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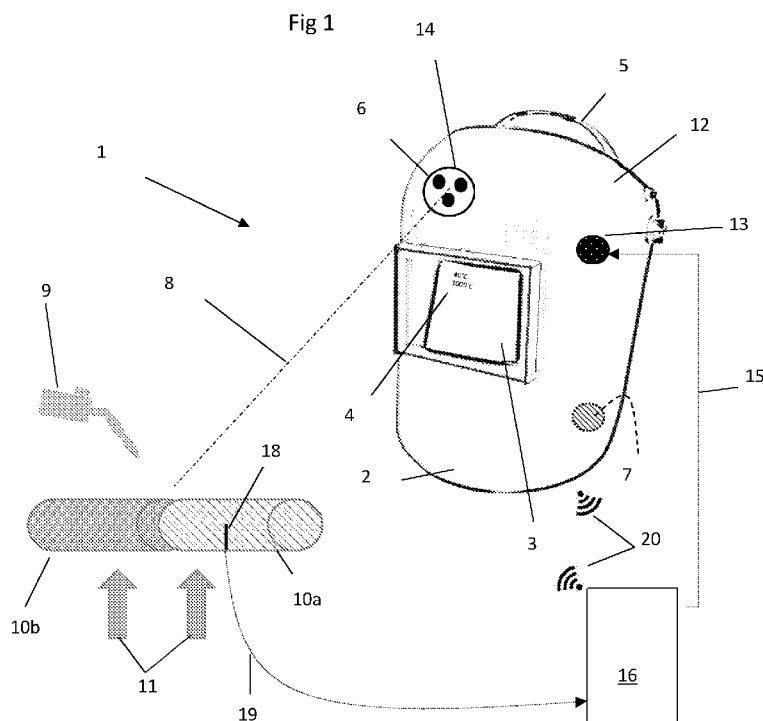
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(54) Title: WELDING HELMET



(57) Abstract: The present invention relates to improvements in the active welding helmets, specifically for providing welding information to the user. There is provided an active welding helmet for a user welding components, comprising a welding helmet, wherein the helmet comprises at least one operational parameter monitor, operably linked to an indicator, wherein said indicator provides an output stimulus to the user related to an operational parameter.

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WELDING HELMET

The present invention relates to improvements in welding helmets, specifically for providing an active welding helmet to provide information to the
5 user.

Welding helmets provide protection to the user during the process of welding. They comprise a face guard to protect the face, neck and eyes. To allow the user to view the weld, and avoid damage to the eye, a specific lens
10 shade is used within the guard, through which the user views the welding process. The lens shade has a shade/tint which can be selected or may be light sensitive in order to protect the user's eyes against intense light, UV and IR emitted by the welding torch.

15 According to a first aspect of the present invention, there is provided an active welding helmet for a user welding components, comprising a welding helmet, wherein the helmet comprises at least one operational parameter monitor, operably linked to an indicator, wherein said indicator provides an output stimulus to the user related to an operational parameter; as provided by
20 the at least one operational parameter monitor.

The use of operational parameter monitors integrally formed as part of the welding helmet allows the user to only receive information from the helmet. In typical welding process the use of separate devices are often used, which may be located remote from the user, and involve looking away from the
25 welding process.

Preferably, one of the at least one operational parameter monitors may be a thermocouple or non-contact thermometer to measure the operational parameter of the temperature of a component to be welded, wherein the

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indicator provides the user with the temperature of the component to be welded. Preferably, a non-contact thermometer.

It is essential in many welding process to ensure that the components to be welded are pre-heated to a specific temperature to avoid stresses being introduced to the final welded component. Typically the temperatures are
5 measured using colour changing contact strips etc.

The non-contact thermometer may preferably be an IR laser thermometer. There may be at least two, or at least three non-directional laser thermometers, which are located on the front of the helmet arranged to provide
10 a fixed focus point, at defined distance from the helmet. The focus point being the component to be welded. The use of non-directional lasers may require the average temperature to be used to ensure that they are all focused on the component to be welded. The laser thermometers typically have a visible aiming dot or pattern to show the user where the thermometer is taking its
15 measurement, the user can move their head to point the helmet in the correct direction.

The IR laser thermometer may be a scanning laser thermometer, such that the temperature of dedicated zone or region in front of the user is determined, this may relieve the burden on the user to aim the non-contact
20 thermometer.

