sealing work, enabling construction of a highly convenient training system.

Example 1

[0020] FIG. 2 shows a flange tightening training system according to Example 1 of the training system. In FIG. 2, portions that are the same as those of FIG. 1 are provided with the same symbols.

The flange tightening training system 2-1 (hereinafter referred to simply as the "training system 2-1") includes a flange tightening equipment unit (hereinafter referred to simply as the "equipment unit") 4-1, the base unit 6, and the extension base units 8. The equipment unit 4-1 is an example of the training equipment unit 4 and enables flange tightening defined in JIS B2251 to be performed. That is, flange joint tightening training for sufficient exhibition of a function of a gasket can be performed.

[0021] A flange tightening training head (hereinafter referred to as the "training head") 10-1 is included as an example of the training head 10 and the training head 10-1 includes an attachable/detachable protective cover 16. With the base stand portion 12, the training head 10-1 is included at a top portion and a pedestal 18 is included at a bottom portion. The pedestal 18 is supported on the base stand portion 12 by a plurality of support column portions 20 mounted radially to the base stand portion 12. The pedestal 18 is fixed by a plurality of fixing bolts 21 to the installation portion 14 that is fixed to the base unit 6 side. The equipment unit 4-1 and the base unit 6 are thereby integrated.

For example, four extension base units 8 are couplable to the base unit 6 to extend a base surface of the base unit 6 to the surroundings.

[0022] <Flange Tightening Training Head 10-1>

As shown in FIG. 3, the training head 10-1 includes flange portions 22-1 and 22-2. Whereas the flange portion 22-1 is a disk that is attachable and detachable, the flange portion 22-2 is fixed to the top portion of the circular cylindrical base stand portion

of locking pieces 44 on a cylindrical body 42 formed of a metal or a synthetic resin. The cylindrical body 42 has height such that it at least covers a peripheral surface of the flange portion 22-2 from the connector plates 36 on the base stand portion 12. Upper end portions of the locking pieces 44 are formed to L shapes toward the flange portion 22-1 side and are therefore locked to the upper surface of the flange portion 22-1. The protective cover 16 is thereby installed on the training head 10-1 to cover the training head 10-1 and upper surfaces of the connector plates 36 and a protected space 46 is formed between the training head 10-1 and the connector plates 36. The axial sensors installed on the bolts 30 and other measurement equipment and the leads thereof are disposed in the protected space 46 to enable effects of contact and external disturbance during measurement, etc., to be avoided.

[0025] <Connector Plates 36>

As shown in FIG. 4A, by a plurality of L-shaped supporting pieces 48, each connector plate 36 is fixed to the peripheral surface of the base stand portion 12 by fixing screws 50 and its plate surface is maintained horizontally. These connector plates 36 are members that form an annular plate surface at a periphery of the base stand portion 12 and, as shown in FIG. 4B, are constituted of a pair of semicircular fan shaped connector plates 36.

[0026] <Base Unit 6>

As shown in FIG. 5A, the base unit 6 includes a square frame 52 as a frame member surrounding a periphery. For example, band steel is used in the frame 52. To this frame 52, a plurality of flat bars 54 are mounted in parallel as first bridging members of the same height as constituent members of the frame 52 and a plurality of cross bars 56, intersecting the respective flat bars 54, are mounted in parallel as second bridging members. That is, the base unit 6 is a lattice member, which has the periphery surrounded by the frame 52 and includes the intersecting pluralities of flat bars 54 and cross bars 56, and a flat floor surface is formed by upper edge portions of the frame 52, the flat bars 54, and the cross bars

receiving the training can do so with little movement and trouble and the training can be performed in correspondence to the customer's facility.

[0032] (4) The extension base units 8 can be coupled to the base unit 6 as necessary or just the base unit 6 can be used in accordance with wideness or narrowness of the training area. In addition, the training area can be adjusted by coupling a single or plurality of the extension base units 8 to the base unit 6, and further, restrictions of installation location are removed such that even narrow installation locations can be accommodated, etc.

(5) The training system 2-1 excels in ease of assembly and ease of disassembly according to units and excels in portability in that it can be packaged compactly in specialized boxes to enable efficient and highly safe transport.

(6) The base unit 6 and the extension base units 8 are coupled using the fitting structures between the frames 52 and the couplers 64-1 and 64-2 and are therefore high in coupling strength, enabling construction of a stable floor space and enabling highly safe and reliable work training.

Example 2

[0033] FIG. 9 shows a torque sensation training system according to Example 2. In FIG. 9, portions that are the same as those of FIG. 1 and FIG. 2 are provided with the same symbols.

The torque sensation training system 2-2 (hereinafter referred to simply as the "training system 2-2") includes a torque sensation equipment unit (hereinafter referred to simply as the "equipment unit") 4-2, the base unit 6, and the extension base units 8. The equipment unit 4-2 is an example of the training equipment unit 4 and enables training on bodily sensation of precision of tightening using a hand wrench for torque control.

