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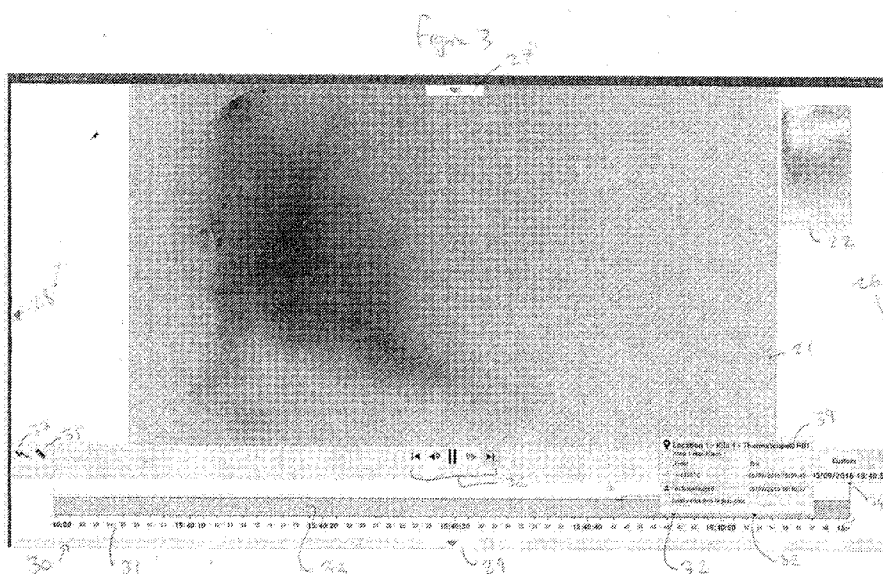
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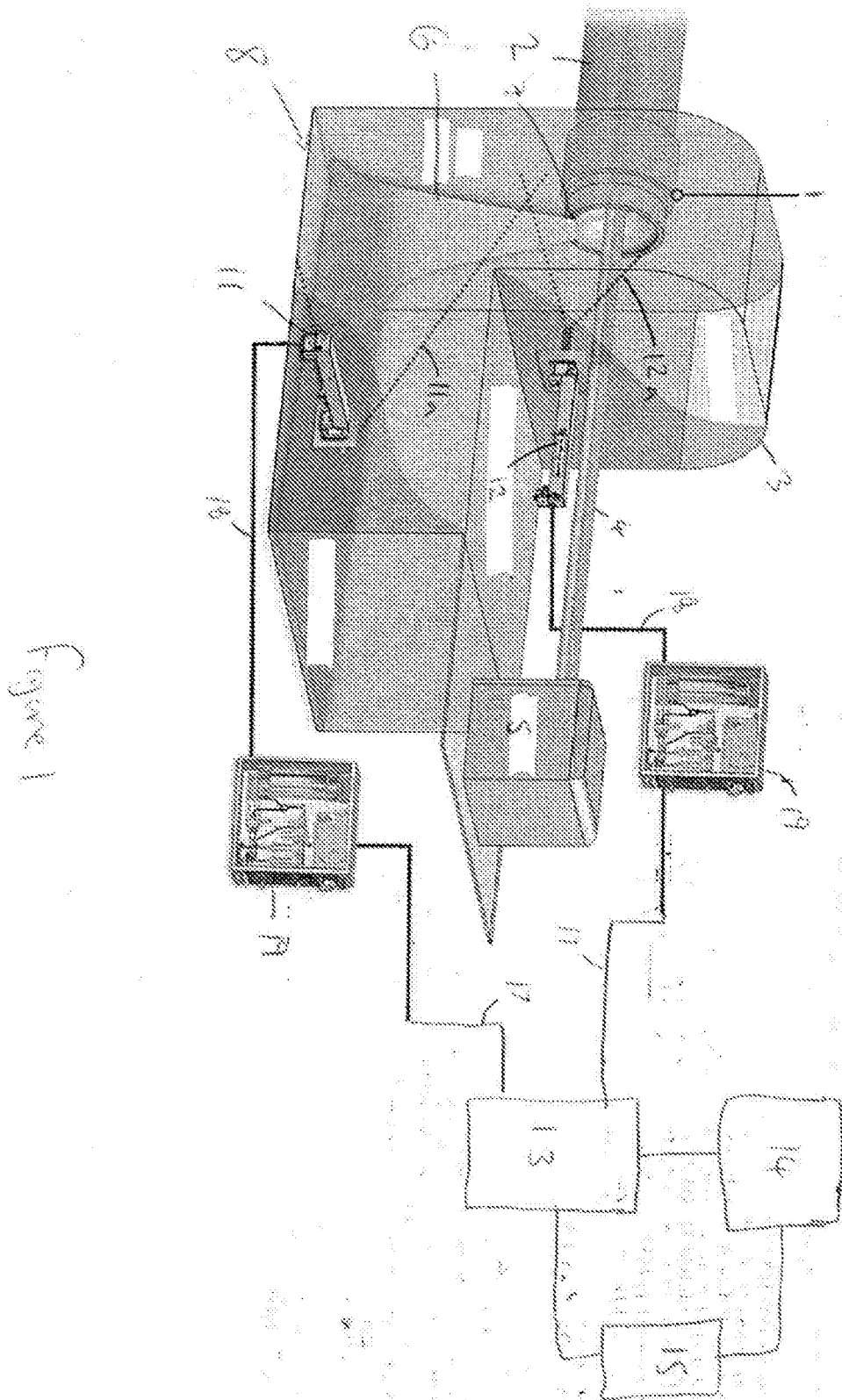
(56) Documents Cited:  
EP 2929773 A1 US 6332147 B1  
US 20140047371 A1 US 20130124997 A1  
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INT CL F27D, G07C, G08B  
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(54) Title of the Invention: **Monitoring system with interactive display interface**  
Abstract Title: **Monitoring system comprising timestamped incident tagging of images**