In a highly preferred arrangement there is provided an active welding helmet for a user welding components, comprising a welding helmet, wherein the helmet comprises a temperature monitoring laser to monitor the temperature of a component to be welded, an indicator to provide an output
25 related to operational parameters, said indicator operably linked to the temperature monitoring laser, to provide the user with the temperature of the component to be welded.

The operational parameter may be any parameter associated with the
30 safety of performing the process, improving the efficiency of the process and/or

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improving the final quality of the final welded component. An example of monitoring safety may be where one of the at least one monitors is an atmospheric analyser, located inside the helmet, such as to measure the operational parameter of the user's ambient temperature. The atmospheric
5 analyser may also detect the presence of noxious gases emitted during the welding process.

The welding process typically generates large amounts of heat, both from the pre-welding heating of the component and also from the use of the welding torch. The user can readily experience heat fatigue, especially in
10 confined spaces, hence the health of the user may be protected by ensuring they do not overheat.

Further biometric operational parameters may also be recorded, such as, for example blood pressures, oxygen sats., heart rates, and may be used to assess the health of the user during the welding process.

15 The monitors may be connected via wires to an industrial user interface system, or directly to the indicators, or may be connected wirelessly.

The indicator may provide a stimulus that is outputted to the user, to alert them to the presence of an operational parameter, or to the change of an operational parameter, such as, for example an audio stimulus, visual stimulus
20 or vibratory stimulus or combinations thereof to the user. In a preferred arrangement the indicator is a head-up display, which can provide a visual output of the at least one or plurality of operational parameter.

Conveniently, there may be a plurality of channels, each associated with each of said operational parameters. In one arrangement, each channel may
25 have a different selected audio stimulus, visual stimulus or vibratory stimulus.

There may be wireless communication capability for each of said channels.

Where the indicator's output stimulus is other than a HUD, the output stimulus may undergo a user determinable change to correlate with a change in
30 said operational parameter(s). For example the frequency and/or amplitude of

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an audible sound may change with the nearing towards a threshold value for the operational parameter.

The operational parameters may have minimum and/or maximum threshold levels, such that if at least one operational parameter is outside of said threshold it may cause activation of the indicator, or cause a determinable change to the output stimulus of the indicator. If the threshold parameter is safety critical, to the equipment or health of the user, the welding apparatus may be deactivated. This may include stopping the welding process such as by turning off power or fuel supply to the welding apparatus.

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The welding helmet as defined herein may have an integral battery power source. The helmet may further comprise a data logger to record the operational parameters. This history may be useful to determine process efficiency. The data logger may be interrogated at the end of a process, or may be continuously monitored remotely via a wireless solution to a dedicated monitoring system. Preferably the welding helmet data is managed by an industrial user interface system. The input channels from the sensors and output channels which drive the indicators are managed by the industrial user interface system to manage said operational parameters, such as, for example PanelPilotACE design studio. The multi-channel panel meter is a human machine interface which allows the control of multiple channel inputs both wireless and wired. The industrial user interface may comprise a touch screen, and associated development board(s) capable of receiving a plurality of inputs and providing channels for outputs. The industrial user interface may be software driven to allow the user to determine threshold limits of the operational parameters, and to allow a welding process to be logged and analysed.

The industrial user interface system may be worn by the user, or may be remote from the user within wireless communication range of the welding helmet. The wireless system may be any communication standard such as Wi-Fi, Bluetooth, and NFC etc. There may be provided a welding helmet system, comprising the welding helmet as defined herein and further comprising the

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industrial user interface system to manage said operational parameters. The industrial user interface system may receive temperature measurements from a non-contact thermometer and/or a thermocouple, the latter being directed affixed to the component(s) to be welded.

5

For a better understanding of the invention, and to show how arrangements of the same may be carried into effect, reference will now be made, by way of example, to the accompanying diagrammatic drawings in which:

10

Figure 1 shows welding helmet according to the invention.

Turing to figure 1 there is provided a welding system 1, with a welding helmet 12 which comprises a shading lens 3 that provides the user with protection against harmful UV and high intensity light, whilst retaining the ability to view the welding process. The helmet may be a simple face guard 2 with a head strap 5, or it may be a full re-entrant helmet (akin to a motorbike helmet), which covers the user's entire head. The helmet 12 comprises a plurality of operational parameter monitors 14, which detect the environment proximate to the user or the components to be welded etc. The use of a non-contact laser thermometer 6 may provide the temperature of the components to be welded 10a, 10b, i.e. the pre-weld temperature. The components 10a, 10b, are heated 11 to a tightly defined temperature, such as by inductive heating or a flame. Once the pre-weld temperature has been reached the non-conductive thermometer 6 will detect 8 the temperature and indicate the temperature via indicator 4 (a head up display), that the desired temperature has been reached. The indicator 4, may alternatively be an audible sound or a vibration stimulus that alerts that the pre-weld temperature has been reached.

