Title: TOOL FOR ESTIMATING OF WORKING ABILITY OF A PERSON

Abstract: The objective of the invention is a tool for estimating of working ability of a person, which tool comprises at least two layers (1, 2, 3), which have been formed mostly of different, removable from each other pieces (4, 5, 6). The tool in accordance with the invention comprises a removable attaching tool (7, 8) placed between the layers for joining the layers together.

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— with international search report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.
TOOL FOR ESTIMATING OF WORKING ABILITY OF A PERSON

The present invention relates to a tool for estimating of working ability of a person which tool comprises at least two layers, which have been formed of different kind of removable pieces.

Great changes happen in working life nowadays and many people have to change working places more often than earlier during their working life. In addition, more physical, psychological and/or social stress than earlier is directed to people in work as well as during their leisure time. Therefore, for estimating of working ability of a person more comprehensive studies and research are needed as well as tools for those. In studies, physical, psychological, social and vocational qualifications of a person in coping with work are estimated.

There are very few estimating methods for versatile measuring of practical working ability. The methods in use have the main stress on separate estimations of physical working ability and psychological tests. In the first phase of studies, so-called initial mapping tasks are applied. An initial mapping task is a practical task typifying work, which task a person client carries out in the initial phase of studying or rehabilitation period related to a vocational rehabilitation, for example. The purpose of initial mapping tasks is to gather a good general picture of practical working ability and functional capacity of a person. On these grounds following tasks are given in the future and suitability of different tasks to the person is estimated.

For initial mapping of working ability, technically oriented initial mapping tasks have been used. One of the tasks is assembling of a lock. In the task, a person works following written instructions assembling a whole padlock out of parts. In case problems appear during the work, more instructions will be given to the person. The person practises assembling first for about an hour and after this he assembles ten locks as fast as he can. Temporally a performance of less than seven and a half minutes is estimated as good or excellent. A performance of over twelve minutes is estimated as poor.

Another task for initial mapping task is drawing, disconnecting and connecting of a series of wires following oral instructions. The oral instructions are given with similar content to all rehabilitants. Additional instructions are given while needed also in the wire task. A person draws a diagram of connections on a cross-ruled paper using a ruler. After the person has finished drawing, a working test instructor checks the drawing, after which the person disconnects the wires from the diagram.
After this, the person starts to connect the wires according to his own drawing. In this task, the time spent for the task and the tidiness of the work are estimated.

The used tasks are light tasks in terms of physical stress to be carried out in sitting or in standing position at a table plane. The tasks have been taken into use over 20 years ago. Along with general changes related to work, there is also a need to develop methods estimating more versatile working ability.

The objective of the invention is to provide a tool for estimating of working ability of a person with the use of which improvements to methods and devices today in use are created. In addition, the objective of the invention is to provide a tool, with which it is possible to versatile estimate the working ability and functioning capacity of a person in terms of physical, cognitive and psychosocial components.

The objective of the invention is accomplished by a tool, the characteristics of which are presented in the claims.

The tool in accordance with the invention comprises a removable attaching tool locating between layers placed one on top of the other for connecting the layers together. In this case, to be able to disconnect the layers also the attaching tool must be removed, which must be carried out in a way differing from the way of removing the pieces in the layers and the functioning is versatile and complicated.

In an advantageous application of the invention, there are three or more layers in the tool. In this case, the estimating task is more difficult and working ability may be measured more versatile than while using two layers.

In the next advantageous additional application of the invention, the area of the upper layer of the tool is smaller than the area of the pieces of the layer located lower than it. Therefore, the area of the upper most layer is smaller than that of the next layer and so on, in which case, all layers are partly visible when the tool is assembled. Due to the shape of the tool, more versatility is gained for the task.

In the next advantageous additional application of the invention, the tool has been placed on a plane to be vertically adjusted. The functional capacity pyramid contains, in this case, physical stress and the task must be carried out in standing position and it is possible for the person to adjust the working plane to needed height and thus on one's own initiative to change the working position. The functioning of the person may be monitored and studied, for example, if he adjusts the plane to the suitable working height to himself.
The tool in accordance with the invention is a tool for estimating of working ability, so-called functional capacity tool or pyramid, by means of which the working ability and functional capacity of a person are estimated as a part of vocational rehabilitation. The functional capacity pyramid is aimed for estimating of working ability of adult population of working age. Based on it the tasks given in the future for the person are chosen and the suitability of various tasks for the person is estimated.

