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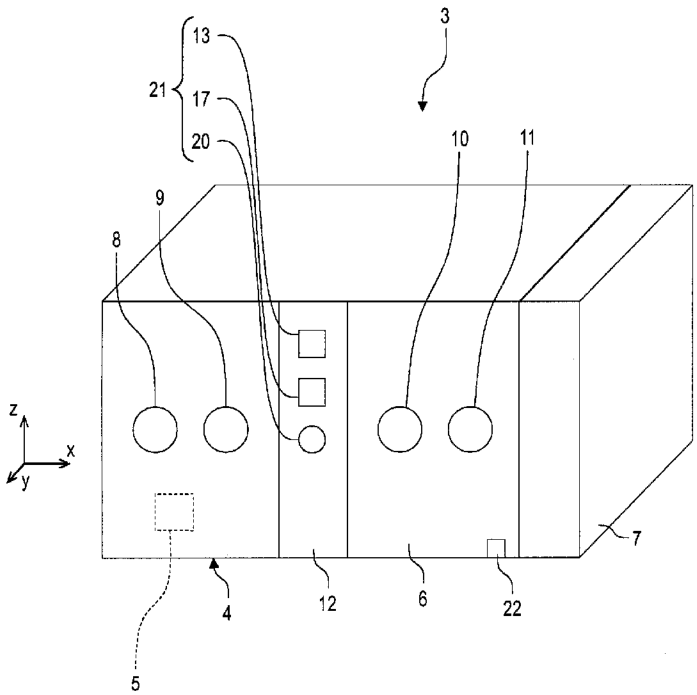


(57) Abrégé/Abstract:
A safety workbench (3) for a mobile laboratory (1), comprising: a working space (4) for examining a sample (5), and a measuring arrangement (21) which is configured to detect an impact load acting upon the working space (4) and to compare the same with a maximum permissible impact load.

# ABSTRACT

(Safety Workbench, Mobile Laboratory and Method)

A safety workbench (3) for a mobile laboratory (1), comprising: a working space (4) for examining a sample (5), and a measuring arrangement (21) which is configuredto detect an impact load acting upon the working space (4) and to compare the same with a maximum permissible impact load.

Fig. 2

# SAFETY WORKBENCH, MOBILE LABORATORY AND METHOD

The present invention relates to a safety workbench for a mobile laboratory, a mobile laboratory with such a safety workbench and a method for determining an impact load of such a safety workbench.

In accordance with DIN EN 12469, microbiological safety workbenches must be subjected to an installation test after each position change. Tested in such an installation test is whether leakages occur at the safety workbench, which were caused by the position change of the safety workbench. In mobile laboratories, such as vehicles, this results in such an installation test being required during or after each position change of the mobile laboratory. A frequent position change of such a mobile laboratory can therefore be associated with a significant financial and time expenditure.

DE 10 2009 052 013 A1 describes a safety workbench for examining nuclear, biological and/or chemical warfare agents that can be used in vehicles.

With this as the background, an object of the present invention consists in providing an improved safety workbench for a mobile laboratory.

Accordingly, a safety workbench for a mobile laboratory is proposed. The safety workbench comprises a working space for examining a sample, and a measuring arrangement which is configured to detect an impact load acting upon the working space and to compare the same with a maximum permissible impact load.

As a result of the measuring arrangement determining whether the maximum permissible impact load was exceeded in the at least one spatial direction, the installation test of the safety workbench can be limited to the installation test only being performed when the maximum permissible impact load is exceeded. Not necessarily required installation tests can be dispensed with as a result since it can be assumed as long as the maximum permissible impact load is not exceeded that the safety workbench does not have any leakages and that installation tests are therefore also not necessary. This results in a significant time and cost saving for the operation of a mobile laboratory with such a safety workbench. In addition to the position change, fields of application of testing for the necessity of the installation test are also, for example, the loading and unloading of the mobile laboratory onto or from a means of transportation, such as a motor truck, an aircraft, a watercraft or a rail vehicle, or during or after a mine explosion.

In particular, the measuring arrangement is configured to detect, in at least one spatial direction, the impact load acting upon the working space and to compare the same with a maximum permissible impact load acting in the at least one spatial direction. Preferably provided are three spatial directions that are in particular positioned to be orthogonal to each other. The measuring arrangement is preferably designed to detect the impact load as individual force vectors acting in the respective spatial direction and/or as resulting total force vector oriented in any way in relation to the spatial directions. The installation test is preferably required when the impact load acting as individual force vectors exceeds the maximum permissible impact load in the respective spatial direction. The installation test can however also be required when the individual force vectors do not yet exceed the maximum permissible impact load but the total force vector resulting from the impact load is greater than the maximum permissible impact load in at least one of the spatial directions in particular. When the maximum permissible impact load is exceeded, a signal that indicates the necessity of an installation retest can be emitted.

