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(54) **TOOL FOR THE CENTRALIZED SUPERVISION AND/OR HYPERVISION OF A SET OF SYSTEMS HAVING DIFFERENT SECURITY LEVELS**

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H04L 29/06 (2006.01)

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CPC ***H04L 63/1408*** (2013.01)

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CPC H04L 43/08; H04L 63/00; H04L 63/1408; H04L 63/16; H04L 67/12; H04L 67/36; H04L 41/22; H04L 43/045; H04L 63/105; G06F 2221/2149; H04M 2250/12; H04N 1/00209; H04N 1/32523; H04N 2201/3202; A61B 5/0022
USPC 709/206
See application file for complete search history.

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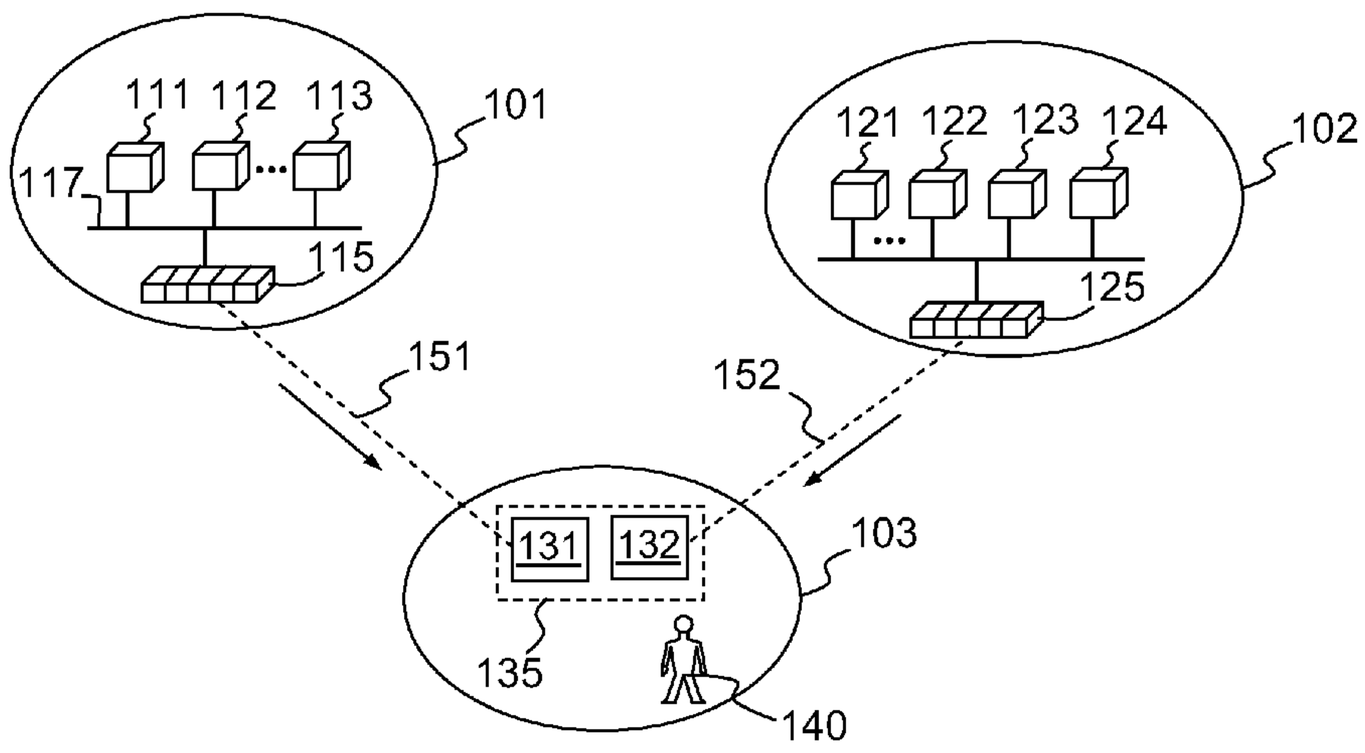
(57) **ABSTRACT**

A tool for the supervision and/or hypervision of a set of systems of different security levels, the systems transmitting messages, includes a display system, and further includes, for each supervised network, at least one gateway for converting the messages to image data, said gateways transmitting said image data via a one-way video link to the display system, at least one of the supervised networks being of a higher security level than the area in which the display system is placed. The invention applies notably to the centralized supervision of several information systems when said systems are subjected to different security constraints.