The tool i.e. the functional capacity pyramid is used, for example, as follows: The person is given oral instructions in the beginning, on grounds of which he starts working. The person has an assembled pyramid in front of him, for example, a three-layer tool, which he draws and takes into pieces in the first phase. The person takes off the pieces of the first layer to a marked box. After removing the pieces the person takes off the attaching tool placed on the middle layer, for example, a metal frame by means of a tool (such as a hex wrench, for example). After removing the frame the person draws a pattern drawing on a cross-ruled paper of the middle layer using a desired scale (for example, 1 square = 5 cm). After this, the person takes off the pieces and places them on the floor. Next, the person removes the attaching tool i.e. the frame placed on the bottom layer again using tools, after which the person draws the pattern drawing of the bottom layer and removes the pieces on the floor. Before the second phase the working test instructor checks the pattern drawings done by the person as well as that the pieces on the floor are mixed.

In the second phase, the person assembles the two lowest layers of the pyramid in accordance with the drawing done by himself. For assembling the upper most layer, the person is given a ready pattern drawing of the figure formed of the pieces. The table plane, on which the person is working, is adjustable. The person is given instructions for adjusting the table plane in the beginning, but no instructions for ergonomic working, because in this case it is possible to monitor which kind of working positions the person himself chooses. In the beginning of the task, the person is given a follow-up form, in which the person marks the time spent to different working phases and the problems or other feelings experienced during the task. In addition, breaks and their reasons are also marked on the form.

Various kinds of components, such as sensomotor, cognitive and psychososio logical components may be monitored by means of the tool in accordance with the invention.

Sensomotor components may be monitored in various ways. Dynamic motion and recurrence as parts of gross motor are monitored by following the picking up and
moving of pieces in the taking off and assembling phases. Eye-hand-coordination and finger dexterity as parts of fine motor are monitored by following drawing, dismounting of the frames and handling of the pieces of the upper layer. Strength is monitored by following the picking up and moving of the pieces of the bottom layer. Endurance is monitored by studying the overall performance of the task. Controlled handling of pieces gives the picture of the person’s coordination and the overall performance of balance.

Cognitive components are followed and monitored in various ways. Orientation, thinking and memory are needed for understanding the task and receiving the instructions. By following the functioning of the person after the instructions have been given it is possible to study the initiative of the person and the ability to follow given instructions. Observation and attention are needed to avoid mistakes. There will be problem situations, in which case the problem solving ability is monitored as well as the ability to ask for instructions/help. While following the accuracy of working, drawing, attaching of frames, forming of layers and forming of the picture, information about the person’s accuracy, spatial outlining ability as well as ability of forming a picture are gathered. In addition, the overall performance of the task expresses about the ability to concentrate, about persistence and vitality of working.

Psychososiological components are followed in various ways. The overall performance tells about the endurance of motivation, ability to stand the stress caused by the task, about self-confidence and the belief on one’s own abilities. Interpersonal skills and the ability to express feelings can be observed by monitoring the communication ability, stress tolerance and by examining personal experiences about carrying out the task. Decision-making, problem handling and meeting of challenges may be monitored by examining the way the person reacts in problem situations. In addition, attitude to monitoring the work and feedback given about it tells about person’s ability to approve monitoring and valuation.

In planning of the functional capacity pyramid the fact that casual accomplishment of the task is very unlikely has been taken into account. There are not many pieces of the same size and the same shape in the tool i.e. functional capacity pyramid. The shape, constructions and the way of use of the tool may, naturally, vary in various applications of the invention. The parts of the functional capacity pyramid are mostly of moderate large size (the biggest parts, for example 60 cm long) and the material such that the pieces are relatively heavy (the heaviest may weight for example 5 kg). Therefore, adults may handle the parts but handling requires physical strength. In addition, dismounting of a functional capacity pyramid is a relatively
long task or valuation act, it takes about two hours for a normal person at working age to carry out the task.

By means of a functional capacity pyramid overall managing, ability to concentrate, persistency, using of hands and finger dexterity, motor of hands, eye-hand coordination, outlining ability, orientation to new tasks, commitment to work, flexibility, interest, motivation, initiative, activity, temporal accomplishment, qualitative accomplishment, ability to understand, follow and adapt oral instructions as well as physical accomplishment of the task are examined and monitored.

A person is able to carry out the task independently in accordance with the given instructions without continuous control. In addition, the task is long enough, in which case by means of it, it is possible to evaluate the commitment to work and persistency. In addition, the tool may be applied to both men and women and does not require any special professional skill. The task may be interrupted in between and continue after a while which is also an advantage.

Advantages in regard with earlier initial mapping tasks are the possibilities of differentiation and variation of the task as well as realization of versatile working positions and the part with physical stress.

To rehabilitants of mental health different kinds of things in practical functional capacity tasks cause problems than, for example, to persons having rheumatic diseases and diseases of organs of motion. Therefore, it is practical and advantageous that the functional capacity pyramid task may be changed and differentiated while needed. The versatile construction of the tool makes this possible. If it is suspected that a person will have difficulties in some specific functions/tasks, only those parts of the functional capacity pyramid can be used during carrying out of which the problems are revealed. Alternatively, those parts of which earlier is known that the person will not cope, may be left undone.