The installation test is preferably a tightness test or a test for leakages. The impact load can also be called shock load. The mobile laboratory can be a vehicle, such as a land vehicle, a rail vehicle, a watercraft or an aircraft. The safety workbench is preferably a microbiological safety workbench. The safety workbench can however also be suitable for examining chemical samples and/or nuclear-contaminated samples. The safety workbench can also be called mobile safety workbench, in particular mobile microbiological safety workbench. The fact that the safety workbench is "mobile" is in particular to be understood to mean that the safety workbench is sufficiently small, stable and/or lightweight to be installed in a vehicle.

The sample is preferably a microbiological sample. The impact load can be positive or negative. This means that the impact load can be a positive acceleration or a negative acceleration, or deceleration.

Within the scope of a defined test movement, in particular an off-road test drive, in a simulator or on a vibrating bench, the maximum permissible impact load of the safety workbench is recorded by means of the measuring arrangement. For this purpose, a negative pressure is preferably generated in the working space, and the pressure in the working space is detected during and after the test movement and recorded. During the test movement, no significant pressure change can preferably be measured. This ensures that a pressure change due to leakage did not occur during the test movement as a result of the mechanical load on the safety workbench. During the test movement, the occurring maximum impact load, i.e., maximum acceleration and deceleration values, are determined, programmed as limit values, and stored for optionally triggering an alarm by means of a signaling device. The recorded maximum impact loads are preferably programmed as limit values. They are in particular used to trigger alarms, i.e., as a means to the information whether an installation test must be performed after a position change or whether it can be omitted.

The measuring arrangement is preferably configured to detect the impact load in three axes or in three spatial directions, to store the same and to compare the same with the maximum permissible impact load. The measuring arrangement for measuring the impact load, i.e., for measuring the maximum acceleration or for measuring the maximum deceleration, preferably comprises at least one measuring device which can preferably record the impact load in three spatial directions. The measuring device is preferably assigned to the measuring arrangement. The measuring device can also be called impact sensor or shock sensor.

Measurement data of the measuring device are then preferably transferred via an interface to a computing unit with a storage medium. A so-called data logger, i.e., a process-controlled storage unit, which is electrically connected to the measuring arrangement or is assigned thereto, can, for example, function as the computing unit. This computing unit preferably receives measurement data from a measurement in a given predeterminable rhythm and stores them in the storage medium.

The determined and measured values are stored in the storage medium of the computing unit and are subsequently compared in the computing unit with the stored limit values.

For this purpose, the computing unit may comprise an evaluation unit, e.g., an integrated circuit, in particular a microchip. The signaling device is preferably connected downstream of the computing unit. The signaling device preferably generates a signal, in particular an alarm signal, during or after a position change of the mobile laboratory only if the impact load of the safety workbench during the position change exceeded at least one of the predetermined limit values with respect to the maximum permissible impact load. Corresponding information is however absent when the impact load is within the bounds of the preset limit values. The measurement data as well as the limit values can additionally be displayed on a display device, e.g., a monitor, in order to thus allow for an alternative, in particular manual, or additional check.

Alternatively as well as additionally, the measuring arrangement can also comprise a position and time determination system, such as GPS, GLONASS, Beidou, Galileo/GNSS or the like, or operate by means of such a system. In this case, a data profile of the position and time determination system can contain various vehicle data, such as of a jounce travel of a wheel suspension over time, but also data of an available terrain profile, which can be used to evaluate the impact load occurring during the position change. These data are preferably to be translated into a Cartesian coordinate system in order to be comparable with the limit values for the maximum impact load.

According to an embodiment, the safety workbench comprises a signaling device which is designed to emit a signal as soon as the detected impact load exceeds the maximum permissible impact load.

By means of the signaling device, it can be clearly perceived when an installation test must be performed and when it can be omitted. The signaling device can also be embodied as a display device, e.g., a monitor, or comprise a display device.

According to a further embodiment, the signaling device is designed to emit an optical and/or acoustic signal.

For this purpose, the signaling device can comprise an optical signal generator, such as a light-emitting diode or the like. The signaling device can also comprise an acoustic signal generator. The signaling device can also be a screen or a monitor on which the detected impact load is displayed. Alternatively, a display device, in particular a monitor, can be provided in addition to the signaling device. The maximum permissible impact load is programmed, in particular in each spatial direction, as limit value for triggering an alarm. As long as this limit value is not exceeded, it can be assumed that the position change did not result in leakages at the working space, as a result of which an installation test can be omitted.

According to a further embodiment, the measuring arrangement comprises a measuring device which is configured to detect the impact load acting upon the working space, and a computing unit in which the maximum permissible impact load is stored and which is configured to compare the impact load detected by means of the measuring device with the maximum permissible impact load.

The measuring device is in particular configured to detect the impact load acting upon the working space in the at least one spatial direction. The maximum permissible impact load acting in the at least one spatial direction is preferably stored in the computing unit. The computing unit preferably comprises a storage medium in which the maximum permissible impact load acting in the at least one spatial direction is stored. The computing unit can be a so-called data logger. The computing unit can comprise the measuring device and/or the signaling device. The computing unit is preferably connected to the measuring device by means of an interface. The measuring device can comprise one or more sensors, in particular acceleration sensors. As mentioned above, the computing unit can comprise an evaluation unit, e.g., an integrated circuit.

