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(73)

Proprietor: **ISHIKAWAJIMA-HARIMA JUKOGYO**
KABUSHIKI KAISHA
No. 2-1, Ote-machi 2-chome,
Chiyoda-ku
Tokyo-to 101 (JP)

(72)

Inventor: **Sekiguchi, Kenji**

No. 5-1, Yakiyama-Matsugaoka 1-chome
Kure-shi,
Hiroshima-ken 737 (JP)

Inventor: **Imashimizu, Yoshinori**

No. 10-8, Yakiyama-Higashi 1-chome
Kure-shi,
Hiroshima-ken 737 (JP)

Inventor: **Suda, Yoshiaki**

No. 9-11, Yakiyama-Honjo 3-chome
Kure-shi,
Hiroshima-ken 737 (JP)

Inventor: **Yamamoto, Shuichi**

No. 20-11, Yakiyama-Higashi 1-chome
Kure-shi,
Hiroshima-ken 737 (JP)

Inventor: **Takada, Toshiyuki**

No. 315-68, Ato,
Yasuura-cho

Toyota-gun,
Hiroshima-ken 729-25 (JP)

Inventor: **Yokumoto, Tadao**

No. 7453, Koyo,
Etajima-cho

Aki-gun,
Hiroshima-ken 737-21 (JP)

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Inventor: **Nishimoto, Yoshihisa**
No. 21-67, Kamihata-cho
Kure-shi,
Hiroshima-ken 737 (JP)

Inventor: **Morita, Sadayuki**
No. 912, Nakano,
Kamigori-cho
Ako-gun,
Hyogo-ken 678-12 (JP)

Inventor: **Miura, Shinji**
No. 4-5, Aza-Futamata,
Hinaga
Chita-shi,
Aichi-ken 478 (JP)

Inventor: **Fukuoka, Masanori**
No. 11-24, Hirai 2-chome
Edogawa-ku,
Tokyo-to 132 (JP)

Inventor: **Yoshida, Osamu**
No. 8-2-18-304, Minamikoiba
Edogawa-ku,
Tokyo-to 133 (JP)

Inventor: **Morioka, Kunihiro**
No. 1-2-15, Nagahama,
Hiro-machi
Kure-shi,

Hiroshima-ken 737-01 (JP)

Inventor: **Michishita, Tomohira**
No. 16-1-203, Yakiyama-Higashi 1-chome
Kure-shi,
Hiroshima-ken 737 (JP)

⑦ Representative: **Jennings, Nigel Robin et al**
KILBURN & STRODE
30 John Street
London WC1N 2DD (GB)

Description

The present invention relates to a method for forming functional modules and a method of arranging such modules.

Figure 9 is a schematic view of a conventionally fitted out ship's engine room a in which various types of machine or apparatus c are brought into the room a and are arranged on a hull structure b in the room a. Reference character d represents a piping arrangement; and e, a ventilation arrangement or an electric cable arrangement.

The machines or installations c are not necessarily installed in accordance with their particular functions and are arranged in scattered or random manner in the engine room a. As the result, when the components of a main engine lubricating and cooling system are to be operated or maintained or inspected, an operator or inspector must walk about in the engine room a, resulting in inefficient operation or maintenance and inspection.

Moreover, the installations c are arranged two-dimensionally over a relatively extensive area on the hull structure b of the engine room a, resulting in ineffective utilization of the space in the room a.

The conventional outfitting procedure, in which each of the machines or devices c is installed on the hull structure b, will cause various additional problems. Adjustment of detailed schedules for the design and outfitting steps are needed for the hull structure b and machines or installations c. Reinforcement members are required to furnish the installations c on the hull structure b. Designing must be effected with full consideration of the hull structure. Re-designing of the installations c is required if there is any change in the hull since the layout of the installations c depends upon the hull structure.

The Naval Engineers Journal vol. 83, No. 5, Oct. 71, pp 45-52 discusses the possibility of the production of modular warships. The article contemplates a ship having large scale modules dedicated to a particular function, e.g. a weapons module might comprise a missile launcher, magazine, handling equipment and fire control electronics. A module could be inserted in a space in a ship's structure and modules could be interchangeable.

US3363597 discloses a method of constructing a ship comprising assembling a hull envelope having compartments and inserting a framework 51 which defines a number of cuboid spaces arranged in 3 dimensions, into each compartment. Self-contained modules are then lowered into each space in the framework.

An object of the present invention is to facilitate the operation and maintenance and inspection of various kinds of equipment, such as outfits, and to enable outfitting to be performed independently of

the hull structure, thereby facilitating designing of an engine room or a plant and outfitting and operation of installations or plant elements as well as effectively utilizing the available space.

According to the present invention a method of mounting engine room equipment in the engine room of a ship comprises dividing the equipment into a plurality of groups, the equipment of each group having related functions, mounting each group of equipment with related functions in a respective frame, each frame defining a frame module, and arranging said frame modules in abutting horizontally side-by-side and vertically stacked relationships in said engine room.

The present invention also embraces a method of arranging modules which comprises subdividing a hull structure module into separately fabricated deck modules and block modules for seating on said deck modules with at least some of said block modules being horizontally spaced from each other, accommodating outfits having related functions in separate frames, each defining a frame module and being of a size placeable on a deck module in a block module or between block modules or in place of a block module, and replaceably placing said frame modules on said deck modules, in or between block modules or in place of said block modules.

