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(54) EMERGENCY RESTORATION EQUIPMENT FOR STEEL STRUCTURE

(57) The present invention relates to emergency restoration equipment for a steel structure, comprising: a weight that has a shape of a cylinder; an emergency restoration mat that is wrapped around the weight and has a plurality of permanent magnets; a mat fixing member that includes a fixing string that is wound, at one end thereof, around the emergency restoration mat; and a plurality of guides formed on the upper end portion of the fixing string in the longitudinal direction; and a cutting member provided to cut the fixing string. The emergency restoration equipment can achieve a low production cost thanks to the simple structure thereof, and can be easily installed through prior installation training without expertise. Further, since a worker does not have to work while clinging to a wall or in water if visibility is ensured, in cases where a part of a large steel structure, such as a vessel or a storage tank, is damaged, the worker can rapidly restore the damage using the emergency restoration equipment.

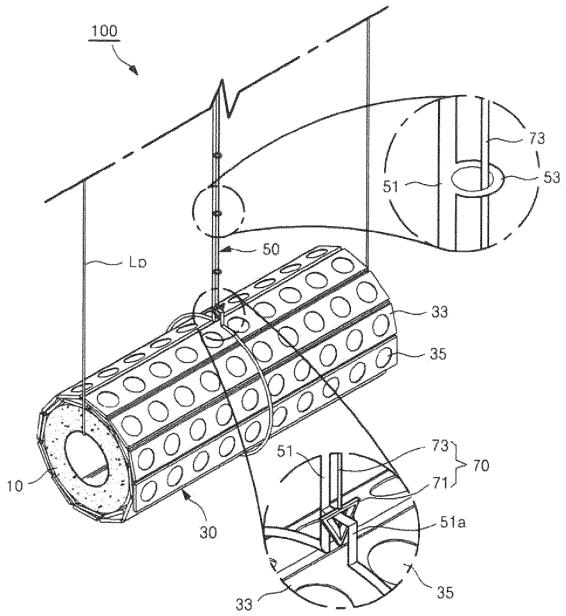

Fig. 1

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Description

[Technical Field]

[0001] The present invention relates to emergency restoration equipment for a steel structure.

[Background Art]

[0002] Korean Patent No. 10-0872584 (registered on December 1, 2008, titled "An emergency restoration device for stopping up an opening) has been proposed for emergency restoration of damage to a steel structure such as a ship or a storage tank in order to block an opening formed in a wall having magnetism. The emergency restoration device for stopping up an opening includes: a blocking plate that is made of a flexible material and has an attachment surface on a side; an electromagnetic module that is disposed inside the blocking plate; and a power supply that includes a battery disposed inside the blocking plate and a switch disposed outside the blocking plate and controlling turning-on/off of the electromagnetic module and supplies power to the electromagnetic module. The attachment surface of the blocking plate is attached to the wall and blocks the opening by a magnetic force of the electromagnetic module generated when power is supplied from the power supply. The electromagnetic module is composed of a plurality of electromagnetic units that is arranged with regular intervals and is independently supplied with power such that the blocking plate is sequentially attached to the wall, thereby closing the opening.

[0003] The related art says that since an attachment plate made of a flexible material is used, so the attachment plate can be easily attached regardless of the shapes of walls including common flat walls and walls having various shapes of curved portions. However, there is a problem in that, in emergency situations, emergency restoration is difficult against the pressure of fluid discharged at high pressure, a large amount of seawater flowing into ships, or the like.

[Disclosure]

[Technical Problem]

[0004] An object of the present invention that has been made in an effort to solve the problems is to provide emergency restoration equipment for a steel structure that can quickly perform emergency restoration when a steel structure such as a ship or a storage tank is partially damaged.

[Technical Solution]

[0005] The object of the present invention can be achieved by emergency restoration equipment for a steel structure, the equipment including: a weight that has a cylindrical shape; an emergency restoration mat that is wound round the weight and has a plurality of permanent magnets; a mat fixing member that has a fixing string for tightening outer side of the emergency restoration mat at an end and a plurality of guides longitudinally formed on the fixing string; and a cutting member that cuts the fixing string.