According to a further embodiment, the measuring device is configured to detect, in three different spatial directions, the impact load acting upon the working space, wherein a maximum permissible impact load for each spatial direction is stored in the computing unit, and wherein the computing unit controls a signaling device such that the latter emits a signal as soon as the detected impact load exceeds the maximum permissible impact load in at least one of the spatial directions.

Preferably provided are one first spatial direction or x direction, one second spatial direction or y direction and one third spatial direction or z direction. The three spatial directions preferably form a coordinate system. The measuring device can also be configured to detect a respective rotational movement about the spatial directions. The measuring device can comprise torque sensors or yaw sensors for this purpose. The computing unit also controls the signaling device when the detected impact load exceeds the maximum permissible impact load in two of the three spatial directions or in all three spatial directions. The signaling device is however controlled whenever the maximum permissible impact load is already exceeded in only one of the spatial directions. As mentioned above, the signaling device can however also be controlled when the individual force vectors do not yet exceed the maximum permissible impact load but the total force vector resulting from the impact load is greater than the maximum permissible impact load in at least one of the spatial directions in particular.

According to a further embodiment, the measuring device comprises at least one acceleration sensor.

The acceleration sensor can be designed to detect the acceleration of the safety workbench in the first spatial direction, in the second spatial direction and in the third spatial direction. Alternatively, the measuring device can also comprise a separate acceleration sensor for each spatial direction. The measuring device can alternatively or additionally also comprise or use a position and time determination system.

According to a further embodiment, the measuring device is configured to detect, in the at least one spatial direction during a position change of the safety workbench, the impact load acting upon the working space.

This means that the measuring device detects the impact load acting upon the working space while the safety workbench moves together with the mobile laboratory. Transportation or vibration of the safety workbench, e.g., during loading of the same or during a mine explosion, is also considered as a position change within the scope of the present invention.

A mobile laboratory, in particular a vehicle, with such a safety workbench is also proposed.

The vehicle can, for example, be a rail vehicle, a land vehicle, a watercraft or an aircraft. The mobile laboratory can comprise several such safety workbenches.

A method for determining an impact load of a safety workbench for a mobile laboratory is furthermore proposed. The method comprises the following steps: Detecting an impact load acting upon a working space of the safety workbench and comparing the detected impact load with a maximum permissible impact load.

In particular, the impact load acting upon the working space is detected in the method in at least one spatial direction and compared with a maximum permissible impact load acting in the at least one spatial direction. The impact load is preferably detected in the method as individual force vectors acting in the respective spatial direction and/or as resulting total force vector oriented in any way in relation to the spatial directions. The steps of detecting and comparing can be performed one after the other or simultaneously. The measuring arrangement described above is used for this purpose. The comparison can also be performed visually, e.g., at a screen. By means of the method, it can thus be determined whether an installation retest of the safety workbench is required or whether it can be dispensed with. This makes a cost and time saving possible.

According to one embodiment, a signal is emitted as soon as the detected impact load exceeds the maximum permissible impact load.

The signal can be optical and/or acoustic. The signaling device, which can comprise an optical and/or acoustic signal generator, is provided for this purpose.

According to a further embodiment, the impact load acting upon the working space is detected in three different spatial directions, wherein the impact load detected in each spatial direction is compared with a maximum permissible impact load assigned to the respective spatial direction, and wherein a signal is emitted as soon as the detected impact load exceeds the maximum permissible impact load in at least one of the spatial directions.

The signal is in particular also emitted as soon as the detected impact load exceeds the maximum permissible impact load in two of the three spatial directions or in all three spatial directions. As mentioned above, the signal can however also be emitted when the individual force vectors do not yet exceed the maximum permissible impact load but the total force vector resulting from the impact load is greater than the maximum permissible impact load in at least one of the spatial directions in particular.

According to a further embodiment, an installation test is performed on the safety workbench as soon as the detected impact load exceeds the maximum permissible impact load.

The installation test comprises a leakage or tightness test. The installation test comprises applying a negative pressure to the working space and detecting and recording a pressure profile during a predetermined time period. If no pressure change or only a slight pressure change takes place during the predetermined time period, it can be assumed that no leakages occur at the safety workbench. The safety workbench can then be put into operation.

According to a further embodiment, the maximum permissible impact load is determined during a test movement of the safety workbench, in particular during an off-road test drive, on a vibrating bench or a simulator.

The test movement preferably includes particularly extreme maneuvers that are generally not achieved during operation of the mobile laboratory. This can ensure that a maximum impact load as large as possible is determined. This ensures that a signal is not already emitted in the method when an installation test is not yet required.

According to a further embodiment, a negative pressure is applied to the working space during the test movement.

Thereby, an inlet air filter and an outlet air filter of the safety workbench are preferably closed. The pressure reduction is measured and recorded during the predetermined time period. The same procedure can also be performed after the test movement.

According to a further embodiment, a pressure change in the working space is determined during the test movement and after the test movement.