The user (not shown) may experience significant thermal fatigue, from operating the welding torch 9 and/or being proximate to the heated components

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10a, 10b. The helmet may have an atmospheric analyser 7, located inside the helmet, such as to measure the operational parameter of the user's ambient temperature and/or presence of noxious gases. The user's temperature and any gases may be displayed on the HUD, any dangerous threshold levels for gases, or temperatures may be also cause a further emergency indicator i.e. a sound or vibration from speaker 13 and may be programmed to automatically disengage the welding torch 9 and/or any heat source 11 for the pre-welding heating. The helmet system may comprise an industrial user interface 16 to manage said operational parameters from the sensors 14, 6, 7. The industrial user interface system may receive the temperature measurements from a non-contact thermometer 6, wirelessly 20, and/or may receive 19 temperature measurements via a thermocouple 18, affixed to the component(s) to be welded 10a, 10b. The industrial user interface 16, may provide the required output signals to the indicators, such as the speaker 13 and the HUD 4. The industrial user interface 16 may be operably linked to the welding torch 9, such that after a series of warning indicators 14 have been communicated to the user, with changes in urgency such as change of amplitude, frequency or pitch or a flashing message on the HUD 4, that once a threshold has been breached the industrial user interface 16 may automatically cause the shut off of power and or fuel to the welding torch 9 or prevent the heating 11 to the components to be welded 10a, 10b. Other users nearby may also be alerted, or a centralised control facility may be alerted to the breach of threshold values.

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CLAIMS

1. An active welding helmet for a user welding components, comprising a welding helmet, wherein the helmet comprises at least one operational
5 parameter monitor, operably linked to an indicator, wherein said indicator provides an output stimulus to the user related to an operational parameter.
2. An active welding helmet according to claim 1, wherein one of the at least one monitors is a non-contact thermometer or thermocouple to measure the operational parameter of the temperature of a component to be welded,
10 wherein the indicator provides the user with the temperature of the component to be welded.
3. An active helmet according to claim 2, wherein the non-contact thermometer is an IR laser thermometer.
4. A helmet according to claim any one of the preceding claims, wherein
15 one of the at least one monitors is an atmospheric analyser, located inside the helmet, such as to measure the operational parameter of the user's ambient temperature and/or presence of noxious gases.
5. The helmet according to any one of the preceding claims, wherein the indicator provides an audio stimulus, visual stimulus or vibratory stimulus or
20 combinations thereof to the user.
6. The helmet of claim 5, wherein the indicator is a head-up display.
7. The helmet of claim 5 to 6 comprising a plurality of channels, each associated with each of said operational parameter monitors.
8. The helmet according to any one of claims 5 to 7, wherein the indicator's
25 output stimulus undergoes a user determinable change to correlate with a change in said operational parameters.
9. The helmet according any one of claims 7 to 8, wherein each channel has a different selected audio stimulus, visual stimulus or vibratory stimulus.

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10. The apparatus of any of the preceding claims comprising an integral battery power source.
11. The apparatus according to any of preceding claims further comprising an industrial user interface system.
- 5 12. The apparatus according to claim 11, wherein the industrial user interface system receives inputs from the operational parameter monitors and determines the output to the indicators, to manage said operational parameters
13. The apparatus according to any one of claims 7 to 12 further comprising wireless communication capability for each of said channels.
- 10 14. The apparatus according to any one of the preceding claims, wherein the operational parameters have minimum and/or maximum threshold levels, such that if at least one operational parameter is outside of said threshold, the user's welding torch is automatically deactivated.