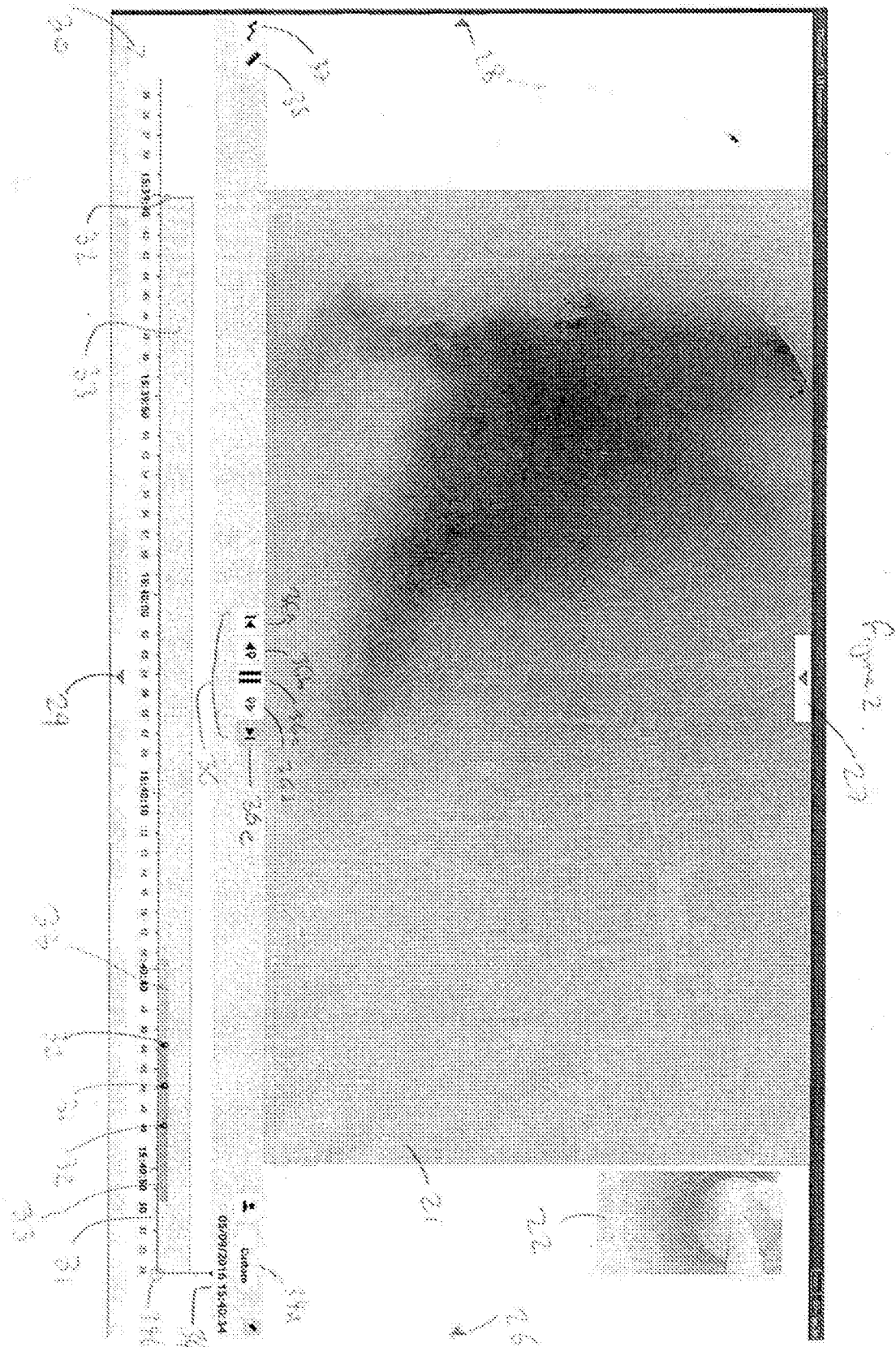
(57) A monitoring system comprises a camera, a display, a selection toolbar 30, a selection input and a control unit. Timestamped images 21, 22 captured by the camera are displayed on the display. Each position on the selection toolbar corresponds to a particular timestamp. In response to selection of a toolbar position using the selection input, the control unit causes the display to display the captured image corresponding to the selected timestamp. Incident tags 32 relating to incidents occurring at specific timestamps are displayed adjacent to selection toolbar positions corresponding to those timestamps. Selection inputs enable selection of incident tags, causing the display of information 39 associated with the incident, such as a captured image with a timestamp corresponding to the selected incident tag. The monitoring system may be used to monitor a rotary kiln. The monitoring system may include sensors, and the control unit may automatically create incident tags in response to sensor outputs.