Thus in the present invention engine room equipment can be modularised. One or more such modules are arranged in an engine room space side by side and one above the other in a replaceable manner thereby facilitating maintenance and inspection of the equipment, facilitating design of the engine room and facilitating fitting out and operation of the equipment and ensuring that the space is effectively utilised.

Further features and details of the invention will be apparent from the following description of certain preferred embodiments which is given by way of example with reference to Figures 1 to 8 of the accompanying drawings, in which:-

Figure 1 shows an embodiment of a method of forming modules in accordance with the present invention and is a flow chart showing a procedure for dividing the installations or devices according to their functions which have been classified in accordance with their fluid system;

Figure 2 is a perspective view of a frame module which is provided by accommodating into a frame the installations or devices, which have been divided according to their functions by the procedure shown in Figure 1;

Figure 3 shows a first embodiment of the method of arranging the modules in accordance with the present invention and is a perspective view showing the three-dimensional arrangement of frame modules as shown in Figure 2;

Figure 4 is a perspective view of a second embodiment of the method of arranging the modules in accordance with the present invention and shows the three-dimensional arrangement of the frame modules in an engine room of a ship.

Figure 5 is a perspective view showing spaces in an engine room of a ship shown in Figure 4;

Figure 6 is a perspective view of a third embodiment of the method of arranging modules in accordance with the present invention;

Figure 7 shows an example of a frame module used in the method of arranging modules shown in Figure 6; and

Figure 8 is a perspective view of a fourth embodiment of the method of arranging modules in accordance with the present invention.

Figures 1 and 2 relate to an embodiment of the method for forming modules according to the present invention as claimed in claims 1,2 and 3.

A "module" as described below is defined as a standard unit for facilitating operation, maintenance and inspection, designing and outfitting and for minimising dead space.

Figure 1 is a flow chart showing the procedure for dividing the installations or units into modules according to their function, the Roman numerals indicating the conventional classification according to the fluid system. I represents a first fluid system (e.g. cooling fresh water system); II, a second fluid system (e.g. lubricant system); and III, a third fluid system (e.g. cooling seawater system). There are many other fluid systems but these are not shown in the figure.

Each fluid system I,II,III contains various types of equipment, such as outfits or plant elements, with different functions (uses and equipments). The equipment or units in each of the fluid systems I,II,III etc are divided or classified according to their functions A,B,C, etc. Thus, equipment having common functions are grouped from the fluid systems I,II,III etc into A function module 1 (e.g. main engine lubricating and cooling module), B function module 2 (e.g. stern tube lubricating module), C function module 3 (e.g. steam generation module) etc.

The equipment is divided into A,B,C etc function modules 1,2,3, etc and the equipment with related functions is accommodated in a standard frame with a predetermined size, say, about the size of 20 ft/40 ft container and a frame module is made up. If the units can be accommodated in a standard frame only by dividing them into A,B,C,...function modules 1,2,3,... there is no need to subdivide these function modules, but in the case of a ship, they can scarcely be accommodated into the standard frames even when they are divided into main engine lubricating and cooling

module, stern tube lubricating module and steam generation module.

For this reason, each of the function modules 1,2,3, etc may be further subdivided by function. A function module may be subdivided into A₁ function module (e.g. cooling fresh water system) 1-1, A₂ function module (e.g. cylinder oil system) 1-2, and so on. Similarly, B function module 2 may be subdivided into B₁ function module 2-1, B₂ function module 2-2, and so on and C function module 3, into C₁ function module 3-1, C₂ function module 3-2, etc.

If necessary, the A₁, A₂,...function modules 1-1, 1-2,...the B₁, B₂,...function modules 2-1, 2-2,...and the C₁, C₂,...function modules 3-1, 3-2,...may be further subdivided. For example, the A₁ function module 1-1 may be subdivided into A₁-1 function module (e.g., tank module) 1-1-1, A₁-2 function module (e.g. pump module) 1-1-2; the A₂ function module 1-2, into A₂-1 function module 1-2-1 and A₂-2 function module 1-2-2 and so on.

The equipment of each function module as described above are accommodated in the standard frame of, for example, 20 ft/40 ft. The combination of the modules varies according to the volumes of the A₁-1 function module 1-1-1, the A₁-2 function module 1-1-2, the A₂-1 function module 1-2-1, the A₂-2 function module 1-2-2 etc. For example, as shown by the chain dotted line X in Figure 1, the A₁-1 and A₁-2 function modules 1-1-1 and 1-1-2 may be accommodated as a module into a frame to form a frame module, and as shown by the chain dotted line Y in Figure 1, the A₂-2 function module 1-2-2 may be accommodated in a frame by itself to form a frame module.

Figure 2 shows a frame module 13 in which the units 12, classified according to their functions by the procedure of Figure 1, are accommodated in a standard frame 11, such as a container. Such a frame module may be lifted as a unit and a plurality of frame modules 13 are prepared and are accommodated three-dimensionally in a space.

Figure 3 shows a first embodiment of the method of arrangement of modules in accordance with the present invention as claimed in claims 4 to 6 and 8. In this embodiment, the frame modules 13 of Figure 2 are three-dimensionally arranged in a space 14, such as an engine room as shown in the perspective view. The three-dimensional arrangement of the frame modules 13 is determined by giving full consideration to operational requirements and convenience in maintenance and inspection of the equipment.

As described above, in the embodiment of the present invention, the various devices and units are divided according to their functions (uses and equipments) and the divided devices and units are accommodated in frames as modules to form

frame modules. The frame modules thus made up are three-dimensionally arranged in a predetermined space, having particular regard to function. This will enhance operation of the equipment, facilitate maintenance and inspection and result in effective utilisation of the space. When the performance or functional characteristics of the equipment are to be changed, this is accomplished by replacing the frame modules 13.