A torque sensation training head (hereinafter referred to as the "training head") 10-2 is included as an example of the training head 10, and a line checker or other equipment that measures a torque value achieved by tightening by a hand wrench or other tightening

tool may be used in the training head 10-2.

Respective members, such as the base unit 6, the extension base units 8, the base stand portion 12, the pedestal 18, etc., are the same as those of Example 1 and description thereof shall thus be omitted.

[0034] <Effects of Example 2>

By Example 2, in addition to providing the same effects as a training system as Example 1, torque sensation training can be realized as the training system.

Example 3

[0035] FIG. 10 is a diagram showing a sealing performance training system according to Example 3. In FIG. 10, portions that are the same as those of FIG. 1 and FIG. 2 are provided with the same symbols.

The sealing performance training system 2-3 (hereinafter referred to simply as the "training system 2-3") includes a sealing performance training equipment unit (hereinafter referred to simply as the "equipment unit") 4-3, the base unit 6, and the extension base units 8. The equipment unit 4-3 is an example of the training equipment unit 4 and enables training on control of differences in sealing performance of various types of gaskets, flange surface flaws, etc.

Two sealing performance training heads (hereinafter referred to as the "training heads") 10-31 and 10-32 are included as an example of the training head 10. The training heads 10-31 and 10-32 include flange portions 22-31 and 22-32, respectively, and include the bolts 30, the tightening nuts 32, and the nuts 34. Training can be performed individually by the training heads 10-31 and 10-32.

Respective members, such as the base unit 6, the extension base units 8, the base stand portion 12, the pedestal 18, etc., are the same as those of Example 1 and description thereof shall thus be omitted.

[0036] <Effects of Example 3>

By Example 3, in addition to providing the same effects as

a training system as Example 1, sealing performance training can be realized with the training system.

Example 4

[0037] FIG. 11 is a diagram showing a compression failure training system according to Example 4. In FIG. 11, portions that are the same as those of FIG. 1 and FIG. 2 are provided with the same symbols.

The compression failure training system 2-4 (hereinafter referred to simply as the "training system 2-4") includes a compression failure training equipment unit (hereinafter referred to simply as the "equipment unit") 4-4, the base unit 6, and the extension base units 8. The equipment unit 4-4 is an example of the training equipment unit 4 and enables training on compression failure of gaskets, including training on differences in compression failure characteristics of various types of gaskets, difference in compression failure characteristics due to presence/non-presence of paste, etc.

[0038] Two compression failure training heads (hereinafter referred to as the "training heads") 10-41 and 10-42 are included as an example of the training head 10 and these are provided across an interval on the base stand portion 12. The training heads 10-41 and 10-42 include flange portions 22-41 and 22-42, respectively, and include the bolts 30, the tightening nuts 32, and the nuts 34. Training can be performed individually by the training heads 10-41 and 10-42.

Respective members, such as the base unit 6, the extension base units 8, the base stand portion 12, the pedestal 18, etc., are the same as those of Example 1 and description thereof shall thus be omitted.

[0039] <Effects of Example 4>

By Example 4, in addition to providing the same effects as a training system as Example 1, compression failure training can be realized with the training system.

Example 5

[0040] FIG. 12 shows a flange/bolt/washer effect training system according to Example 5. In FIG. 12, portions that are the same as those of FIG. 1 and FIG. 2 are provided with the same symbols.

The flange/bolt/washer effect training system 2-5 (hereinafter referred to simply as the "training system 2-5") includes a flange/bolt/washer effect training equipment unit (hereinafter referred to simply as the "equipment unit") 4-5, the base unit 6, and the extension base units 8. By the equipment unit 4-5 as an example of the training equipment unit 4, training on effects of bolt servicing states on gasket surface pressure according to differences in material quality, etc., can be performed.

[0041] Two flange/bolt/washer effect training heads (hereinafter referred to as the "training heads") 10-51 and 10-52 are included as an example of the training head 10 and these are provided across an interval on the base stand portion 12. The training heads 10-51 and 10-52 include flange portions 22-51 and 22-52, respectively, and include the bolts 30, the tightening nuts 32, and the nuts 34. Training can be performed individually by the training heads 10-51 and 10-52.

Respective members, such as the base unit 6, the extension base units 8, the base stand portion 12, the pedestal 18, etc., are the same as those of Example 1 and description thereof shall thus be omitted.

[0042] <Effects of Example 5>

By Example 5, in addition to providing the same effects as a training system as Example 1, training on flange/bolt/washer effects can be realized with the training system.

Example 6

[0043] FIG. 13 and FIG. 14 show a piping rack training system according to Example 6, with FIG. 13 showing respective parts before assembly and FIG. 14 showing an assembled mode. In FIG. 13 and FIG. 14, portions that are the same as those of FIG. 1 and FIG. 2 are provided with the same symbols.

The piping rack training system 2-6 (hereinafter referred to

to the base unit 6W. The pedestal 18 of the base stand portion 12-1 of the equipment unit portion 4-61 is detachably fixed by the fixing bolts 21 to the installation portion 14-1, and the pedestal 18 of the base stand portion 12-2 of the equipment unit portion 4-62 is detachably fixed by the fixing bolts 21 to the installation portion 14-2.