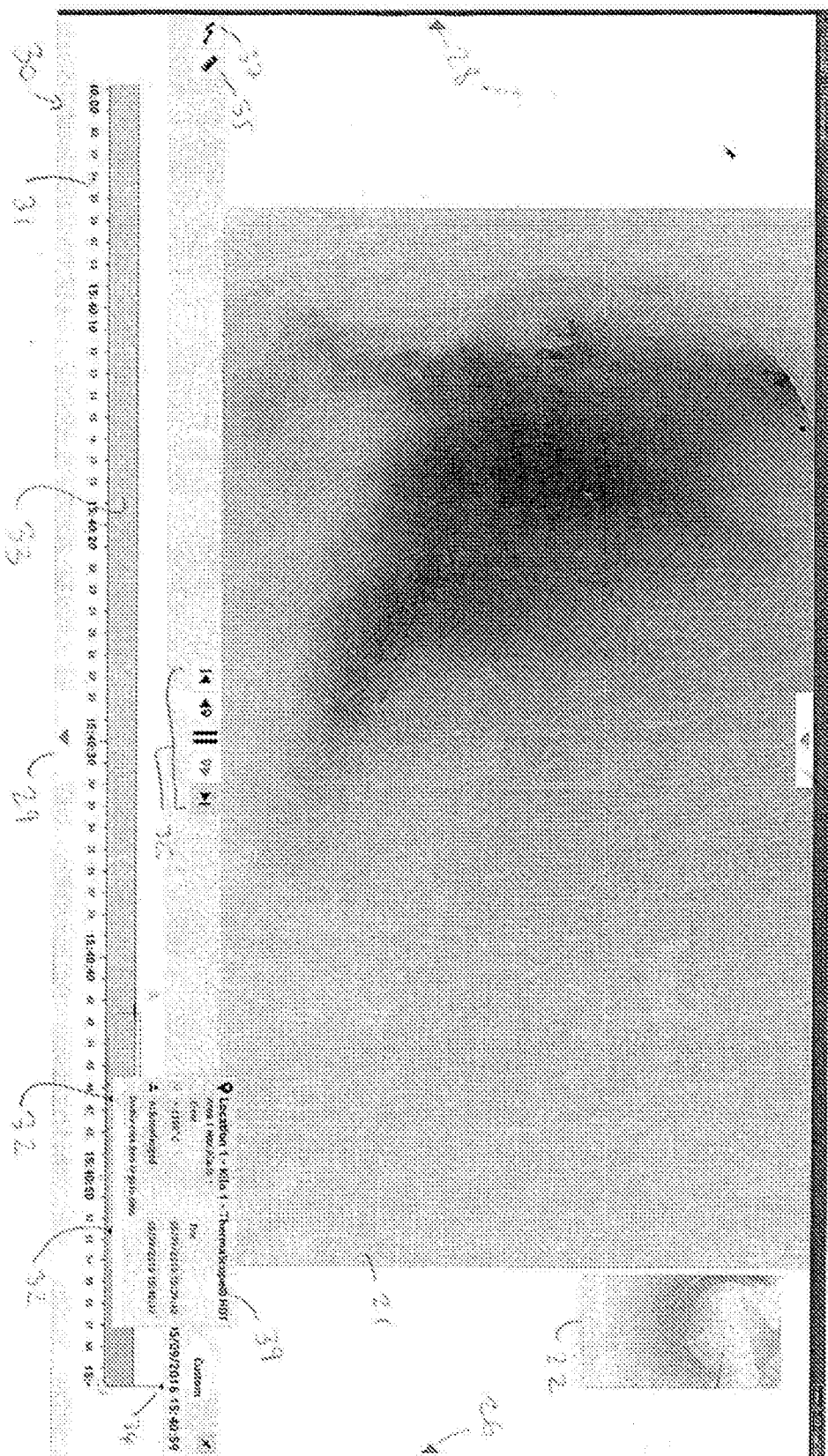
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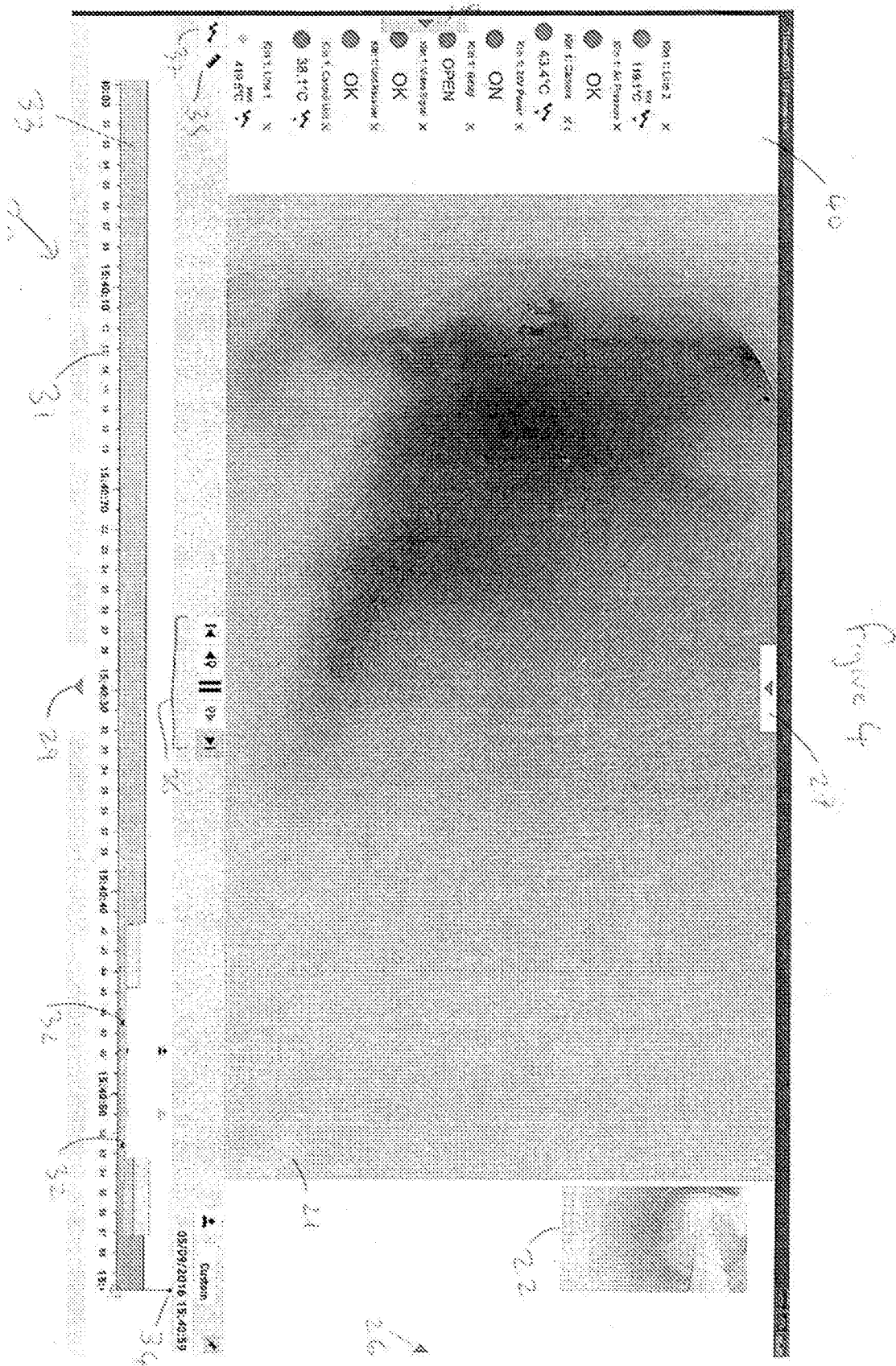
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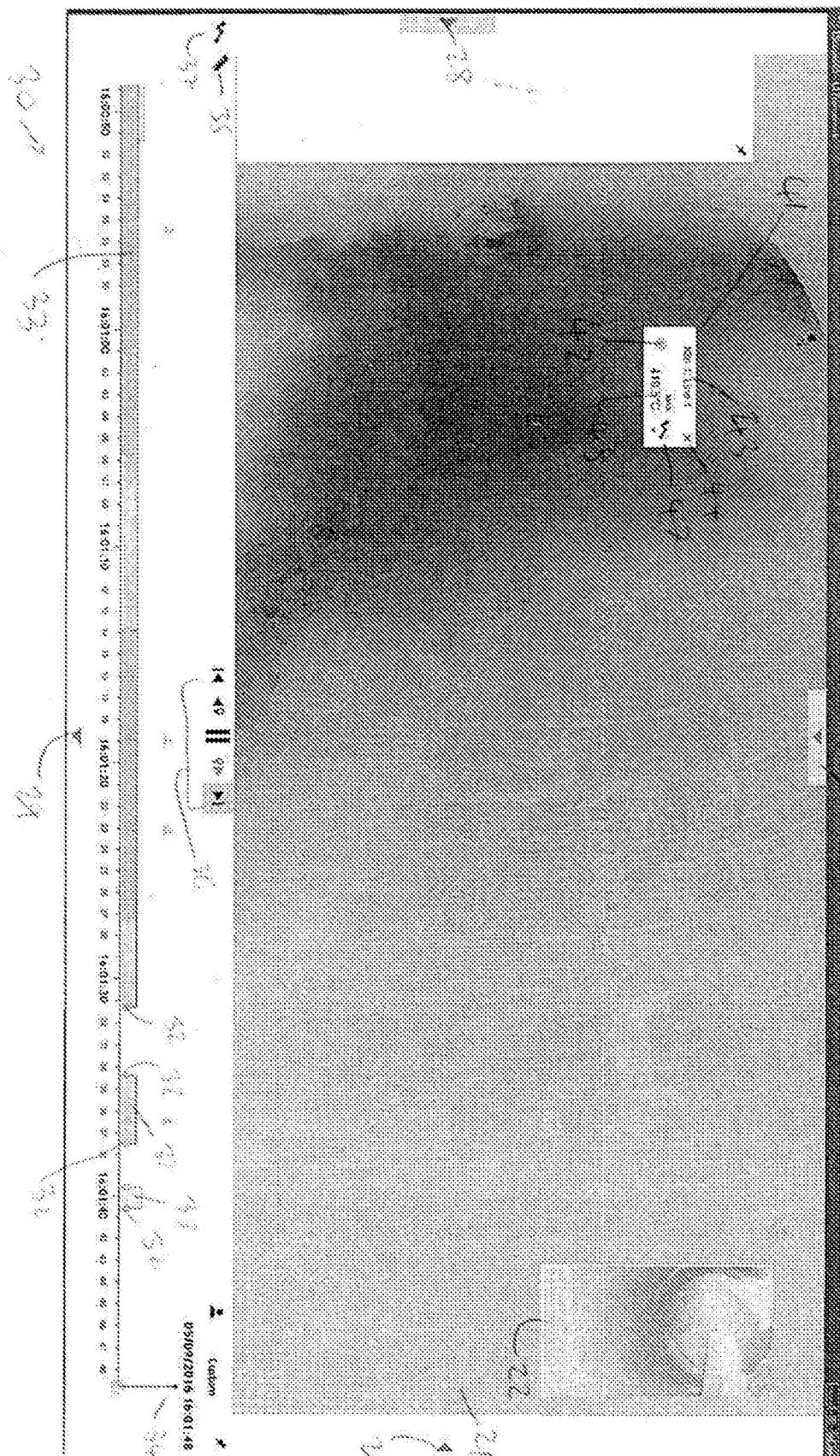