The pressure change is preferably so minor that no significant leakage of the working space can be determined. The pressure change does not have to be zero. A pressure loss of the safety workbench before the test movement and a pressure loss after the test movement should not differ significantly from each other. In this case, it can be assumed that no leakage is present.

In some embodiments disclosed herein, there is provided a safety workbench for a mobile laboratory, comprising: a working space for examining a sample, a measuring arrangement which is configured to detect an impact load acting upon the working space and to compare the same with a maximum permissible impact load, wherein the measuring arrangement comprises a measuring device which is designed to detect the impact load acting upon the working space, and a computing unit in which the maximum permissible impact load is stored and which is configured to compare the impact load detected by means of the measuring device with the maximum permissible impact load, and a signaling device which is configured to emit a signal as soon as the detected impact load exceeds the maximum permissible impact load.

In some embodiments disclosed herein, there is provided a method for determining an impact load of a safety workbench for a mobile laboratory, comprising the following steps: detecting an impact load acting upon a working space of the safety workbench by means of a measuring arrangement which is configured to detect the impact load, wherein the measuring arrangement comprises a measuring device which is designed to detect the impact load, comparing the detected impact load with a maximum permissible impact load by means of the measuring arrangement, wherein the measuring arrangement comprises a computing unit in which the maximum permissible impact load is stored and which is configured to compare the impact load detected by means of the measuring device with the maximum permissible impact load, and emitting a signal as soon as the detected impact load exceeds the maximum permissible impact load by means of a signaling device.

Additional possible implementations of the safety workbench, the mobile laboratory and/or the method also comprise not explicitly mentioned combinations of features or embodiments described above or below with respect to exemplary embodiments. In this case, the person skilled in the art will also add individual aspect as improvements or additions to the respective basic form of the safety workbench, of the mobile laboratory and/or of the method.

Additional advantageous embodiments and aspects of the safety workbench, of the mobile laboratory and/or of the method are the subject matter of the dependent claims and of the exemplary embodiments of the safety workbench, of the mobile laboratory and/or of the method described below. The safety workbench, the mobile laboratory and/or the method are explained in more detail below with reference to the enclosed figures.

Fig. 1 shows a schematic view of an embodiment of a mobile laboratory;

Fig. 2 shows a schematic perspective view of an embodiment of a safety workbench for the mobile laboratory according to Fig. 1;

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Fig. 3 shows a schematic view of an embodiment of a measuring arrangement for the safety workbench according to Fig. 2; and

Fig. 4 shows a schematic block diagram of an embodiment of a method for determining an impact load of the safety workbench according to Fig. 2.

Unless otherwise indicated, identical or functionally identical elements are provided with the same reference signs in the figures.

Fig. 1 shows a schematic lateral view of an embodiment of a mobile laboratory 1. The mobile laboratory 1 can be a vehicle, in particular a motor vehicle. The vehicle can alternatively also be a rail vehicle, a watercraft or an aircraft. The vehicle can in particular be a military vehicle. The vehicle can however also be used in civilian applications. The mobile laboratory 1 comprises a laboratory space 2 in which a safety workbench 3, in particular a microbiological safety workbench, can be installed. By means of the mobile laboratory 1, a position change of the safety workbench 3 can be carried out.

One embodiment of such a safety workbench 3 is shown in Fig. 2. The safety workbench 3 comprises a working space 4 for examining a sample 5. The sample 5 is preferably a microbiological sample. The working space 4 can be designed in the shape of a cuboid. The working space 4 can also be called glove box. The working space 4 comprises a front wall 6 which is designed to be at least partially transparent. A transfer lock 7 for loading and unloading the sample 5 into or from the working space 4 can furthermore be provided on the working space 4. The sample 5 can be observed through the transparent front wall 6. As shown in Fig. 2, the transfer lock 7 can be provided on the sides of the working space 4. The transfer lock 7 can however also be provided at any other point of the working space 4. The transfer lock 7 can be part of the working space 4.

Any number of glove ports 8 to 11 can be provided on the front wall 6. For example, four such glove ports 8 to 11 can be provided. The number of glove ports 8 to 11 is however arbitrary. By means of the glove ports 8 to 11, the sample 5 located in the working space 4 can be handled for its examination.

The safety workbench 3 furthermore comprises an operating area 12. The operating area 12 can, for example, be provided on the front side of the working space 4. The operating area 12 can however also be a component that is separate from the working space 4. For example, the operating area 12 can be arranged below or above the working space 4.

The safety workbench 3 furthermore comprises a measuring device 13 which is configured to detect, in at least one spatial direction x, y, z, an impact load acting upon the working space 4. The measuring device 13 is preferably configured to detect, in at least a first spatial direction or x direction x, in a second spatial direction or y direction y and in a third spatial direction or z direction z, the impact load acting upon the working space 4. By means of the measuring device 13, accelerations and decelerations acting in particular in the three spatial directions x, y, z can be detected. A deceleration within the scope of the present invention is to be understood as a negative acceleration.