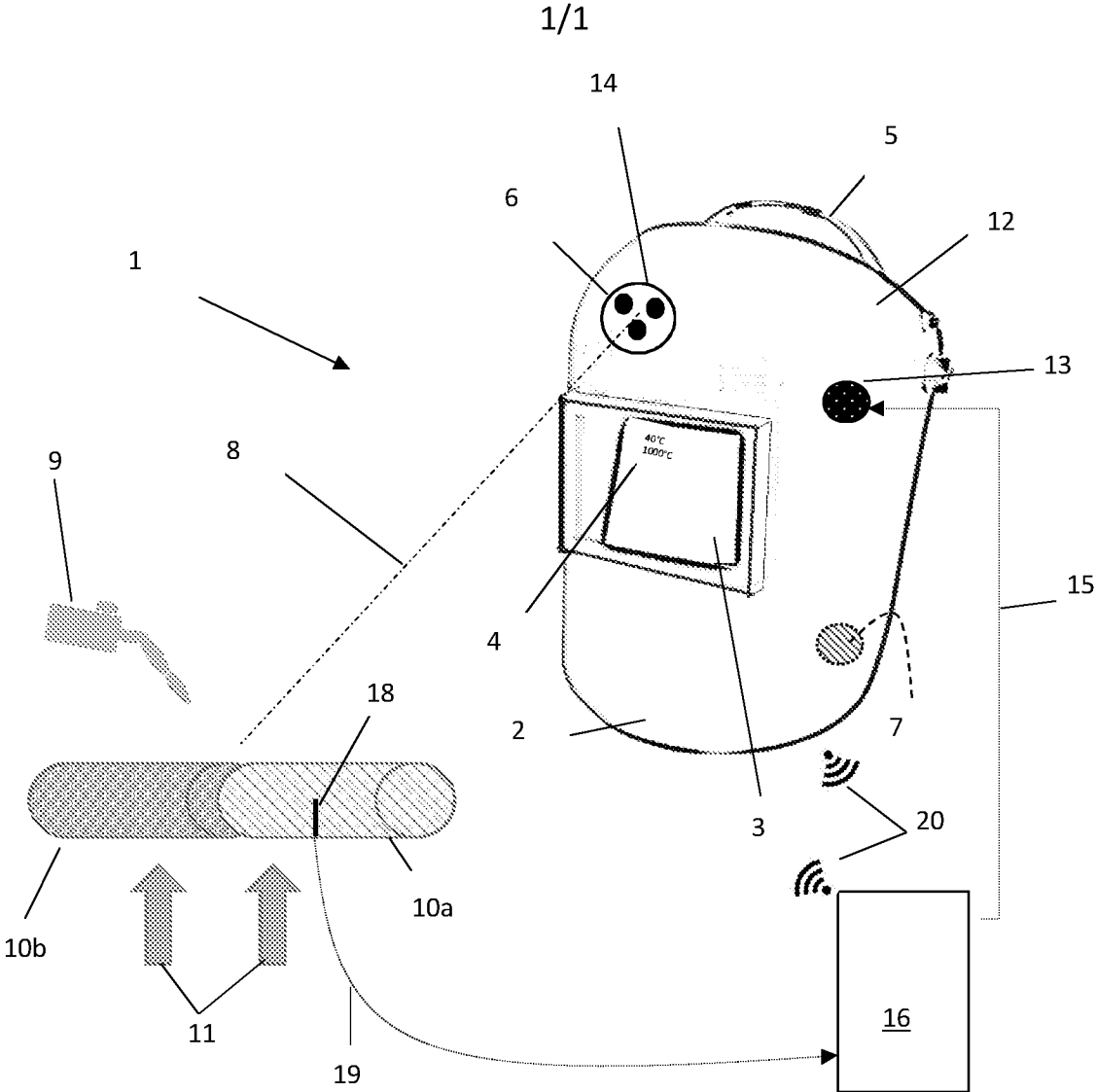


Fig 1

INTERNATIONAL SEARCH REPORT

International application No

PCT/GB2022/050632

A. CLASSIFICATION OF SUBJECT MATTER

INV. B23K9/095 B23K9/32 A61F9/06
ADD.

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B23K A61F

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

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

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 3 395 487 A1 (LINCOLN GLOBAL INC [US]) 31 October 2018 (2018-10-31)	1-3, 5-14
Y	paragraphs [0002], [0011]; figure 16 paragraphs [0021], [0051], [0079] -----	4
X	US 2020/368840 A1 (HUH MOON YOUNG [KR] ET AL) 26 November 2020 (2020-11-26) paragraphs [0084] - [0086]; figures 1-3 -----	1-3, 5-14
Y	US 2017/326674 A1 (DUNBAR DOUGLAS N [US] ET AL) 16 November 2017 (2017-11-16) paragraphs [0028] - [0031]; figures 1-4 -----	4



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

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INTERNATIONAL SEARCH REPORT

Information on patent family members

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