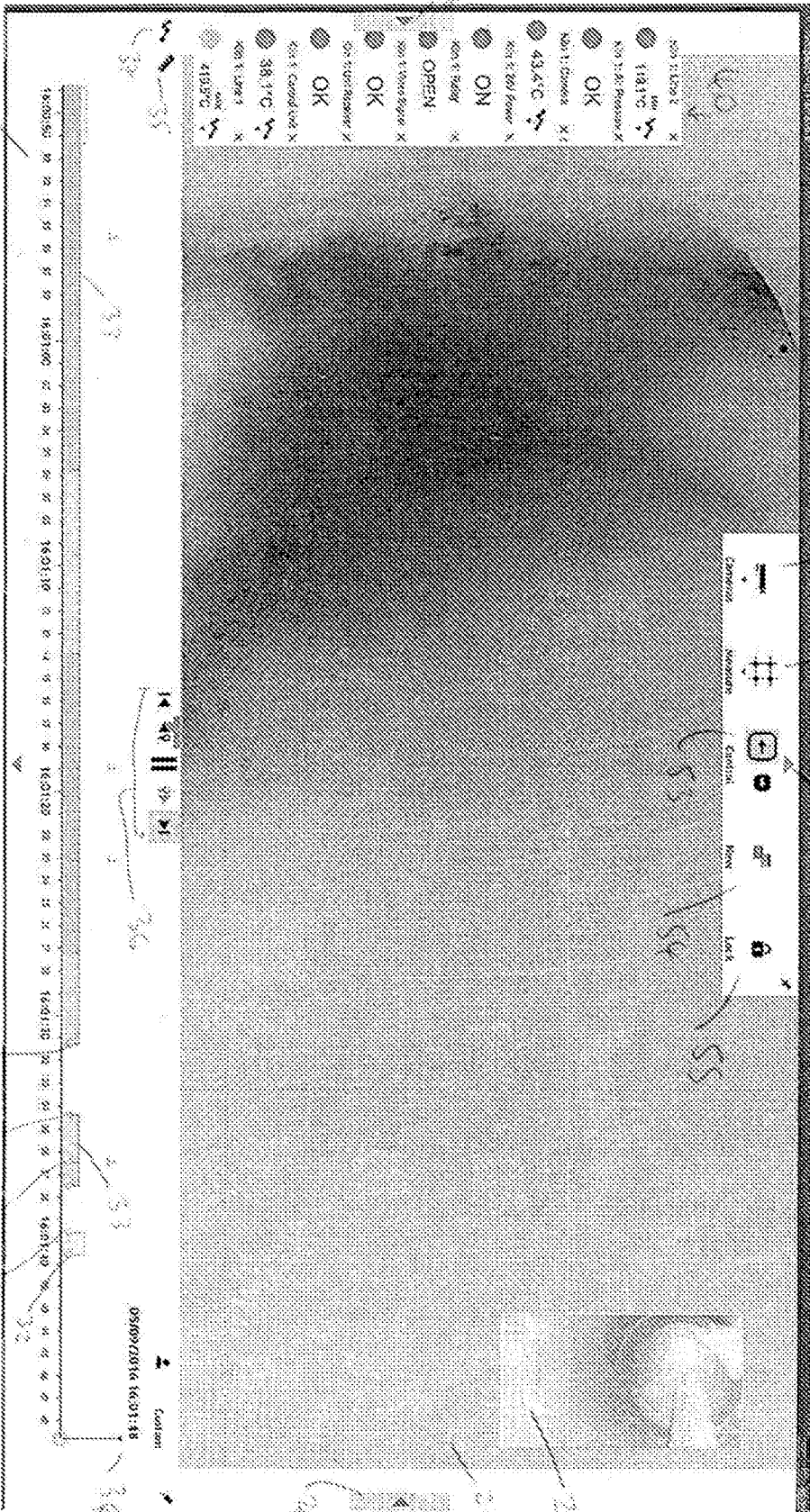




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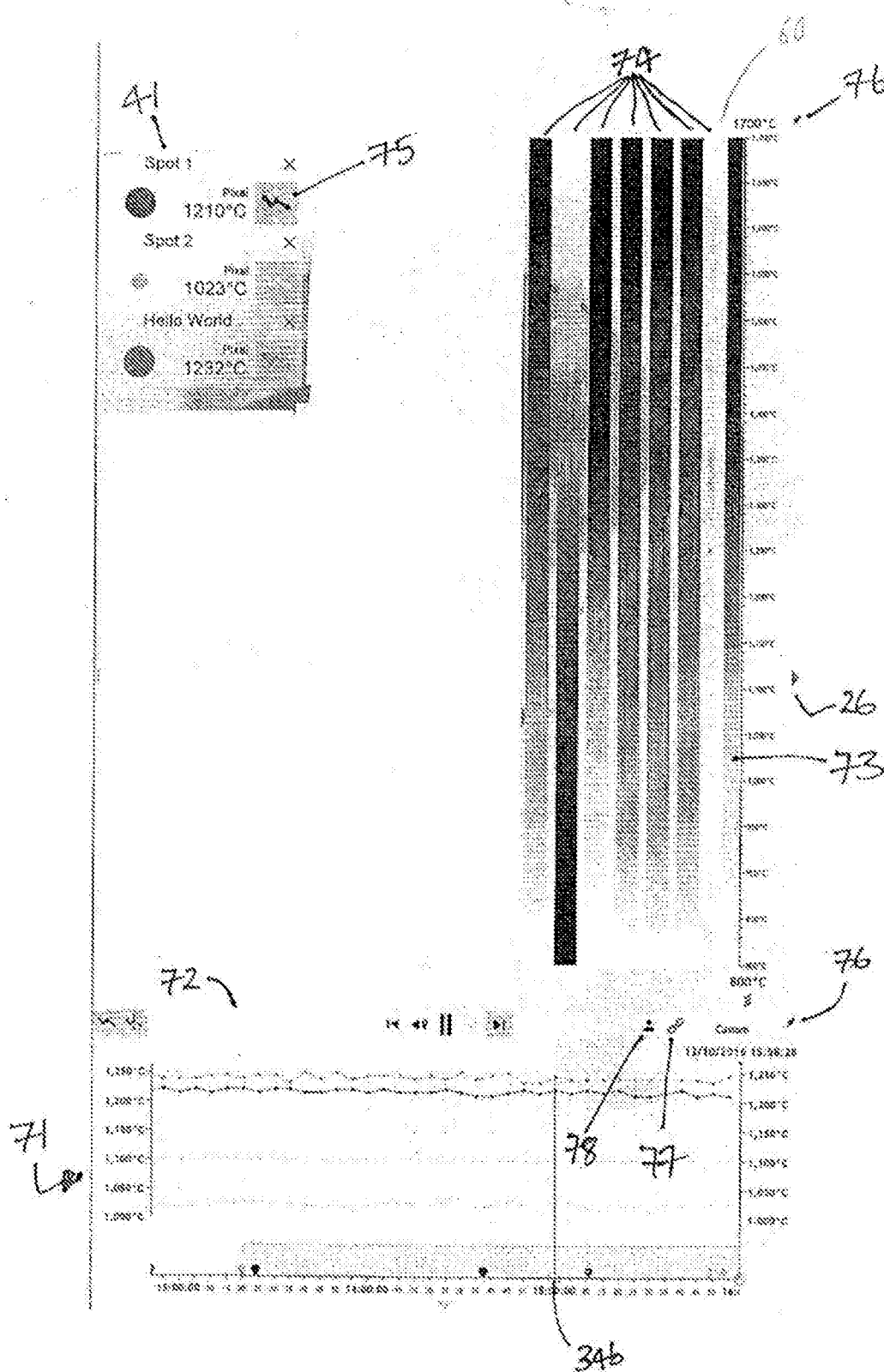