As shown in Fig. 3, the measuring device 13 can comprise an acceleration sensor 14 for detecting the impact load. The acceleration sensor 14 can be configured to detect the acceleration in all three spatial directions x, y, z. Alternatively, the measuring device 13 can also comprise a first acceleration sensor 14 which is configured to detect the impact load in the first spatial direction x, a second acceleration sensor 15 which is configured to detect the impact load in the second spatial direction y, and a third acceleration sensor 16 which is configured to detect the impact load in the third spatial direction z.

Alternatively or additionally to the acceleration sensors 14 to 16, the measuring device 13 can also determine the impact load in the three spatial directions x, y, z by means of a position and time determination system. A data profile of the position and time determination system can include various vehicle data, such as a jounce travel of a wheel suspension over time, or terrain data, which can be used to evaluate the impact load occurring during the movement of the mobile laboratory 1.

In addition to the measuring device 13, the safety workbench 3 can also comprise a computing unit 17. The computing unit 17 can be a so-called data logger. A data logger is a process-controlled storage unit which receives data in a given rhythm via an interface and stores them in a storage medium 18. The computing unit 17 can comprise the measuring device 13. The computing unit 17 comprises the storage medium 18 in which a maximum permissible impact load is stored for each of the three spatial directions x, y and z. The computing unit 17 is configured to compare the impact load detected by means of the measuring device 13 in each of the three spatial directions x, y, z with the maximum permissible impact load in the respective spatial direction x, y, z. For this purpose, the computing unit 17 may comprise an evaluation unit 19, e.g., an integrated circuit, in particular a microchip.

The safety workbench 3 furthermore comprises a signaling device 20 which can be controlled by means of the computing unit 17. The signaling device 20 can in particular be controlled by the computing unit 17 such that the signaling device 20 emits a signal as soon as the detected impact load for one of the spatial directions x, y, z exceeds the maximum permissible impact load for the respective spatial direction x, y, z. The signaling device 20 can be configured to emit an optical and/or acoustic signal. For this purpose, the signaling device 20 can, for example, comprise a warning lamp and/or an acoustic signal generator.

The signaling device 20 can also be a display device, such as a monitor, on which the detected impact load is displayed. Alternatively, a display device, such as a monitor, can also be provided in addition to the signaling device 20. The measuring device 13, the computing unit 17 and the signaling device 20 form a measuring arrangement 21 of the safety workbench 3. The safety workbench 3 furthermore comprises a pressure sensor 22 with which a pressure prevailing in the working space 4 can be detected. The pressure sensor 22 can also be assigned to the measuring arrangement 21.

The functionality of the safety workbench 3 is explained below with reference to Figures 1 to 3 and to Fig. 4, which shows a block diagram of an embodiment of a method for determining an impact load of the safety workbench 3.

In order to determine the maximum permissible impact load, in particular the maximum permissible acceleration and deceleration, in the three spatial directions x, y, z, a defined negative pressure is first generated in the working space 4 of the safety workbench 3. To this end, an inlet air filter and an outlet air filter of the safety workbench 3 are preferably closed. A test movement, in particular a test drive, with the mobile laboratory 1 is subsequently carried out under conditions that are as extreme as possible. This test movement can, for example, take place as an off-road test drive, wherein driving maneuvers as extreme as possible are performed in order to achieve great accelerations and decelerations in the three spatial directions x, y, z.

Alternatively, the test movement can also be performed stationarily on a simulator or a vibrating bench. During the test movement, measurements are taken by means of the pressure sensor 22 and recorded by means of the computing unit 17, for example. A separate computing unit can also be assigned to the pressure sensor 22. In this case, it is determined whether and how strongly the pressure in the working space 4 increases. The test movement is in this case not performed until an increased leakage rate, i.e., a pressure increase, can be determined, but preferably only a test movement is performed under extreme conditions which are usually not achieved during normal operation of the mobile laboratory 1. After carrying out the test movement, the pressure in the working space 4 is monitored during a defined time interval as during the test movement. If no significant pressure increase is determined, it can be assumed that no leakage is present.

In the method for determining an impact load of the safety workbench 3, the impact load acting upon the working space 4 of the safety workbench 3 is detected in at least one of the three spatial directions x, y, z during a position change of the mobile laboratory 1, after the maximum permissible impact load in the three spatial directions x, y, z was determined in a step S1. However, the impact load acting upon the working space 4 is preferably detected in all three spatial directions x, y, z. The measuring arrangement 21 serves this purpose.

In a step S2, which can be carried out after or simultaneously with step S1, the detected impact load is compared by means of the computing unit 17 with the maximum permissible impact load acting in the respective spatial direction x, y, z. By means of the signaling device 20, a corresponding signal can be emitted when the detected impact load exceeds the maximum permissible impact load in at least one of the spatial directions x, y, z.

If it is now determined in step S2 that the detected impact load exceeds the maximum permissible impact load, a corresponding signal is emitted by means of the signaling device 20 as mentioned above. An installation test of the safety workbench 3 is furthermore performed as soon as the detected impact load exceeds the maximum permissible impact load in at least one spatial direction x, y, z. For this purpose, as described above, a negativepressure is generated in the working space 4, the change of which pressure is measured and recorded during a defined time period. If the negative pressure in the working space 4 does not change significantly, the safety workbench 3 can be put into operation.