[0006] Preferably, the weight of the present invention is made of concrete, wood, a nonmetal, or synthetic resin.

[0007] Preferably, the emergency restoration mat is composed of a base plate, a shock-absorbing member divided into a plurality of parts by sectional grooves formed in a width direction on the top of the base plate, and a plurality of permanent magnets disposed in the top of the shock-absorbing member to be exposed, and rectangular notches are formed on a lower side opposite to the sectional grooves on the shock-absorbing member.

[0008] More preferably, the shock-absorbing member is manufactured by covering raw rubber or a sponge formed by foaming synthetic resin with an outer cover made of synthetic resin, the base plate is composed of a base fabric that is a tent fabric or a parachute fabric and a support plate made of one of ABS, polypropylene (PP), a nonmetal, or a plastic synthetic material on the top of the base fabric, and the base fabric and the support plate are integrated by an adhesive.

[0009] Preferably, the cutting member is composed of a cutter disposed at a knot of the mat fixing member and a cutting marking line connected to the cutter and guided by the guides.

[Effect]

[0010] As described above, the emergency restoration equipment can achieve a low production cost thanks to the simple structure thereof, and can be easily installed through prior installation training without expertise. Further, since a worker does not have to work while clinging to a wall or in water if visibility is ensured, in cases where a part of a large steel structure, such as a vessel or a storage tank, is damaged, the worker can rapidly restore the damage using the emergency restoration equipment.

[Description of Drawings]

[0011]

FIG. 1 is a perspective view illustrating emergency restoration equipment for a steel structure according to the present invention.

FIG. 2 is a perspective view illustrating an emergency restoration mat.

FIG. 3 is a cross-sectional view of FIG. 2.

FIGS. 4 and 5 are perspective views illustrating use of the emergency restoration equipment for a steel structure according to the present invention.

[Best Mode]

[0012] Hereafter, embodiments of the present invention are described with reference to drawings.

[0013] Referring to FIGS. 1 to 3, emergency restoration equipment 100 for a steel structure according to the present invention includes: a weight 10, an emergency restoration mat 30, a mat fixing member 50, and a cutting member 70.

[0014] The weight 10 is made of concrete, wood, a nonmetal, or synthetic resin in the shape of a cylindrical tube.

[0015] Herein, it is the most preferable that the weight 10 is made of concrete.

[0016] The emergency restoration mat 30 is wound around the weight 10. Herein, the emergency restoration mat 30 is composed of a base plate 31, a shock-absorbing member 33 divided by a plurality of sectional grooves 37 formed in a width direction on the top of the base plate 31, and a plurality of permanent magnets 35 disposed in the top of the shock-absorbing member 33 to be exposed. In particular, the sectional grooves 37 are not formed across the width of the shock-absorbing member 33, and as illustrated in FIG. 4, they have a small, not large, width, but are illustrated wide in the drawings for description.

[0017] Accordingly, fluid cannot flow out through the sectional grooves 37.

[0018] Further, rectangular notches 39 are formed on the bottom of the shock-absorbing member 33, for example, on the lower surface opposite to the sectional grooves 37 for easy winding.

[0019] The emergency restoration mat 30 of this embodiment has the sectional grooves 37 and the rectangular notches 39 so that it can be easily and smoothly wound around the weight such as "bamboo strips" that is a bamboo book in ancient China.

[0020] Herein, the shock-absorbing member 33 is preferably manufactured by covering raw rubber or a sponge formed by foaming synthetic resin with an outer cover made of synthetic resin.

[0021] Further, the base plate 31 is composed of a base fabric and a support plate made of one of ABS, polypropylene (PP), a nonmetal, or a plastic synthetic material on the top of the base fabric, in which the base fabric and the support plate are preferably integrated by an adhesive. In particular, the base fabric may be a tent fabric or a parachute fabric that has durable and waterproof characteristics.