figure 7



## **MONITORING SYSTEM WITH INTERACTIVE DISPLAY INTERFACE**

### **Technical Field of the Invention**

The present invention relates to monitoring systems and in particular monitoring systems for apparatus, the systems comprising one or more cameras for capturing  
5 images of the monitored apparatus. Most particularly, the present invention relates to a monitoring apparatus including an interactive display interface.

### **Background to the Invention**

It is common to provide monitoring systems for monitoring the operation of an apparatus in use. In particular cases, the monitoring systems comprise one or more  
10 cameras. For example, in instances where direct human access to the view provided by the camera is dangerous or impossible during operation of the apparatus. In such instances, it is known for a user to be able to monitor the output of the cameras via a control screen. This can enable problems with the operation of the apparatus to be detected by the user. In cases where a problem has occurred or been detected by other  
15 means, the captured images may be stored for later review.

Whilst such a system is of considerable use in enabling the monitoring of an apparatus, it relies upon vigilance by the user. If the user is distracted, an otherwise clear incident can remain undetected. Even where incidents are detected, it may be difficult to later identify the key captured images of the incident. A further issue is that  
20 it is not clear either during live monitoring or subsequent review, whether an incident was noticed by the user and classified as insignificant or whether the incident was unnoticed.

It is therefore an object of the present invention to address disadvantages associated with the prior art.

### Summary of the Invention

According to a first aspect of the present invention there is provided a  
5 monitoring system for an apparatus, the monitoring system comprising: one or more  
cameras operable to capture timestamped images of the monitored apparatus; a display  
unit operable to display said timestamped images captured by the one or more cameras  
and a selection toolbar, each position along the selection toolbar corresponding to a  
particular timestamp; a selection input operable to enable selection of one or more  
10 positions along the selection toolbar; and a control unit operable in response to the  
selection input to cause the display unit to display a captured image with a timestamp  
corresponding to the selected position on the selection toolbar, wherein the display unit  
is further operable to display one or more incident tags relating to incidents occurring  
at specific timestamps, the incident tags being displayed adjacent to the selection  
15 toolbar positions associated with said timestamps, wherein the selection inputs are  
operable to enable selection of incident tags and wherein in response to selection of an  
incident tag, the control unit is operable to cause the display unit to display a captured  
image with a timestamp corresponding to the selected incident tag and/or to display  
information associated with the tagged incident.

20 The present invention therefore provides a system wherein particular images  
within a time stream of images may be readily accessed. Most particularly, the system  
enables the ready access of images associated with specific incidents within the time  
period and/or information associated with said incident.

The system may comprise a plurality of cameras. Each camera may be located so as to capture images of different features of the apparatus. The cameras may each be operable to capture images in the same wavelength range. Additionally or alternatively, different cameras may be operable to capture images at different  
5 wavelength ranges.

In one preferred embodiment, the monitored apparatus may be a kiln. In particular, the kiln may be a rotary kiln. In such embodiments, the or each camera may be operable to capture images at infrared wavelengths. In such embodiments, the system may comprise a camera located to capture an image of the kiln burning zone or  
10 a camera located so as to capture an image of the kiln cooler or cameras operable to capture images of both the kiln burning zone and kiln cooler.

The system may comprise one or more sensing systems. The sensing systems may comprise dedicated sensors operable to detect variations in particular parameters associated with the apparatus. Additionally or alternatively, the sensing systems may  
15 comprise a processing unit operable to analyse and classify captured images or features within captured images. The control unit may be operable to automatically create incident tags in response to the output of the sensing systems. Additionally or alternatively, the control unit may be operable in response to the selection input to create incident tags. This can allow a user to create incident tags.

20 The information associated with the incident tag may include any or all of the following: time of incident, nature of incident, severity of incident, status of incident (e.g. active, acknowledged, unacknowledged, resolved, etc.), user identity, user notes

(typically free form text), incident creation information (e.g. automatic, in response to user action etc.) or the like.

The incident tag may vary in appearance according to the nature of the incident or the information associated with the incident. In particular, the icon associated with the tag indication or the colour of incident may vary in response to the severity of the incident or the status of the incident. Where incident tags have been viewed by a user or have notes added by a user, an additional user incident tag may be displayed alongside the incident tag. If the user incident tag is selected by the selection input, the control unit may be operable to cause the display unit to display information relating to the user. This information may include any or all of the user identity, time of viewing, user action, user notes or the like.

The incident tag may comprise a tag icon and an incident duration bar. The incident duration bar may extend over the range of timestamps during which the incident is active. This can provide a user with an immediate simple indication of the duration of an incident. The tag icon may be provided at one end of the incident duration bar, in the middle of the incident duration bar or at both ends of the incident duration bar. The incident duration bar may vary in appearance according to the nature of the incident or the information associated with the incident.

The selection toolbar may be operable to scale to a fixed time interval. Alternatively, the selection toolbar may be operable to scale to different time intervals. The scaling may be varied by selection of a scale select tool. The fixed time interval may end at the time of the latest image captured by the system or may end at another selected time.

The selection toolbar may be displayed alongside one edge of the image. In one preferred embodiment, the selection toolbar is displayed alongside the lower edge of the image. The selection toolbar may be displayed by default. In an alternative embodiment, the selection toolbar may be hidden by default and may be displayed only  
5 in response to selection of a show/hide icon using the selection input.