Figures 4 and 5 show a second embodiment 2 of the method of arranging modules in accordance with the present invention as claimed in claims 4, 5 and 8.

In Figure 5, reference numeral 21 represents the engine room of a ship 22; 23, a space aft of a transverse bulkhead 24 in the front portion of the engine room 21; and 25, spaces inside shell plates 26 near the bulkhead 24.

The frame modules are arranged three-dimensionally in the spaces 23 and 25 and are formed similarly to the frame modules of Figure 3 in the first embodiment. More specifically, the outfits having the same functions (uses and equipments) are accommodated in a frame so that frame modules 27 as shown in Figure 4 are formed.

Such frame modules 27 are arranged three-dimensionally in the spaces 23 and 25 in the engine room 21 of Figure 5. The three-dimensional arrangement of the frame modules 27 is as shown in Figure 4. By three-dimensionally arranging the frame modules 27 in the vertical and horizontal directions, the outfits can be freely arranged regardless of the hull structure and the spaces 23 and 25 in the engine room 21 can be effectively utilised.

In the case of a small ship, the available spaces 23 and 25 are behind transverse bulkhead 24 and part of the internal spaces inside the shell plates 26, as shown in Figure 5, while in the case of a large ship, spaces 28 behind the spaces 25 can be utilised for the three-dimensional arrangement of the frame modules, as shown in Figure 5.

As shown in Figures 6 and 7, the outfits or devices 34 necessary for the engine room 31 are grouped according to their functions (uses and equipments) and are accommodated in frames 32, such as containers, and are utilised into frame modules 33. The frame module or modules 33 are then arranged as a single unit or as two or more units at required point or points in the engine room 31 to complete the outfitting thereof.

More specifically, some outfits 34 with related functions (uses and equipments) necessary for the engine room 31 are accommodated in the frame 32, such as a 20 ft/40 ft general-purpose container. Lifting means 35, passage means 36, ventilation means 37, lighting means 38, piping means 39, etc. are also accommodated in the frame 32, thus

providing the frame module 33 with the grouped outfits 34. The frame modules 33 for the grouped outfits 34 are arranged in predetermined outfit sections 40 to 49, thus completing the outfitting of the engine room 31. In Figure 6, reference numeral 40 represents a propulsion section; 41, a bilge processing section; 42, an oil tank section; 43, an oil processing section; 44, a lubricant section; 45, a steam generation section; 46, a fresh water section; 47, an option space; 48, a seawater section; and 49, an elevator section. In the frame modules 33, therefore, the outfits 34 related to each of the outfit sections 40 to 49 are accommodated in the respective frames 32.

As described above, the outfitting of the engine room 31 is completed by the use of the frame modules 33 with the outfits 34 of related functions necessary for the engine room 31 being accommodated in the frames 32, such as containers. This will eliminate the work of installing the outfits on the hull structure using reinforcement members as in the prior art and eliminate the necessity of adjusting the details of the design and outfitting schedule thus facilitating the handling of the outfits. Since the fitting out can be performed independently of the hull structure by the use of the above frame modules 33, it may be performed in a place other than a module factory or a shore-based fitting out station of a shipyard. Owing to modularisation of the related outfits 34, the design of the fitting out may be effected using the frame 32 as origin coordinates, thereby enhancing the applicability to other ships. This contributes to the improvement of basic, functional and production design as well as the fitting out process.

In Figure 8, reference numeral 51 represents a hull structure module which comprises hull deck modules 52 and hull structure block modules (skeleton structure modules) 53.

Outfits 56 having related functions (uses and equipments) are accommodated in the frames 54 which are sized to be placeable between or in place of the hull structure block modules 53, thus forming the frame modules 55. The frame modules 55 are placed replaceably between or in place of the hull structure block modules 53, as shown by the arrow 57 or 58.

The hull structure module 51 is thus subdivided into hull deck modules 52 and hull structure block modules 53 which are fabricated separately. The replaceability of the hull structure block modules 53 will expand the engineering range and enhance the applicability to other ships. Subdivision of the hull structure module 51 in fabrication will shorten the time required for fabrication of the modules 51. Outfits 56 having related functions are accommodated in a frame 54 with a predetermined volume to make up a frame module 55 which is

then placed replaceably between or in place of the hull structure block modules 53. The replaceable arrangement of the frame modules 55 will widen the engineering range and increase the applicability to other ships.

This facilitates designing of a ship's engine room and fitting out.

As described above, the method for forming modules in accordance with the present invention as claimed in claim 1 has the advantageous effects of improving handling of equipment, such as outfits, and facilitating maintenance and inspection.

The method of arranging modules in accordance with the present invention as claimed in claim 2 has the advantageous effects of

I. improving handling of the outfits and facilitating maintenance and inspection; and

II. being capable of freely fitting the outfits regardless of the hull structure.

III. In the case where the method is used for fitting out a ship, it has the advantages that

(i) the fitting out can be performed independently of the hull structure;

(ii) the design can be effected with the frame being used as the origin coordinate and the applicability of the outfits to other ships can be increased;

(iii) that handling is facilitated and fitting out can be performed at a place other than a module factory or a shore-based fitting out station in a shipyard;

(iv) the designing, fitting out method and operational efficiency in the engine room are improved and the production engineering is facilitated; and

(v) effective utilisation of space

Claims

1. A method of mounting engine room equipment (12) in the engine room of a ship comprising dividing the equipment into a plurality of groups, the equipment (12) of each group having related functions, mounting each group of equipment with related functions in a respective frame (11), each frame (11) defining a frame module (13), and arranging said frame modules (13) in abutting horizontally side-by-side and vertically stacked relationships in said engine room (14; 21).