In comparison to known microbiological safety workbenches, a time-consuming and cost-intensive installation test is thus not required for the safety workbench 3 after each position change. The installation test is only required if the maximum permissible impact load was actually exceeded in one of the three spatial directions x, y, z.

Although the present invention was described based on exemplary embodiments, it can be modified in various ways.

## LIST OF REFERENCE SIGNS

| | |
|---|---|
| 1 | laboratory |
| 2 | laboratory space |
| 3 | safety workbench |
| 4 | working space |
| 5 | sample |
| 6 | front wall |
| 7 | transfer lock |
| 8 | glove port |
| 9 | glove port |
| 10 | glove port |
| 11 | glove port |
| 12 | operating area |
| 13 | measuring device |
| 14 | acceleration sensor |
| 15 | acceleration sensor |
| 16 | acceleration sensor |
| 17 | computing unit |
| 18 | storage medium |
| 19 | evaluation unit |
| 20 | signaling device |
| 21 | measuring arrangement |
| 22 | pressure sensor |
| S1 | step |
| S2 | step |
| x | x direction |
| y | y direction |
| z | z direction |

<u>CLAIMS:</u>

1. Safety workbench for a mobile laboratory, comprising:

a working space for examining a sample,

a measuring arrangement which is configured to detect an impact load acting upon the working space and to compare the same with a maximum permissible impact load, wherein the measuring arrangement comprises a measuring device which is designed to detect the impact load acting upon the working space, and a computing unit in which the maximum permissible impact load is stored and which is configured to compare the impact load detected by means of the measuring device with the maximum permissible impact load, and

a signaling device which is configured to emit a signal as soon as the detected impact load exceeds the maximum permissible impact load.

2. Safety workbench according to claim 1,

wherein

the signaling device is configured to emit an optical and/or acoustic signal.

3. Safety workbench according to claim 1 or 2,

wherein

the measuring device is configured to detect, in three different spatial directions, the impact load acting upon the working space, a maximum permissible impact load for each spatial direction is stored in the computing unit, and the computing unit controls a signaling device such that the latter emits a signal as soon as the detected impact load exceeds the maximum permissible impact load in at least one of the spatial directions.

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4. Safety workbench according to any one of claims 1 to 3,

wherein

the measuring device comprises at least one acceleration sensor.

5. Safety workbench according to any one of claims 1 to 4,

wherein

the measuring device is configured to detect the impact load acting upon the working space in the at least one spatial direction during a position change of the safety workbench.

6. Mobile laboratory comprising a safety workbench according to any one of claims 1 to 5.

7. Mobile laboratory according to claim 6,

wherein

the mobile laboratory is a vehicle.

8. Method for determining an impact load of a safety workbench for a mobile laboratory, comprising the following steps:

detecting an impact load acting upon a working space of the safety workbench by means of a measuring arrangement which is configured to detect the impact load, wherein the measuring arrangement comprises a measuring device which is designed to detect the impact load,

comparing the detected impact load with a maximum permissible impact load by means of the measuring arrangement, wherein the measuring arrangement comprises a computing unit in which the maximum permissible

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impact load is stored and which is configured to compare the impact load detected by means of the measuring device with the maximum permissible impact load, and

emitting a signal as soon as the detected impact load exceeds the maximum permissible impact load by means of a signaling device.

9. Method according to claim 8,

wherein

the impact load acting upon the working space is detected in three different spatial directions, the impact load detected in each spatial direction is compared with a maximum permissible impact load assigned to the respective spatial direction, and a signal is emitted as soon as the detected impact load exceeds the maximum permissible impact load in at least one of the spatial directions.

10. Method according to claim 8 or 9,

wherein

an installation test is performed on the safety workbench as soon as the detected impact load exceeds the maximum permissible impact load.

11. Method according to any one of claims 8 to 10,

wherein

the maximum permissible impact load is determined during a test movement of the safety workbench on a vibrating bench or a simulator.

12. Method according to claim 11,

wherein

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the maximum permissible impact load is determined during a test movement during an off-road test drive.

13. Method according to claim 11 or 12,

wherein

a negative pressure is applied to the working space during the test movement.

14. Method according to any one of claims 8 to 13,

wherein

a pressure change in the working space is determined during the test movement and after the test movement.