The display unit may additionally be operable to display one or more additional toolbars. The additional toolbars may incorporate any one or more of: a function toolbar; palette toolbar and a data block toolbar. Each toolbar may be provided alongside one edge of the image. In one preferred embodiment, the function toolbar is  
10 displayed alongside the upper edge of the image, the palette toolbar is displayed alongside the right edge of the image and the data block toolbar is displayed alongside the left edge of the image. Each toolbar may be displayed by default. In an alternative embodiment, each toolbar may be hidden by default and may be displayed only in response to selection of a show/hide icon using the selection input.

15 The function toolbar may comprise one or more selectable icons. In response to selection of the icons using the selection input, the control unit may be operable to initiate particular functions of the system or to cause the display unit to vary the display in accordance with a particular function or mode selected. Functions or modes activated by the function toolbar may include but are not limited to: control camera, enabling the  
20 camera field of view or focus to be controlled; select camera (where multiple cameras are provided); select display mode (where multiple cameras are provided display multiple camera images side by side or overlapping or on different screens); select measurement function, enabling the measurement of features within a captured image; lock/unlock function, enabling the system settings to be locked/unlocked.

The palette toolbar may enable selection of specific colour display modes for the captured images. In particular, this may enable selection of particular subsets of wavelengths within the captured image. In embodiments comprising an infrared camera, the palette toolbar may enable selection of a specific equivalent temperature range to be displayed in the captured image. The scale of the palette toolbar may automatically adjust so that the palette colours are distributed across the full displayed intensity or temperature range. Alternatively the scale may be fixed so that particular intensities or temperatures are associated with particular colours on the palette.

The data block toolbar may comprise one or more selectable data blocks. Each data block may correspond to a particular parameter or feature of the apparatus. The parameter may be a local parameter, such as the pixel value of a particular pixel within the captured image. This can enable monitoring of the behaviour of the particular pixel in successive captured images. The parameter may be a parameter sensed by the sensing systems. With fixed cameras, this can provide an indication of the condition of the portion of the apparatus corresponding to said pixel.

Each data block may comprise any one or more of: status indication, by way of text, an icon or both; parameter indication; control icon or the like. In particular, data blocks relating to specific parameter may be provided with a plot icon. In response to selection of the plot icon by use of the selection input the control unit may cause a plot of the parameter value over time to be displayed on or alongside the selection toolbar.

In response to selection of an individual data block using the selection input, the control unit may be operable to enable the data block to be moved from the data block toolbar to another location. This can enable an individual data block to be displayed



over the captured image. This can help a user to monitor features or parameters of selected data blocks even when the data block toolbar is not displayed.

The display unit may comprise a single display screen. In alternative embodiments, it is possible for the display unit to comprise multiple screens.

- 5           The selection input may comprise a one or more dedicated controls, a keypad, pointing device such as a mouse, trackball, touch pad, joystick, tablet pen or similar. In one embodiment, the selection interface may be a touchscreen integrated with the display unit.

#### Detailed Description of the Invention

- 10           In order that the invention may be more clearly understood an embodiment/embodiments thereof will now be described, by way of example only, with reference to the accompanying drawings, of which:

- Figure 1       is a schematic diagram of an example of a monitoring system according to the present invention;
- 15   Figure 2       shows an example of a user interface displayed on a display screen of a monitoring system according to the present invention;
- Figure 3       shows another example of the user interface of figure 2;
- Figure 4       shows an additional example of the user interface of figure 2 and figure 3;
- 20   Figure 5       shows a further example of the user interface of figures 2 to 4;
- Figure 6       shows a still further example of the user interface of figures 2 to 5; and
- Figure 7       shows another example of the user interface of figures 2 to 6.

Turning to figure 1, a schematic illustration of a monitoring system 10 according to the present invention is illustrated. In the illustrated example, the system 10 is set up for monitoring a rotary kiln 1 using two cameras 11, 12. The skilled man will however appreciate that the apparatus monitored and the number of cameras used for monitoring the apparatus may be varied. In the present example, the cameras 11, 12 are preferably infrared cameras. The skilled man will however appreciate that other forms of camera may be more appropriate for monitoring other forms of apparatus.

In the example of figure 1, the rotary kiln 1 comprises a lined shell 2, hood 3 and a burner 5, provided with a burner pipe 4 for heating the interior of the shell 2. Hot clinker 6 falls out of opening 7 into cooler 8.

In the present example, the system 10 comprises: a camera 11, with field of view 11a, positioned to capture an image of the cooler 8; and a camera 12, with field of view 12a, positioned to capture an image of the interior of the shell 2 and the burner pipe 4. The cameras may be operable to capture still and/or video images. Monitoring of the images captured by cameras 11, 12 can provide an insight into the operation of the kiln 1 and an early indication of any problems with the operation of the kiln 1. Particularly, energy efficiencies and environmental benefits can be achieved by analysing flame characteristics. Each of the cameras 11, 12 is operable to timestamp each captured image.

The cameras 11, 12 are connected to a control unit 13. In the example of figure 1, the connection is via a local cable 18 to a junction box 19. A fibre optic cable 17 then runs from the junction box 19 to the control unit 13. It is of course possible for other

suitable wired or wireless connections to be made between the cameras 11, 12 and the control unit 13.

The control unit 13 is connected to a display screen 14 operable to display images captured by the cameras 11, 12. Whilst a single display screen 14 is shown in the example, the skilled man will appreciate that multiple display screens 14 may be provided. The or each display screen 14 may be remote from the control unit 13 and could be connected to the control unit over a local network or the internet. In order to enable user control of the display screen 14, a selection input 15 is provided. The selection input 15 may take any suitable form and may include any or all of, pointing devices (including but not limited to mouse, trackball, touchpad or the like), keyboards or keypads and a touchscreen.

Turning now to figure 2, an illustration of the output of display screen 14 in use is shown. The display comprises a primary image 21 captured by camera 11 and a secondary image 22 captured by camera 12. The relative position and size of the displayed images 21, 22 can be varied or swapped in response to the selection input 15.

The display screen 14 output further comprises a selection toolbar 30, provided in this example along the lower edge of the screen 14. Each position along the selection toolbar 30 corresponds to a particular timestamp. The selection toolbar 30 is provided with a scale 31 indicating which positions correspond to which timestamp. Selection of a particular position along the selection toolbar 30 results in the respective displayed images 21, 22 being images captured at the corresponding timestamp. This allows a user to rapidly select and view images captured at a particular time and may also allow

a user to playback recorded video and/or temperature data corresponding to the selected timestamp.

The scale 31 may additionally be provided with an indication of the present time 34, and the position this corresponds to on the scale 31. In some embodiments, a scale change tool 35 may be provided, which may be automatic. Selection of the scale change tool 35 using the selection input 15 changes the scale 31, such as to ensure that the acquired data is always within the range of the display. This may for example vary the extent of the selectable time period and /or operate to automatically adjust the display so that there is always a palette entry associated with each acquired data point.

The length of scale 31 may be adjusted to user requirements by selection input means 15 or by selecting a preset time length by actuable input means 34a. When a time scale is selected that is not a fixed preset length actuable input means 34a is marked "Custom". The offset of scale 31 may be adjusted to user requirements by selection input 15. In one embodiment, in which the selection means 15 comprises a mouse, rolling the mouse wheel changes and selects the length of time scale 31 and placing the mouse cursor on time scale 31 and dragging changes the time offset.