2. A method of arranging of modules which comprises subdividing a hull structure module (51) into separately fabricated deck modules (52) and block modules (53) for seating on said deck modules (52) with at least some of said block modules (53) being horizontally spaced from each other, accommodating outfits (56)

having related functions in separate frames (54), each defining a frame module (55) and being of a size placeable on a deck module (52) in a block module (53) or between block modules (53) or in place of a block module (53), and replaceably placing said frame modules (55) on said deck modules (52), in or between block modules or in place of said block modules (53).

Patentansprüche

1. Verfahren zum Montieren von Maschinenraumausrüstung (12) Im Maschinenraum eines Schiffes, umfassend das Aufteilen der Ausrüstung in eine Mehrzahl von Gruppen, wobei die Ausrüstung (12) jeder Gruppe zueinander in Beziehung stehende Funktionen aufweist, das Montieren jeder Ausrüstungsgruppe mit zueinander in Beziehung stehenden Funktionen in einem entsprechenden Rahmen (11), wobei jeder Rahmen (11) ein Rahmenmodul (13) definiert, und das horizontal nebeneinander aneinanderstoßende und Übereinander gestapelte Anordnen dieser Rahmenmodule (13) in dem Maschinenraum (14, 21).

2. Verfahren zum Anordnen von Modulen, umfassend das Unterteilen eines Rumpfstrukturmoduls (51) in getrennt hergestellte Deckmodule (52) und Blockmodule (53) zum Anordnen auf den Deckmodulen (52), wobei wenigstens einige der Blockmodule (53) horizontal voneinander beabstandet sind, das Aufnehmen von Ausrüstungen (56) mit zueinander in Beziehung stehenden Funktionen in getrennten Rahmen (54), die jeweils ein Rahmenmodul (55) definieren und eine solche Größe aufweisen, daß sie auf einem Deckmodul (52), in einem Blockmodul (53), zwischen Blockmodulen (53) oder anstelle eines Blockmoduls (53) platzierbar sind, und das auswechselbare Anordnen dieser Rahmenmodule (55) auf den Deckmodulen (52), in oder zwischen Blockmodulen oder anstelle der Blockmodule (53).

Revendications

1. Méthode de montage d'équipement (12) de machinerie dans la machinerie d'un navire, consistant à diviser l'équipement en plusieurs groupes, l'équipement (12) de chaque groupe ayant des fonctions reliées, à monter chaque groupe d'équipement ayant des fonctions reliées dans un cadre respectif (11), chaque cadre (11) définissant un module de cadre (13), et à arranger lesdits modules de cadre (13) selon des relations de contact en butée hori-

zontale côte à côte et d'empilement vertical dans ladite machinerie (14; 21).

2. Méthode d'arrangement de modules, qui consiste à subdiviser un module à structure de coque (51) en modules de pont (52) fabriqués séparément et en modules de bloc (53) destinés à être placés sur lesdits modules de pont (52), au moins certains desdits modules de bloc (53) étant espacés horizontalement les uns des autres, à installer des appareillages (56) ayant des fonctions reliées dans des cadres séparés (54), définissant chacun un module de cadre (55) et étant d'une taille pouvant être placée sur un module de pont (52) dans un module de bloc (53), ou entre des modules de bloc (53) ou à la place d'un module de bloc (53), et à placer de manière remplaçable lesdits modules de cadre (55) sur lesdits modules de pont (52) dans ou entre des modules de bloc ou à la place desdits modules de bloc (53).

