third main bars transversely; and providing a plurality of stirrup caps on the second opening rebar net and the stirrups; wherein the stirrup caps are disposed corresponding to the openings.

10. The manufacturing method of claim 9, wherein the beam reinforcement system comprises a first section and a second section connected with each other, the steps of hanging the rebar cage module comprises: hanging a plurality of stirrups on the first section and the second section; and providing the rebar cage module on the second section.