Video cursor 34b indicates the point in time that corresponds to the primary image 21 and secondary image 22. When live data is being displayed video cursor 34b is positioned rightmost on time scale 31. Changing the position of video cursor 34b may pause live data to display data corresponding to the selected time.

In addition to the selection toolbar 30, there are also displayed one or more incident tags 32, each incident tag being displayed at a position of a corresponding timestamp. The incident tags 32 each relate to specific incidents that have occurred at

the corresponding timestamp. Selection of an incident tag 32 results in the respective displayed images 21, 22 being images captured at the corresponding timestamp to the incident. This allows a user to rapidly select and view captured images corresponding to a particular incident.

5           The incident tags 32 may each be associated with an incident duration bar 33. The duration bar 33 provides an indication of the temporal extent of the incident. Selection of a position on the toolbar 30 within the duration bar 33 results in the respective displayed images 21, 22 being images captured at the corresponding timestamp within the duration of the incident.

10           Incidents may be tagged automatically in response to particular properties of the captured images or in response to the output of other sensing systems operable to monitor the apparatus 1. It is also possible for a user to tag an incident directly by use of the selection input 15.

            Selection of a particular incident tag 32 may also result in the display of  
15   information relating to the incident on the screen 14. Typically, this information would be displayed in a pop up 39 displayed over or above the selected incident tag 32 as shown in figure 3. The details might include but are not limited to: time of incident, nature of incident, severity of incident, status of incident (e.g. active, acknowledged, unacknowledged, resolved, etc.), user identity, user notes (typically free form text),  
20   incident creation information (e.g. automatic, in response to user action etc.) or the like. Selection of a tag 32 may change the status of an incident from unacknowledged to acknowledged.

The colour of the incident tags 32 and the duration bars 33 might vary in response to the nature of the incident and its current status. For instance, the tag 32 and duration bar 33 might be coloured: green for an incident that was acknowledged and is now inactive; purple for an incident that became inactive but is not acknowledged; yellow for an incident that is active and acknowledged; and red for an incident that is active but unacknowledged. This therefore enables a user to readily ascertain which tagged incidents are active and which have been acknowledged. Where incident tags 32 have been acknowledged, a user may add information to the pop up using the selection input 15.

A further option for selecting images to display can be provided by selection icons 36. These icons 36 comprise a skip to start icon 36a, selection of which using selection input 15 results in the display of captured images corresponding to the earliest timestamp on scale 31 and a skip to end icon 36e, selection of which using selection input 15 results in the display of captured images corresponding to the latest timestamp on scale 31. The icons 36 further comprise a skip to previous incident icon 36b selection of which using selection input 15 results in the display of captured images corresponding to the previous incident icon 32 on selection toolbar 30 and a skip to next incident icon 36d selection of which using selection input 15 results in the display of captured images corresponding to the next incident icon 32 on selection toolbar 30. The icons also comprise a play/pause toggle icon 36c. Selection of the icon 36c toggles the image display between a paused mode where captured images corresponding to the selected timestamp are displayed and a play mode where successive captured images are displayed starting from images corresponding to the selected timestamp. This can enable a user to readily study a single image corresponding to a particular timestamp,



such as the start of an incident or can enable the user to monitor the development of an incident through successive images.

The selection toolbar 30 may additionally be provided with a selectable graph icon 37. Selection of the graph icon 37 by use of the selection input 15 causes the display of a graph 71 illustrating variation in a particular apparatus parameter or image parameter alongside or over the selection toolbar 30. Moving boundary 72 by selection input 15 changes the space available for graph 71. Graph 71 allows a user to track variation or evolution of a parameter over time.

The display is additionally provided with a show/hide selection toolbar icon 29. Selection of the icon 29 using selection input 15 toggles the image display between a mode where the selection toolbar 30 is displayed and a mode where the selection toolbar 30 is not displayed.

In addition to the show/hide selection toolbar icon, the display may be provided with additional show/hide icons 28, 27 & 26 each operable to toggle the image display between modes where other toolbars 40, 50, 60 are displayed or are not displayed. The show/hide icon 28 is operable to toggle the display mode of a data block toolbar 40. In one embodiment toolbar icons 26, 27, 28 and 29 may be selected to not display any toolbar or toolbar information in order to present an uncluttered view of primary image 21 and/or secondary image 22.

Turning now to figure 4, the data block toolbar 40 is displayed. The toolbar 40 comprises a plurality of data blocks 41. Each data block 41 provides information in relation to a particular feature of apparatus 1 or a particular measurable parameter of apparatus 1. In the example of figure 4, the data blocks 41 provide information on the

following features or parameters: kiln temperature as measured by temperature sensors or as calculated from a selected area or pixel within one of the captured images; kiln air pressure; kiln relay status; camera status. In some modes it is possible for data blocks 41 to be selected individually using the selection input 15. Such data blocks 41 can be moved away from the data block toolbar 40 and remain on display even when the data block toolbar 40 is hidden, as is shown in figure 5.

As is labelled in figure 5 (rather than figure 4, for the sake of clarity), each data block 41 comprises a status indication 42, a parameter/feature indication 43, a hide/cancel icon 44, and a status/parameter readout 45. Where appropriate, the data block 41 may also comprise a selectable graph icon 47.

The status indication 42 may vary in colour according to the determined status and/or to correspond with the colour of incident tag 32 and/or duration bar 33. The status indication can provide a ready indication to users of the status of the monitored parameter or feature.

The parameter/feature indication 43 is typically text identifying the parameter or feature to which the data block 41 corresponds. The hide/cancel icon 44 is selectable by use of the selection inputs 15 and is operable upon selection to hide or cancel the display of the data block 41. The status/parameter readout 45 provides a text or numerical indication of the value of the monitored parameter or the status of the monitored feature. The graph icon 47 is operable upon selection using the selection input 15 to cause the display of a graph illustrating variation in the corresponding parameter alongside or over the selection toolbar 30. This can allow a user to track variation or evolution of a parameter over time.

Turning now to figure 6, the function toolbar 50 is displayed. The toolbar 50 comprises a plurality of control icons 51-55, selectable by use of the selection input 15.

The control icon 51 is operable upon selection to vary which camera 11, 12 output comprises the primary displayed image 21 and which camera 11, 12 output comprises the secondary displayed image 22. In some instances, selection of icon 51 can also determine whether or not a secondary image 22 is displayed and if so, whether or not a secondary image 22 is displayed alongside (as in figures 2- 4) the primary image 21 or over the primary image 21 (as in figures 5, 6).

The control icon 52 is operable upon selection to enable measurement of features within the primary image. Typically, this might be used to measure the extent of features visible within the primary image, whether in terms of linear extent or area. The control icon 52 may also be operable upon selection to activate an alarm according to user set parameters. The alarm activation and status change may cause incident tags 32 and duration bars 33 to appear on the scale 31.

Captured images, alarms, user events and apparatus data are recorded by the monitoring system on a memory storage unit, to the extent allowed by the available disk space. In this way a history of events and data may be built up over time for future recall and analysis. Recorded images and data associated with incident tags 32 may be protected from deletion from the memory storage unit.