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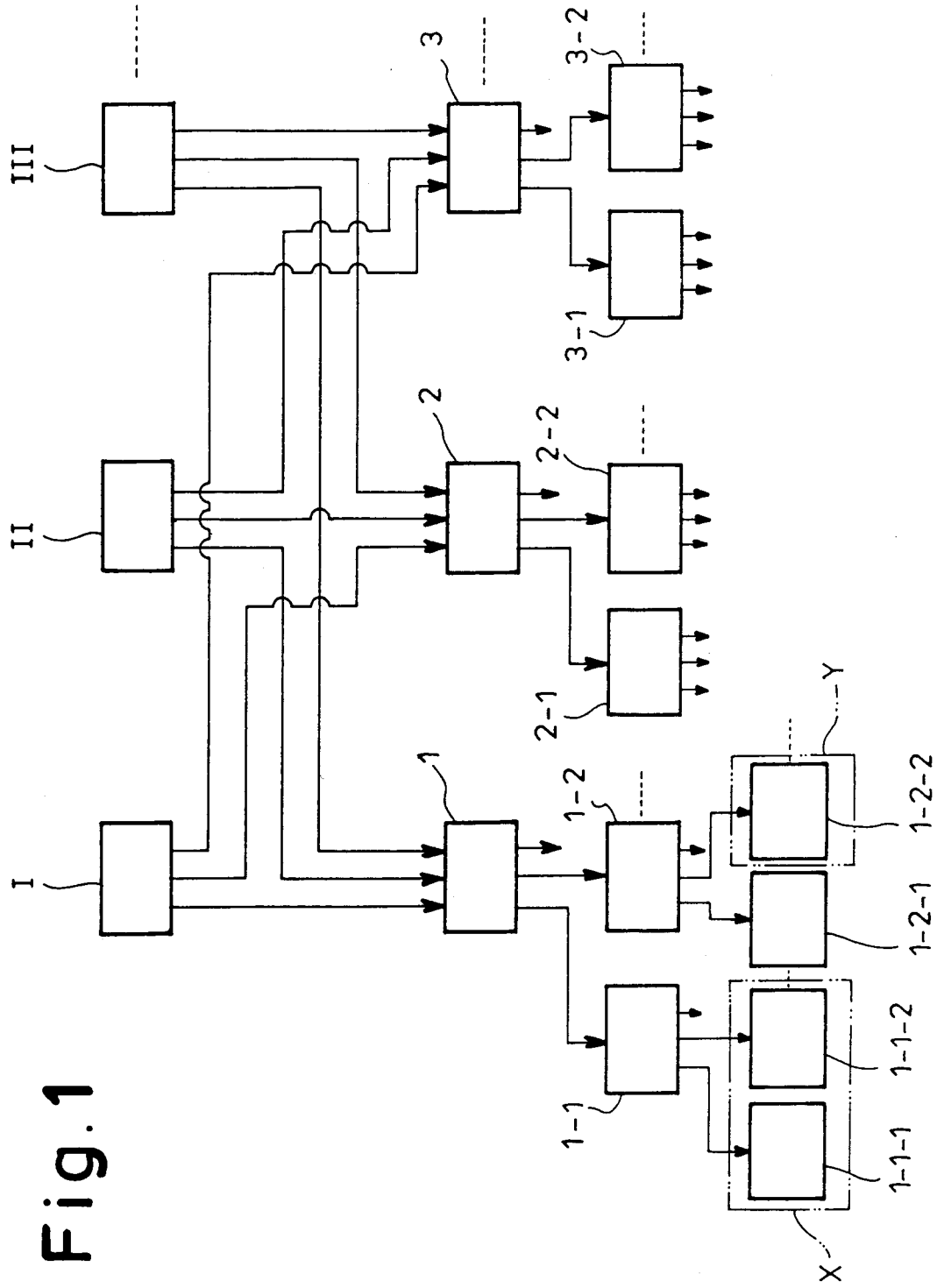
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Fig.1