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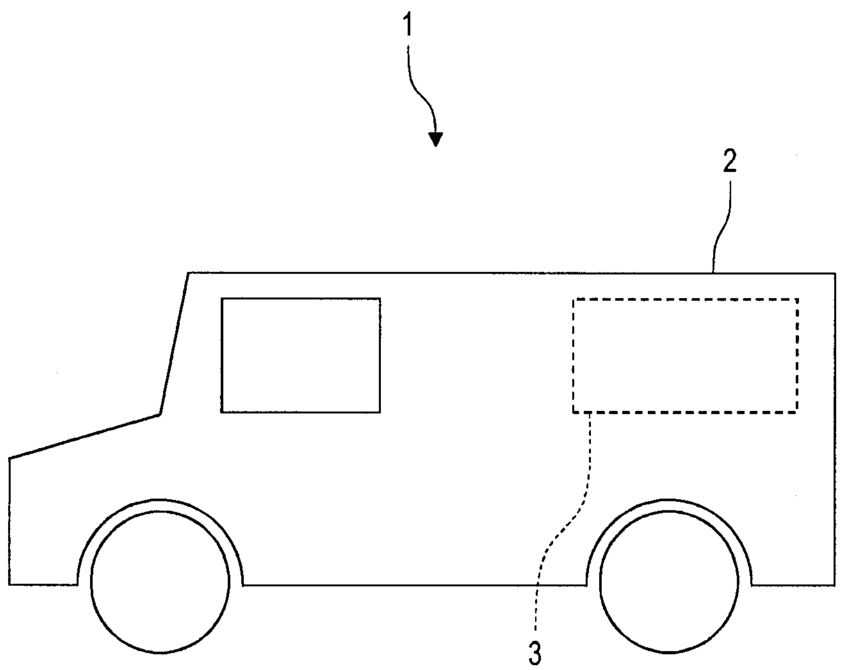