Next, the invention will be explained in more detail with reference to the accompanying drawings, in which,

figure 1 illustrates a functional capacity pyramid viewed diagonally from above;

figure 2 illustrates a functional capacity pyramid in accordance with figure 1 viewed diagonally from above the upper layer removed;
figure 3 illustrates the middle layer of a functional capacity pyramid viewed straight from above;

figure 4 illustrates a functional capacity pyramid in accordance with figure 1 viewed diagonally from above the upper and the middle layer removed, and

figure 5 illustrates the lowest layer viewed straight from above.

The estimating tool in accordance with figures presented in this application is a three-layer construction resembling a pyramid, the bottom layer 1 of which measures 120 cm x 120 cm x 20 cm. The tool has been placed on a table 9 acting as a base, which table is advantageously adjustable in vertical direction. Adjusting is carried out in recognized way, for example, changing the height of the legs of the table, but it is not presented here. In the bottom layer 1, in this application, there are in total 17 pieces 4 of different size and shape, the weight of which varies between 2-4 kilos. On the bottom layer there is an attaching tool 7 to be attached by bolts to it, which attaching tool is a metal frame. This defines the place for the middle layer 2. The middle layer 2 is, in this application, 80 cm x 80 cm x 10 cm by size. There are 14 pieces 5 of different size and shape in the layer, the weight of which varies between 1-2 kilos. The pieces of the middle layer are of different shape than the pieces of the bottom layer but by material, the pieces of both layers are wood. There is a metal frame acting as an attaching tool 8 to be adjusted by bolts on the middle layer, which metal frame defines the place for the upper most layer 3. The upper most layer is 40 cm x 40 cm x 5 cm by size. There are in total 64 pieces 6 on the upper most layer in this application and each piece is cubical and 5 cm x 5 cm x 5 cm by size. The cubes of the upper most layer form a figure, which is in this case the symbol of Invalidiliitto (Finnish Association of People with Mobility Disabilities) (a figure of a hand). The material of the upper most layer is some heavy material such as steatite.

The invention is not limited to the presented advantageous application but it can vary within the frames of the idea of the invention formed in the claims. Therefore, the size of the tool, the number of layers, parameters of parts and pieces, location and used materials may differ in various applications from the earlier presented.
CLAIMS

1. A tool for estimating of working ability of a person, which comprises at least two layers (1, 2, 3) which have been formed mostly of different, removable pieces (4, 5, 6), characterized in that the tool comprises a removable attaching tool (7, 8) placed between the layers for joining the layers together.

2. A tool in accordance with claim 1, characterized in that there are three or more layers.

3. A tool in accordance with claim 1 or 2, characterized in that the area of the upper layer is smaller than the area of the layer lower than it.

4. A tool in accordance with any of claims 1-3, characterized in that the tool has been placed on a base (9) adjustable in vertical direction.
### INTERNATIONAL SEARCH REPORT

**INTERNATIONAL APPLICATION**

**International application No.**

PCT/FI2005/000259

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### A. CLASSIFICATION OF SUBJECT MATTER

IPC7: A61B 5/16, A63F 9/10

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

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### B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: A61B, A63F, A63H, G09B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

FI, SE, NO, DK, classes as above

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

EPO-Internal, WPI, PAJ

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### C. DOCUMENTS CONSIDERED TO BE RELEVANT

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<td>US 4815742 A (AUGUSTINE) 28 March 1989 (28.03.1989), column 2 line 28 - column 3 line 2, figures 1-4</td>
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<td>BR 9505341 A (FERNANDES) 28 October 1997 (28.10.1997), figures 1-2</td>
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<td>US 4469331 A (RINKER) 04 September 1984 (04.09.1984), abstract, figures 1-6</td>
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<td>DE 19958449 A1 (LORENZ) 21 June 2001 (21.06.2001), abstract, figures 1-17</td>
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<td>A</td>
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<td>US 3578330 A (BRAMBIER) 11 May 1971 (11.05.1971), abstract</td>
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☐ 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
  - "E" earlier application or patent but published on or after the international filing date
  - "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
  - "O" document referring to an oral disclosure, use, exhibition or other means document published prior to the international filing date but later than the priority date claimed
  - "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
  - "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
  - "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

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Date of the actual completion of the international search: 19 August 2005 (19.08.2005)

Date of mailing of the international search report: 15 September 2005 (15.09.2005)

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Form PCT/ISA/210 (second sheet) (April 2005)
**INTERNATIONAL SEARCH REPORT**

**Box No. II** Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. □ Claims Nos.: because they relate to subject matter not required to be searched by this Authority, namely:

2. □ Claims Nos.: because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. □ Claims Nos.: because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

**Box No. III** Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

a) Claims 1-3 direct to a tool for estimation of working ability of a person

b) Claim 4 directs to a base

1. □ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☒ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.

3. □ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. □ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

**Remark on Protest** □ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

□ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

□ No protest accompanied the payment of additional search fees.
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