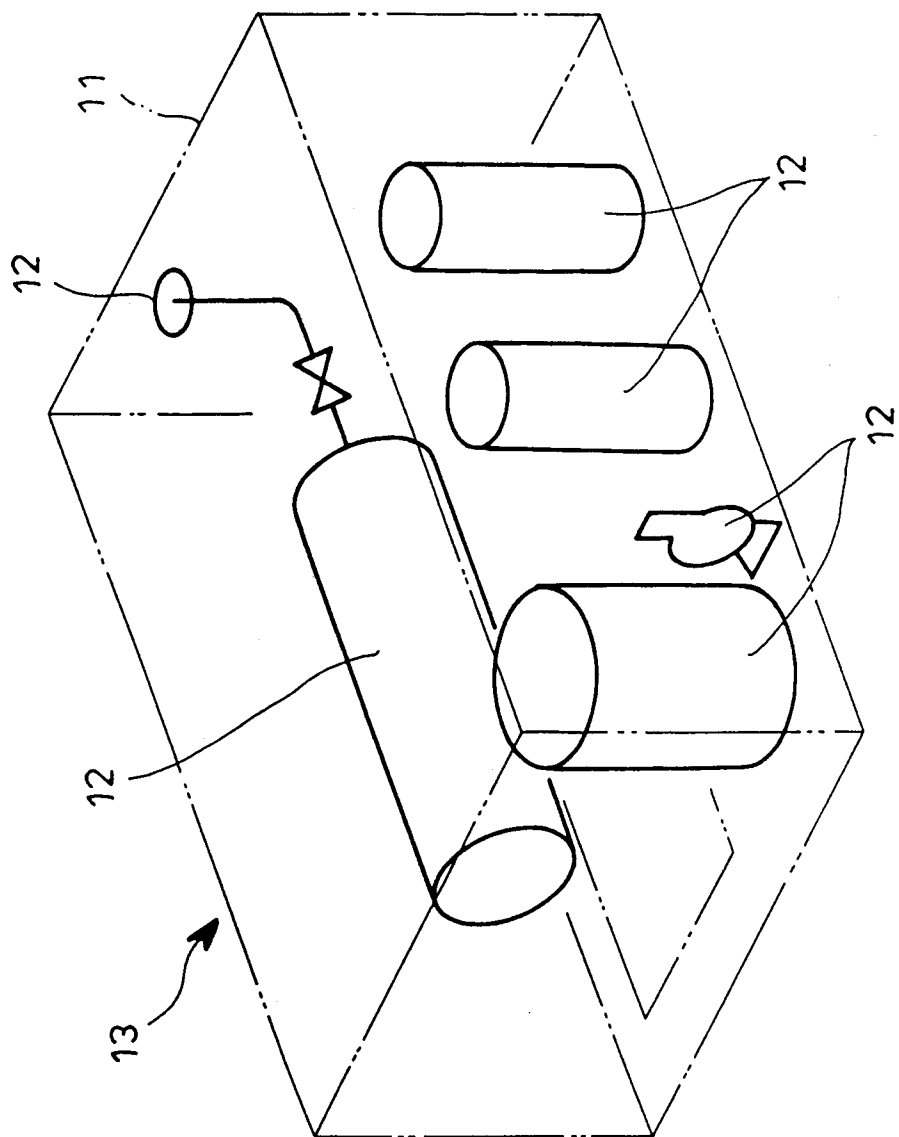


Fig. 2

Fig. 3