[0022] Further, the permanent magnets 36 are preferably disposed in the top of the shock-absorbing member 35 not to be exposed, because if the tops of the permanent magnets 35 are exposed higher than the top of the shock-absorbing member 33, the emergency restoration mat 30 is not smoothly unrolled (rotated) in emergency restoration and it is required to bring the shock-absorbing member 33 in close contact with a steel structure.

[0023] Further, although the permanent magnets 35 are used in this embodiment, it should be understood that when electromagnets are used, an external power unit or a built-in battery may be used.

[0024] The mat fixing member 50 is provided to prevent the emergency restoration mat 30 wound around the weight 10 from unrolling and is composed of a fixing string 51 for tightening the emergency restoration mat 30 and a plurality of guides 53 spaced from each other in a longitudinal direction on the fixing string 51.

[0025] In this configuration, the fixing string 51 is preferably made of synthetic resin. Further, reference numeral "51a" not stated above indicates a knot for tightening the outer side of the emergency restoration mat 30.

[0026] Further, preferably, lubrication oil (or grease) may be applied to the surface of the fixing string 51.

[0027] The cutting member 70 is composed of a cutter 71 disposed at the knot 30 of the mat fixing member 50 and a cutting marking line 73 connected to the cutter 71 and disposed at an upper portion to be guide by the guides 53. The cutter 71 of the present invention is most preferably a blade, but when the cutter uses hot wires, it may be configured such that when the cutting marking line 73 is pulled, the hot wire cutter is operated to melt and cut the fixing string 51.

[0028] Further, a lope Lp may be connected to a crane at both ends through the weight 10, but it is not an important part of the present invention, so it is omitted.

[0029] Referring to FIGS. 4 and 5, the emergency restoration equipment 100 for a steel structure according to the present invention is installed at a steel structure 200 such as a ship or a storage tank and the lope Lp passing through the weight 10 of the emergency restoration equipment 100 for a steel structure may be connected to a crane or may be supported by a worker, but it is not illustrated in detail in this embodiment.

[0030] Further, the cutting marking line 73 and the fixing string 51 of the emergency restoration equipment 100 of the present invention is preferably disposed on the deck of a ship or an upper portion of a storage tank so that a worker can easily contact it.

[0031] In this embodiment, FIGS. 1 to 3 are referred for the emergency restoration equipment 100 for a steel structure, and detailed numbering and description of the configuration are omitted.

[0032] When a damaged or broken portion Dg is generated in the steel structure 200, the lope Lp is put through the weight 10 and moved to the broken portion Dg, and then both ends of the lope Lp are connected to a crane or several workers hold the ends, thereby preparing emergency restoration.

[0033] Next, the emergency restoration equipment 100 for a steel structure is moved to the broken portion Dg by lowering the lope Lp.

[0034] In this process, the fixing string 51 is continually pulled to be tight.

[0035] When the emergency restoration equipment 100 for a steel structure is positioned at the broken portion Dg, the fixing string 51 is cut by strongly pulling the cutting marking line 73. In this process, the fixing member 50 or

the cutting member 70 are returned not to prevent the work.

[0036] Thereafter, the lope Lp is slowly loosened so that the permanent magnets 35 of the emergency restoration mat 30 are widely attached to the steel structure 200, thereby completely and urgently restoring the broken portion Dg.

[0037] Finally, the weight 10 is returned by pulling up the lope Lp.

[0038] Although the present invention was described with reference to the embodiments, it should be understood that the present invention is not limited thereto and embodiments modified on the basis of the spirit of the present invention are all included in the scope of the present invention.