Extension base units 8, of the same shape as the base unit 6, are coupled to the base unit 6W, and two serially-coupled extension base units 8 are coupled to a long side portion of the base unit 6W.

Respective members, such as the base stand portion 12, the pedestal 18, etc., are the same as those of Example 1 and description thereof shall thus be omitted.

[0046] <Effects of Example 6>

(1) By Example 6, a floor surface required for training is enlarged by the base unit 6W, having the base unit 6 as a unit and having a length of two of the base units 6, and coupling or removal of the two equipment unit portions 4-61 and 4-62 is enabled.

(2) Due to the length of the base unit 6W being twice the length of the base unit 6 as a unit, a floor area of the base unit 6W can be enlarged by coupling two extension base units 8 in a width direction of the base unit 6W and the floor area can be enlarged by coupling an extension base unit 8 in a width direction of the base unit 6W.

[0047] (3) A unit width of the base unit 6W thus has the width of the base unit 6 as a unit and therefore, as with Examples 1 to 5, a plurality of base units 6 and extension base units 8 can be coupled for enlargement to a desired floor area and to accommodate the scale of the training site.

(4) With Example 6, the piping units 74-1 and 74-2 are disposed in parallel to the piping portions 76-1 and 76-2 to forcibly realize a narrow space and therefore coupling and tightening of the flanges 80-1 and 80-2 of the piping portions 76-1 and 76-2 must be performed, enabling the same work training as that in the actual facility to be performed and enabling improvement of work skills.

Example 7

[0048] FIG. 15 show a flange tightening training system 2-7 according to Example 7 of the training system. In FIG. 15, portions that are the same as those of FIG. 1 and FIG. 2 are provided with the same symbols. The flange tightening training system 2-7 includes an equipment unit 4-7 and a base unit 6X. As with Example 1, the flange tightening equipment unit 4-7 enables flange tightening defined in JIS B2251 to be performed. That is, flange joint tightening training for sufficient exhibition of a function of a gasket can be performed.

[0049] <Equipment Unit 4-7>

The equipment unit 4-7 includes the training head 10-1 and the base stand portion 12-2. The base stand portion 12-2 is divided into a head side base stand portion 12-21, an intermediate base stand portion 12-22, and a base side base stand portion 12-23 that can be coupled. The head side base stand portion 12-21, the intermediate base stand portion 12-22, and the base side base stand portion 12-23 are cylindrical bodies of the same diameter and at a lower end side of each is included an attachment portion 86. That is, the attachment portion 86 of the head side base stand portion 12-21 can be inserted in and fixed to the intermediate base stand portion 12-22 or the base side base stand portion 12-23, and the attachment portion 86 of the intermediate base stand portion 12-22 can be inserted in and fixed to the base side base stand portion 12-23.

[0050] <Base Unit 6X>

In place of the installation portion 14, a socket portion 87 is installed as an example of a fitting portion in the base unit 6X, and the attachment portions 86 of the head side base stand portion 12-21, the intermediate base stand portion 12-22, and the base side base stand portion 12-23 can be fitted and fixed to the socket portion 87. Other arrangements of the base unit 6X are the same as those of the base unit 6 described above and description thereof shall thus be omitted.

[0051] <Effects of Example 7>

(1) By Example 7, a height of the equipment unit 4-7 can be

adjusted by the base stand portion 12-2. The training head 10-1 can be selectively adjusted to a minimum height by directly coupling the head side base stand portion 12-21 to the socket portion 87 of the base unit 6X, the training head 10-1 can be selectively adjusted to an intermediate height using the base side base stand portion 12-23 as a relay part, and the training head 10-1 can be selectively adjusted to a maximum height by using the intermediate base stand portion 12-22 and the base side base stand portion 12-23 in combination as relay parts.

(2) Training on sealing work at a desired height can be performed efficiently.

(3) With the equipment unit 4-7, transfer can be performed upon separation into the training head 10-1, the head side base stand portion 12-21, the intermediate base stand portion 12-22, and the base side base stand portion 12-23 and the unit of transfer can be made small.

Example 8

[0052] FIGS. 16A and 16B show a training computer system of Example 8 of the training system. The arrangement shown in FIG. 16 is an example and the present invention is not restricted to this arrangement.

The training computer system 2-8 (hereinafter referred to simply as the "training system 2-8") is an example of the training system according to Claim 6, and the training system 2-8 includes a processing unit 88, a monitor 90, and a keyboard 92, and a display screen 94 of the monitor 90 includes a touch panel 96, which is an operation input unit as is the keyboard 92.

[0053] The processing unit 88 is a computer that handles information processing of the training system and, as shown in FIG. 16B, includes a processor 98, a storage 100, an input/output unit (I/O) 102, and a communication unit 104. The processor 98 executes an OS (operating system), a training program, etc., in the storage 100 to perform calculation processing, generation of image information, etc. The storage 100 includes a ROM (read-only memory),