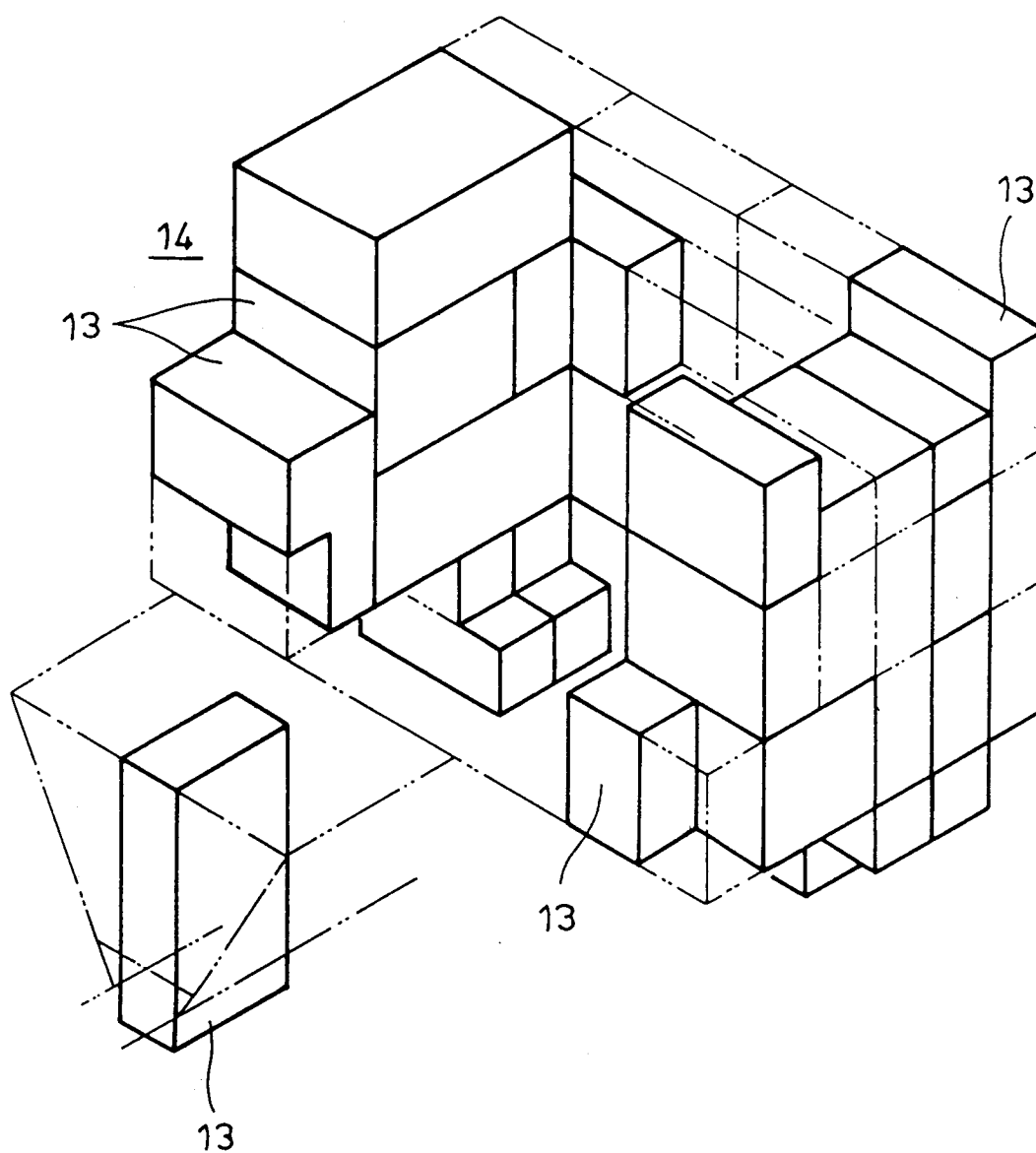
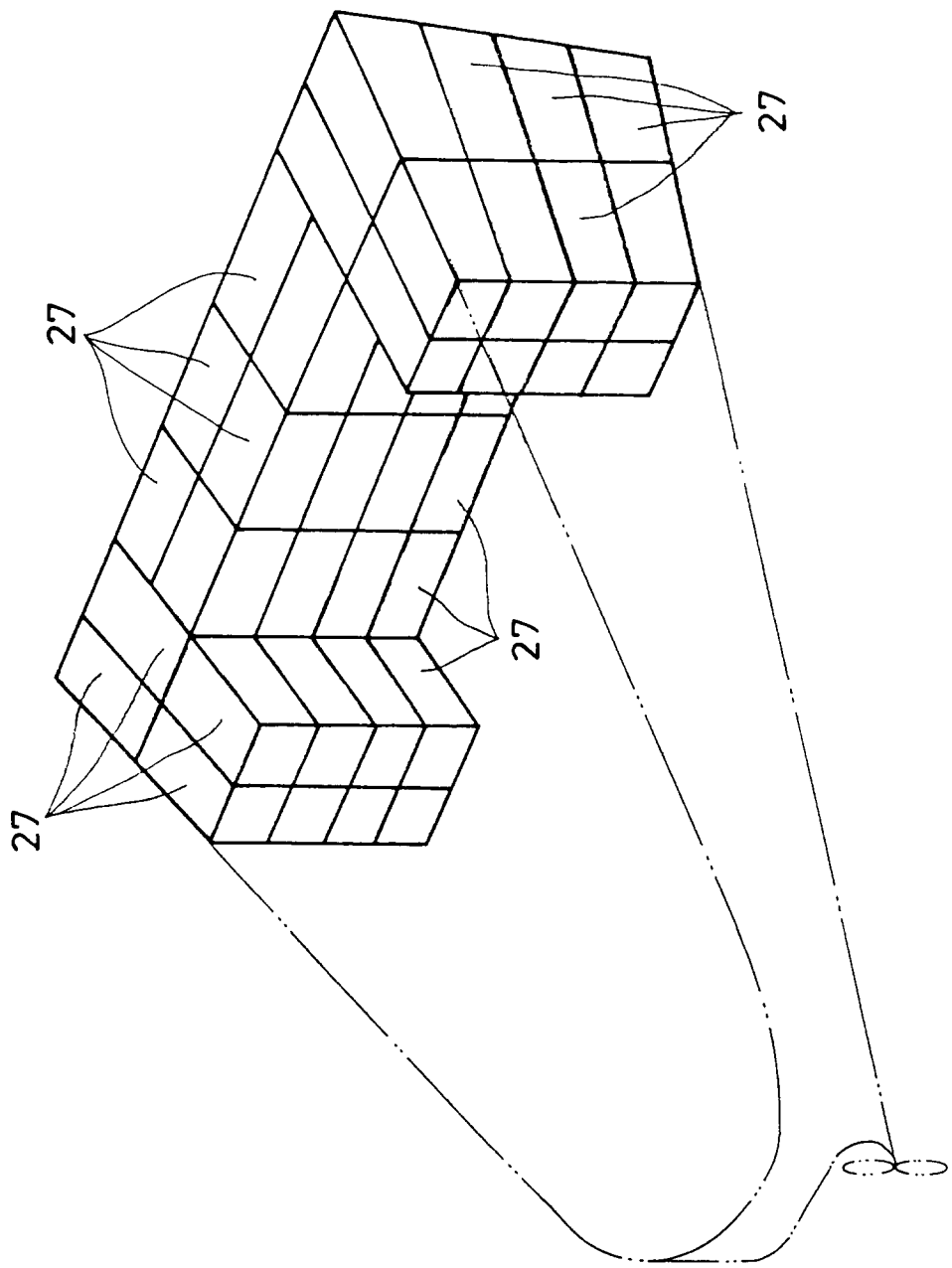