Fig. 1

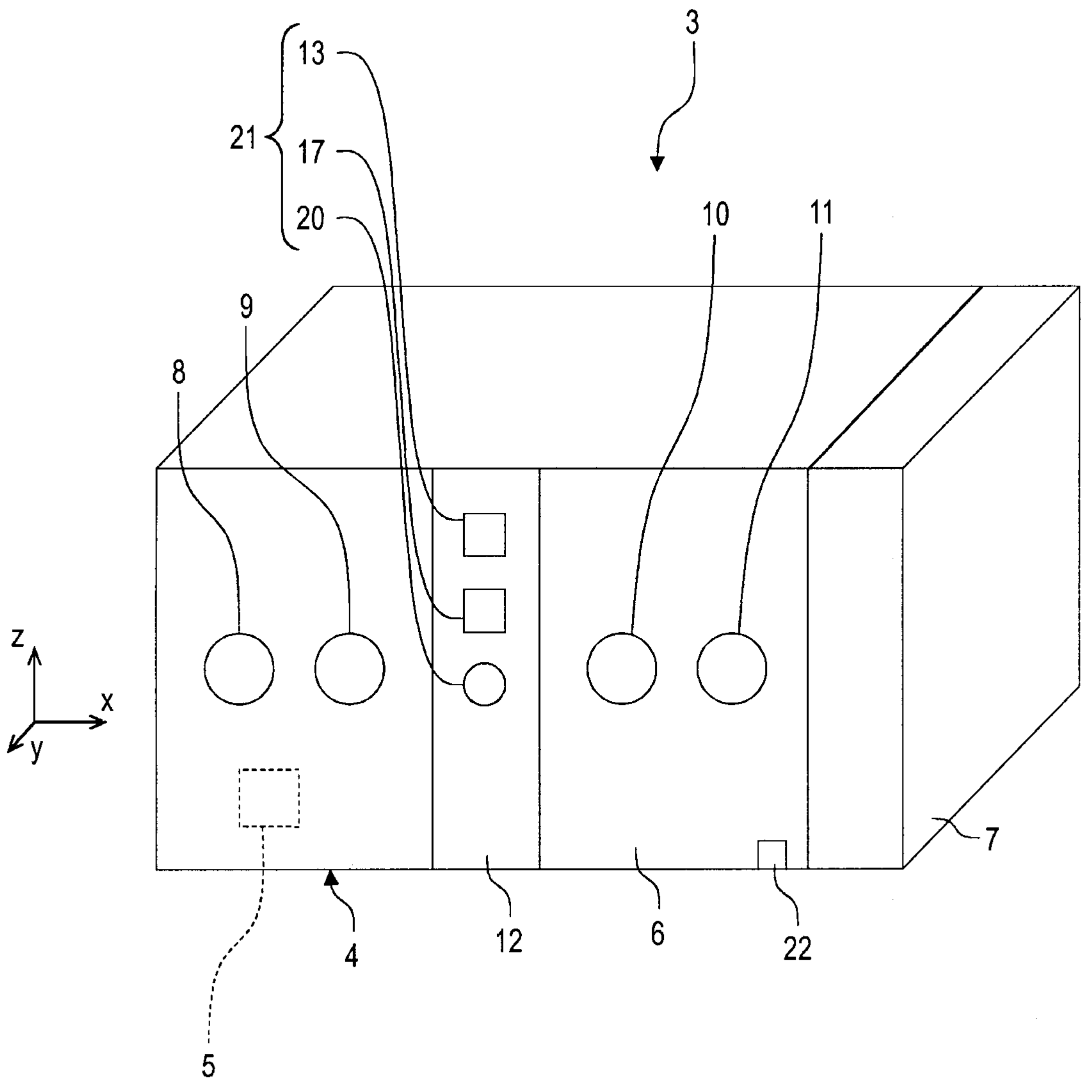



Fig. 2

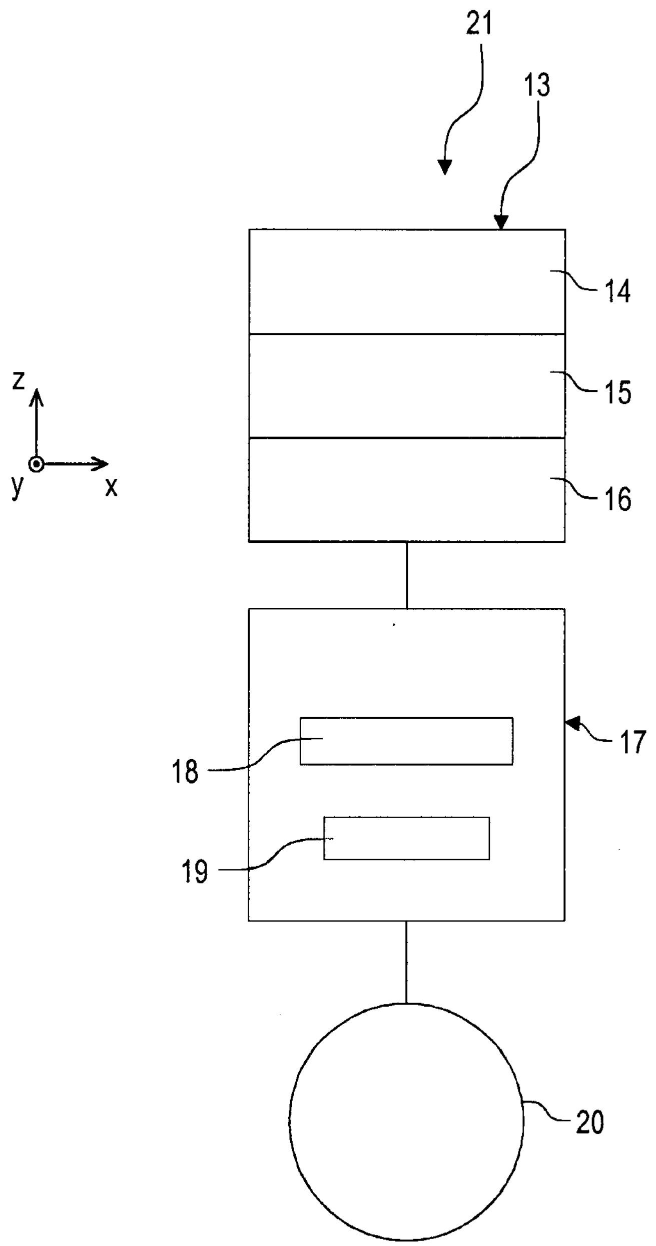



Fig. 3

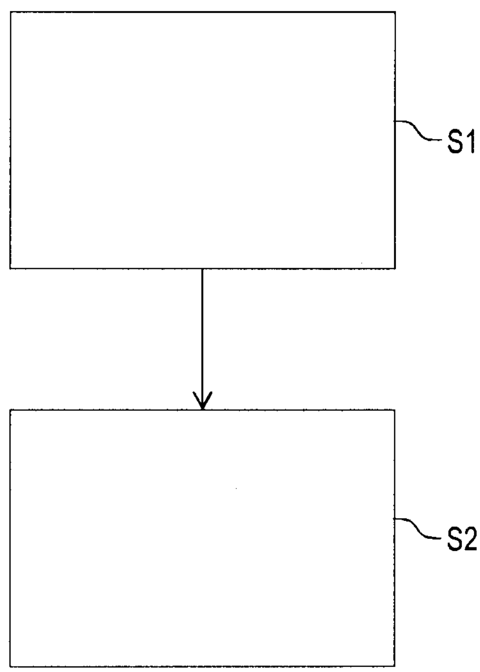
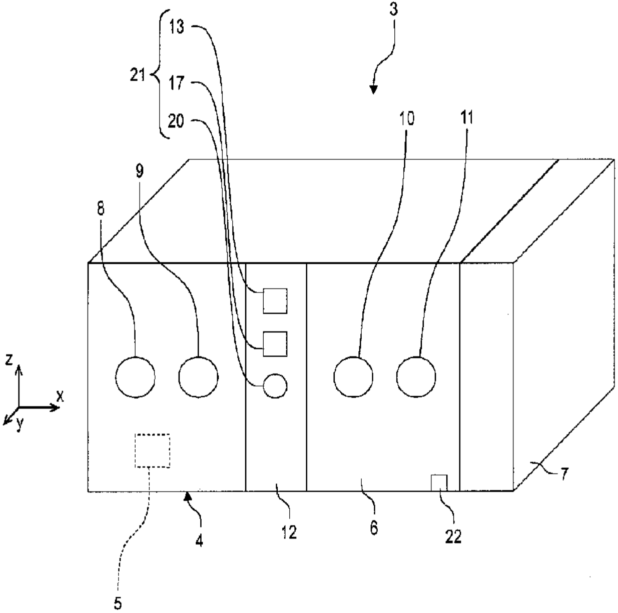



Fig. 4



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