The control icon 53 is operable upon selection to toggle the display between single screen mode and double screen mode, where two display screens 14 are provided. The control icon 54 is operable upon selection to enable the display of a new sequence

of captured images for review. The control icon 54 is operable upon selection to lock or unlock the ability to vary the configuration of the display interface.

Referring now to figure 7, the show/hide icon 26 toggles the display of the palette toolbar 60. Typically this displays the palette in current use for colourising  
 5 primary image 21 and secondary image 22. By using selection input 15, such as a mouse, to select current palette 73 the selection of alternative palettes 74 is displayed. Selection input 15 may be used to select a new current palette 73 and thereafter alternative palettes 74 are no longer displayed.

Figure 7 illustrates the display of three data blocks 41. These may be positioned  
 10 according to user preference by selection input 15. As data blocks 41 are positioned in proximity to each other positioning is facilitated by automatically snapping the blocks together. Selecting icon 75 initiates a graph of the value of the parameter monitored in data block 41 to appear in graph 71.

Toolbars 30, 40 50 and 60 each contain a pin icon 76. This toggles the  
 15 positioning of the primary image 21 between two states. In the first state the primary image is displayed in the area of the toolbar with the toolbar drawn with transparency. In the second state the primary image is drawn to the boundary of the toolbar and not behind the toolbar. The second state provides for better clarity of graph 71 but at the expense of the size of primary image 21.

20 Selection toolbar 30 contains icon 77. This toggles between two display states. The first state synchronises the data displayed in primary image 21 and secondary image 22 to a common timestamp. The second state allows the user to select independent timestamps for each of the displays 21 and 22.

Selection toolbar 30 contains icon 78. The user through selection input 15 selects this icon to enter a user event for recording and recall on the time scale 31. Recorded images and data associated with incident tags 32 generated by user events may be protected from deletion.

- 5        The above embodiment is described by way of example only. Many variations are possible without departing from the scope of the invention as defined in the appended claims.

CLAIMS

1. A monitoring system for an apparatus, the monitoring system comprising: one or more cameras operable to capture timestamped images of the monitored apparatus; a display unit operable to display said timestamped images captured  
5 by the one or more cameras and a selection toolbar, each position along the selection toolbar corresponding to a particular timestamp; a selection input operable to enable selection of one or more positions along the selection toolbar; and a control unit operable in response to the selection input to cause the display unit to display a captured image with a timestamp corresponding to  
10 the selected position on the selection toolbar, wherein the display unit is further operable to display one or more incident tags relating to incidents occurring at specific timestamps, the incident tags being displayed adjacent to the selection toolbar positions associated with said timestamps, wherein the selection inputs are operable to enable selection of incident tags and wherein  
15 in response to selection of an incident tag, the control unit is operable to cause the display unit to display a captured image with a timestamp corresponding to the selected incident tag and/or to display information associated with the tagged incident.
2. A monitoring system as claimed in claim 1 wherein the system comprises a  
20 plurality of cameras, each camera located so as to capture images of different features of the apparatus.
3. A monitoring system as claimed in claim 1 or claim 2 wherein the monitored apparatus is a kiln or a rotary kiln.



4. A monitoring system as claimed in any preceding claim wherein the system comprises sensing systems comprising one or more dedicated sensors operable to detect variations in particular parameters associated with the apparatus and/or a processing unit operable to analyse and classify captured images or features within captured images.
5. A monitoring system as claimed in claim 4 wherein the control unit is operable to automatically create incident tags in response to the output of the sensing systems.
6. A monitoring system as claimed in any preceding claim wherein the control unit is operable in response to the selection input to create incident tags.
7. A monitoring system as claimed in any preceding claim wherein the incident tag varies in appearance according to the nature of the incident or the information associated with the incident.
8. A monitoring system as claimed in any preceding claim wherein the incident tag comprises a tag icon and an incident duration bar extending over the range of timestamps during which the incident is active.
9. A monitoring system as claimed in any preceding claim wherein the selection toolbar is operable to scale to different time intervals, the scaling being varied by section of a scale select tool.
10. A monitoring system as claimed in any preceding claim wherein the selection toolbar is displayed alongside the lower edge of the image.

11. A monitoring system as claimed in any preceding claim wherein the display unit is operable to display any one or more of: a function toolbar; palette toolbar and a data block toolbar.
12. A monitoring system as claimed in claim 11 wherein the function toolbar is  
5 displayed alongside the upper edge of the image, the palette toolbar is displayed alongside the right edge of the image and the data block toolbar is displayed alongside the left edge of the image.
13. A monitoring system as claimed in claim 11 or claim 12 wherein the function  
10 toolbar comprises one or more selectable icons and in response to selection of the icons using the selection input, the control unit is operable to initiate particular functions of the system or to cause the display unit to vary the display in accordance with a particular function or mode selected.
14. A monitoring system as claimed in any one of claims 11 to 13 wherein the  
15 palette toolbar enable selection of specific colour display modes for the captured images.
15. A monitoring system as claimed in any one of claims 11 to 14 wherein the data block toolbar comprise one or more selectable data blocks, each data block corresponding to a particular parameter or feature of the apparatus
16. A monitoring system as claimed in claim 15 wherein each data block  
20 comprises any one or more of: status indication, by way of text, an icon or both; parameter indication or a selectable control icon.
17. A monitoring system as claimed in claim 15 or claim 16 wherein in response to selection of an individual data block using the selection input, the control

unit is operable to enable the data block to be moved from the data block toolbar to another location.

18. A monitoring system as claimed in any preceding claim comprising a memory storage unit operable to store captured images and/or information associated with tagged incidents, wherein captured images with a timestamp corresponding to an incident tag and/or information associated with tagged incidents are automatically protected from deletion from the memory storage unit.



**Application No:** GB1617403.9

**Examiner:** Rob Valkass

**Claims searched:** 1-18

**Date of search:** 16 February 2017

## Patents Act 1977: Search Report under Section 17

### Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X	1-18	US 2008/0071428 A1 (KIM), see paragraphs [0032] and [0035]-[0042], figures 3A and 3B, and accompanying descriptions.
X	1-18	US 2014/0047371 A1 (PALMER et al), see whole document.
X	1-18	US 6332147 B1 (MORAN et al), see abstract, column 9 lines 5-18, figures 5-13 and accompanying descriptions.
X	1-18	US 2008/0145830 A1 (HUANG et al), see abstract, figures 4A-D and accompanying descriptions.
X	1-18	US 2013/0124997 A1 (SPEIR et al), see paragraphs [0010]-[0014], figures 1 and 2, and accompanying descriptions.
X	1-18	EP 2929773 A1 (DEERE & COMPANY), see abstract, figures 6 and 8, and accompanying descriptions.

### Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

### Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC<sup>X</sup> :

Worldwide search of patent documents classified in the following areas of the IPC

F27D; G07C; G08B

The following online and other databases have been used in the preparation of this search report

EPODOC, WPI, TXTA



**International Classification:**

<b>Subclass</b>	<b>Subgroup</b>	<b>Valid From</b>
F27D	0021/02	01/01/2006
G07C	0003/00	01/01/2006