Fig. 4



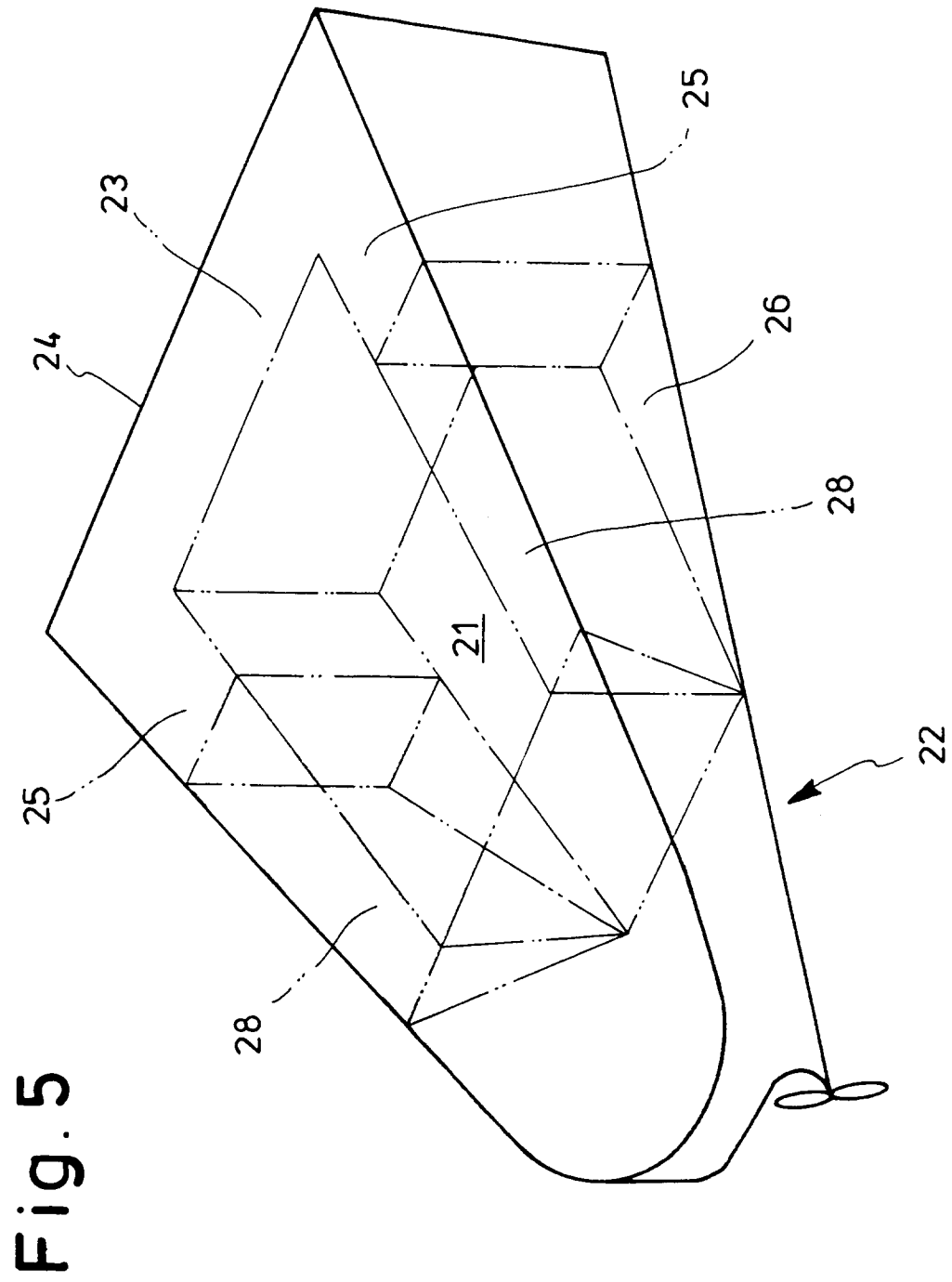


Fig. 6

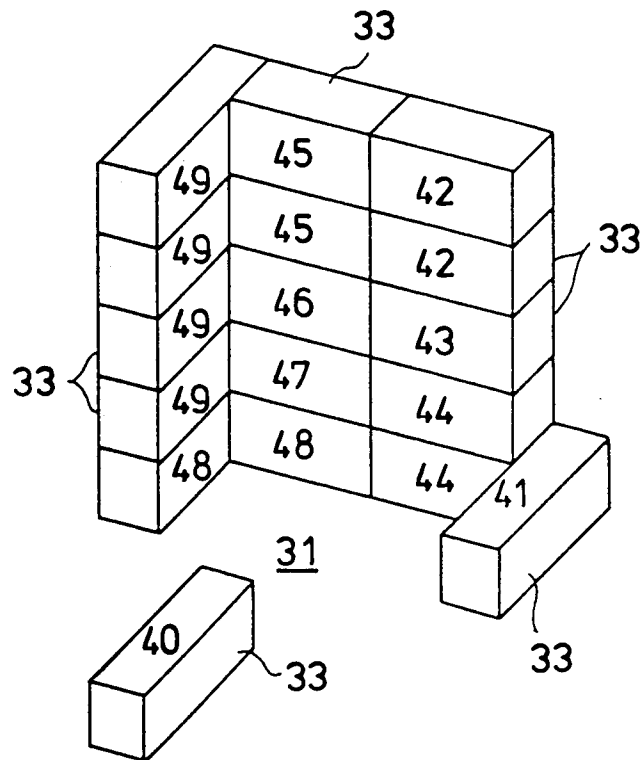


Fig. 7

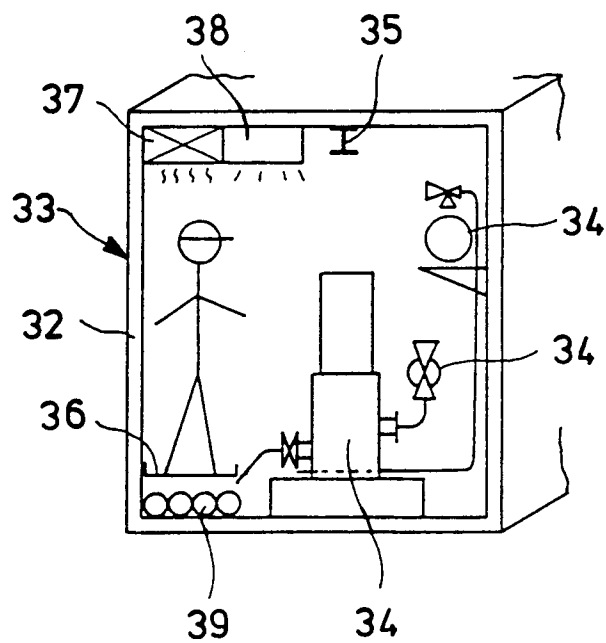


Fig. 8

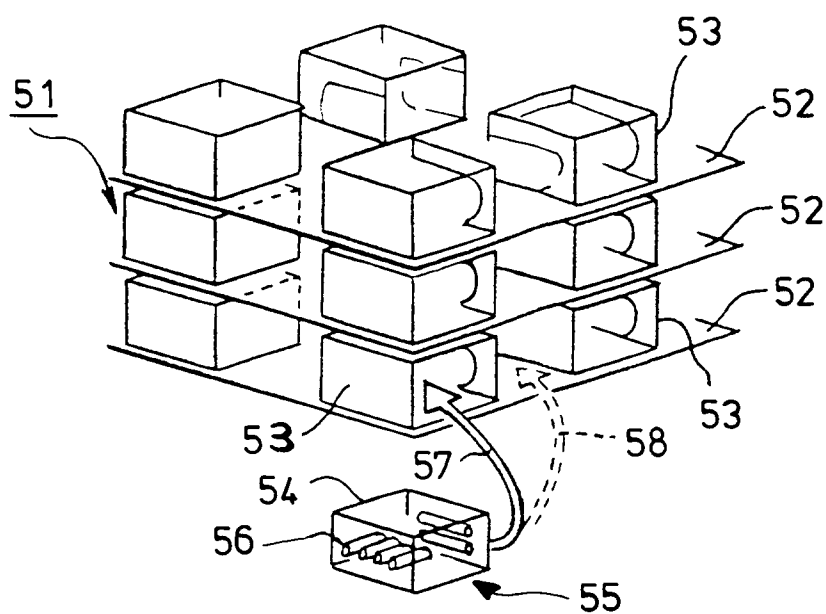


Fig. 9