Claims

1. Emergency restoration equipment for a steel structure, the equipment comprising;
a weight that has a cylindrical shape;
an emergency restoration mat that is wound round the weight and has a plurality of permanent magnets;
a mat fixing member that has a fixing string for tightening outer side of the emergency restoration mat at an end and a plurality of guides longitudinally formed on the fixing string; and
a cutting member that cuts the fixing string,
wherein the weight is made of one of concrete, wood, a nonmetal, and synthetic resin,
the emergency restoration mat is composed of a base plate, a shock-absorbing member divided into a plurality of parts by sectional grooves formed in a width direction on the top of the base plate, and a plurality of permanent magnets disposed on the top of the shock-absorbing member to be exposed,
rectangular notches are formed on a lower side opposite to the sectional grooves on the shock-absorbing member, and
the shock-absorbing member is manufactured by covering raw rubber or a sponge formed by foaming synthetic resin with an outer cover made of synthetic resin, the base plate is composed of a base fabric that is a tent fabric or a parachute fabric and a support plate made of one of ABS, polypropylene, a nonmetal, and a plastic synthetic material on the top of the base fabric, and the base fabric and the support plate are integrated by an adhesive.

2. The equipment of claim 1, wherein the cutting member is composed of a cutter disposed at a knot of the mat fixing member and a cutting marking line connected to the cutter and guided by the guides.

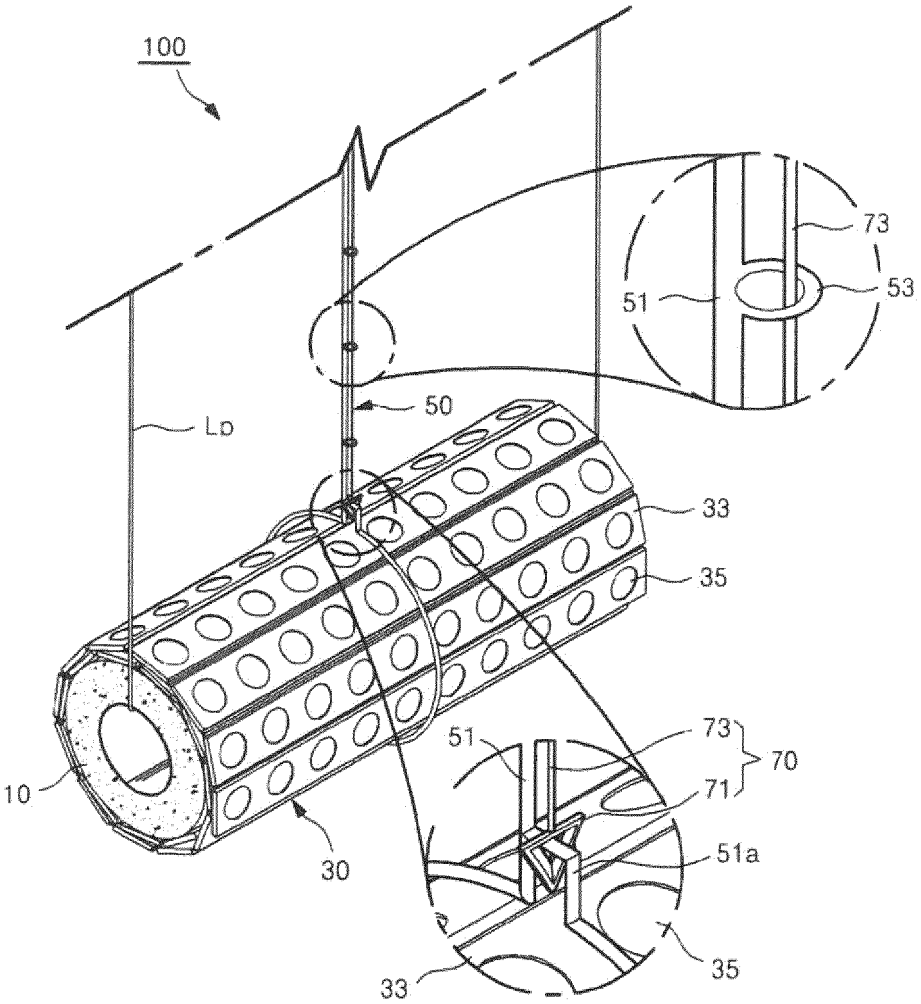

Fig. 1

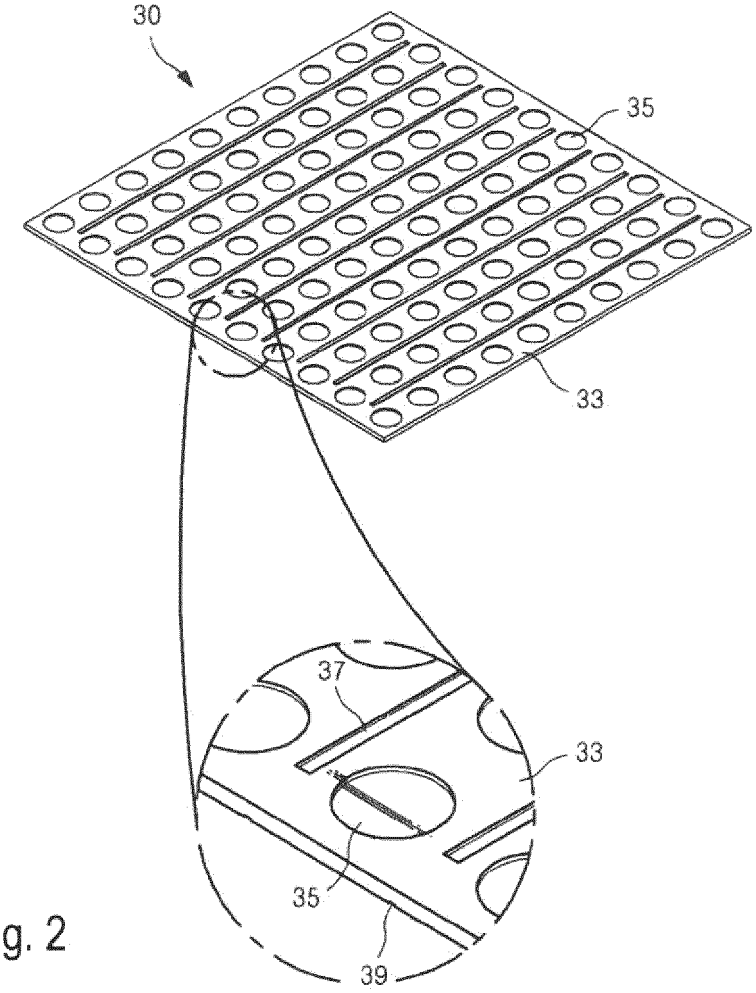

Fig. 2

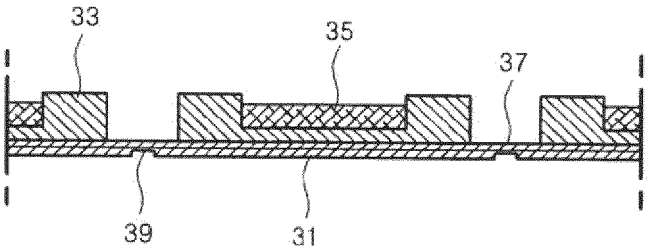

Fig. 3

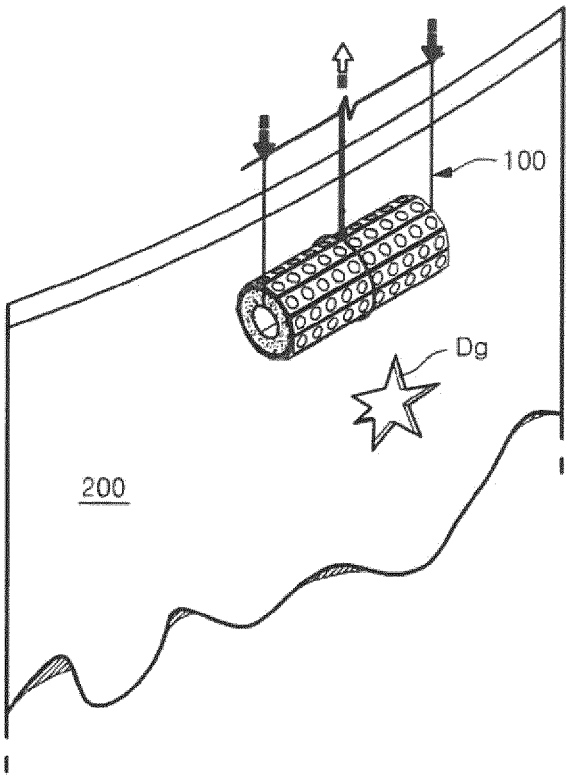

Fig. 4

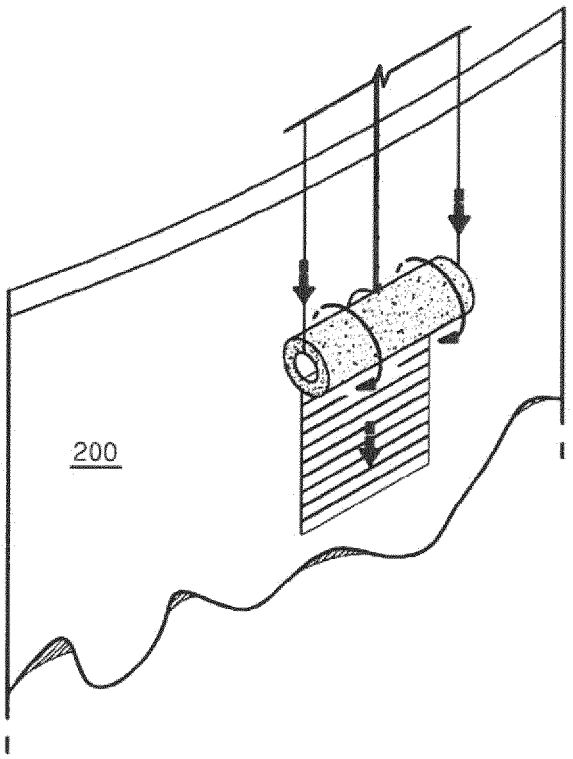

Fig. 5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2015/006926

A. CLASSIFICATION OF SUBJECT MATTER

B63B 43/16(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B63B 43/16; F24F 13/14; B63B 19/04; E06B 9/11

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean Utility models and applications for Utility models: IPC as above
Japanese Utility models and applications for Utility models: IPC as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS (KIPO internal) & Keywords: magnet, magnetism, magnet, cut, knife blade, cut

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	KR 10-2014-0078595 A (KIM, Dong Keun et al.) 25 June 2014 See abstract and figures 3, 5	1-2
A	KR 10-1339203 B1 (REPUBLIC OF KOREA (NATIONAL MARITIME POLICE AGENCY) et al.) 13 December 2013 See claim 4 and figure 1.	1-2
A	US 05165356 A (WILLIAMS; WILLARD E.) 24 November 1992 See claim 1 and figure 1.	1-2
A	JP 10-019360A (SUMITOMO HEAVY IND., LTD.) 23 January 1998 See abstract and figure 2.	1-2
A	KR 20-0448176 Y1 (SONG, Jae Don) 24 March 2010 See claim 1 and figures 4, 5.	1-2

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

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
08 OCTOBER 2015 (08.10.2015)	**08 OCTOBER 2015 (08.10.2015)**
Name and mailing address of the ISA/**KR** Korean Intellectual Property Office Government Complex-Daejeon, 189 Seonsa-ro, Daejeon 302-701, Republic of Korea Facsimile No. 82-42-472-7140	Authorized officer Telephone No.

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

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/KR2015/006926

Patent document cited in search report	Publication date	Patent family member	Publication date
KR 10-2014-0078595 A	25/06/2014	NONE	
KR 10-1339203 B1	13/12/2013	NONE	
US 05165356 A	24/11/1992	NONE	
JP 10-019360A	23/01/1998	NONE	
KR 20-0448176 Y1	24/03/2010	NONE	

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

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- KR 100872584 **[0002]**