11 Claims, 2 Drawing Sheets



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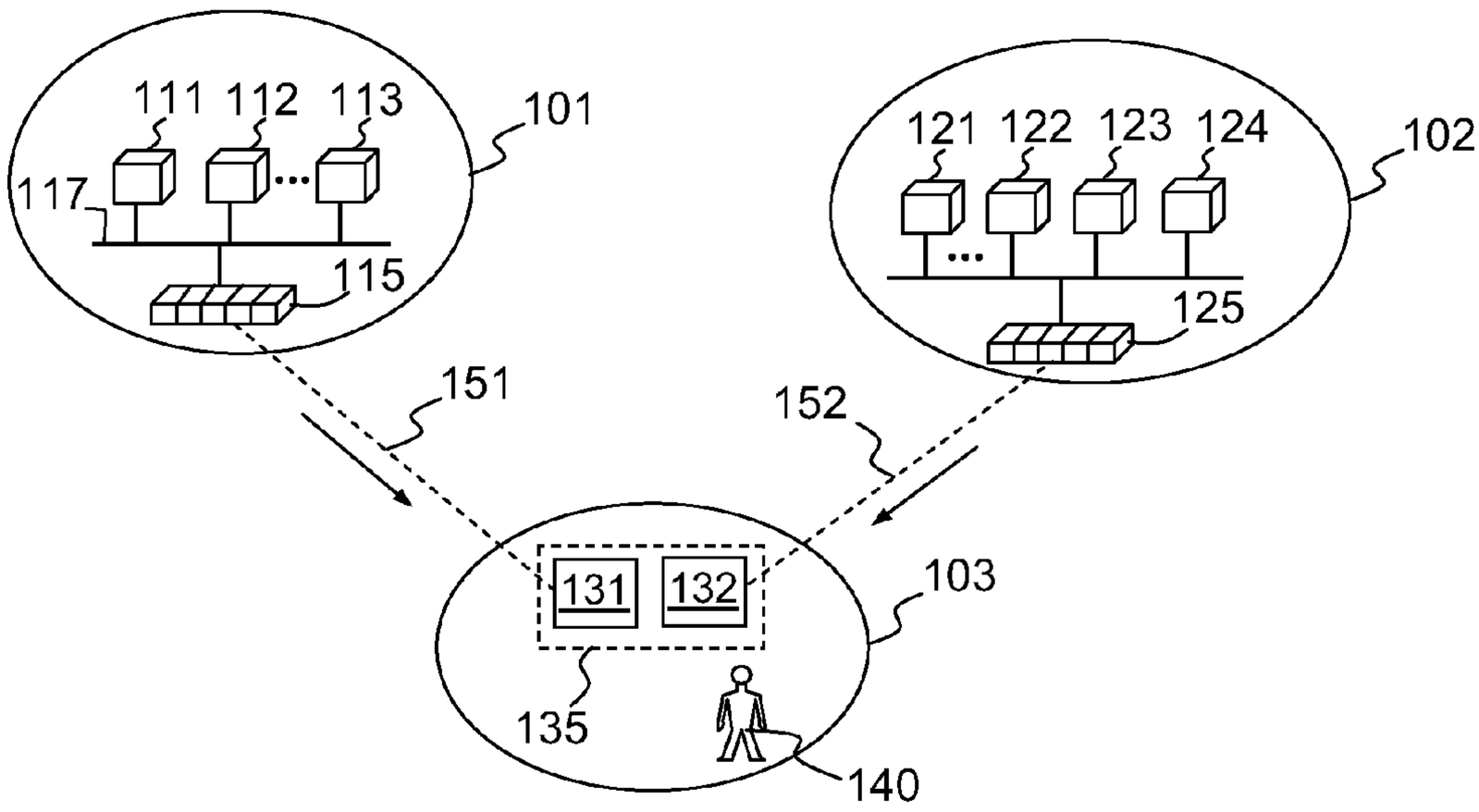
111 112 113
101
117
115
121 122 123 124
102
125
151
152
131 132
103
135
140

FIG.1

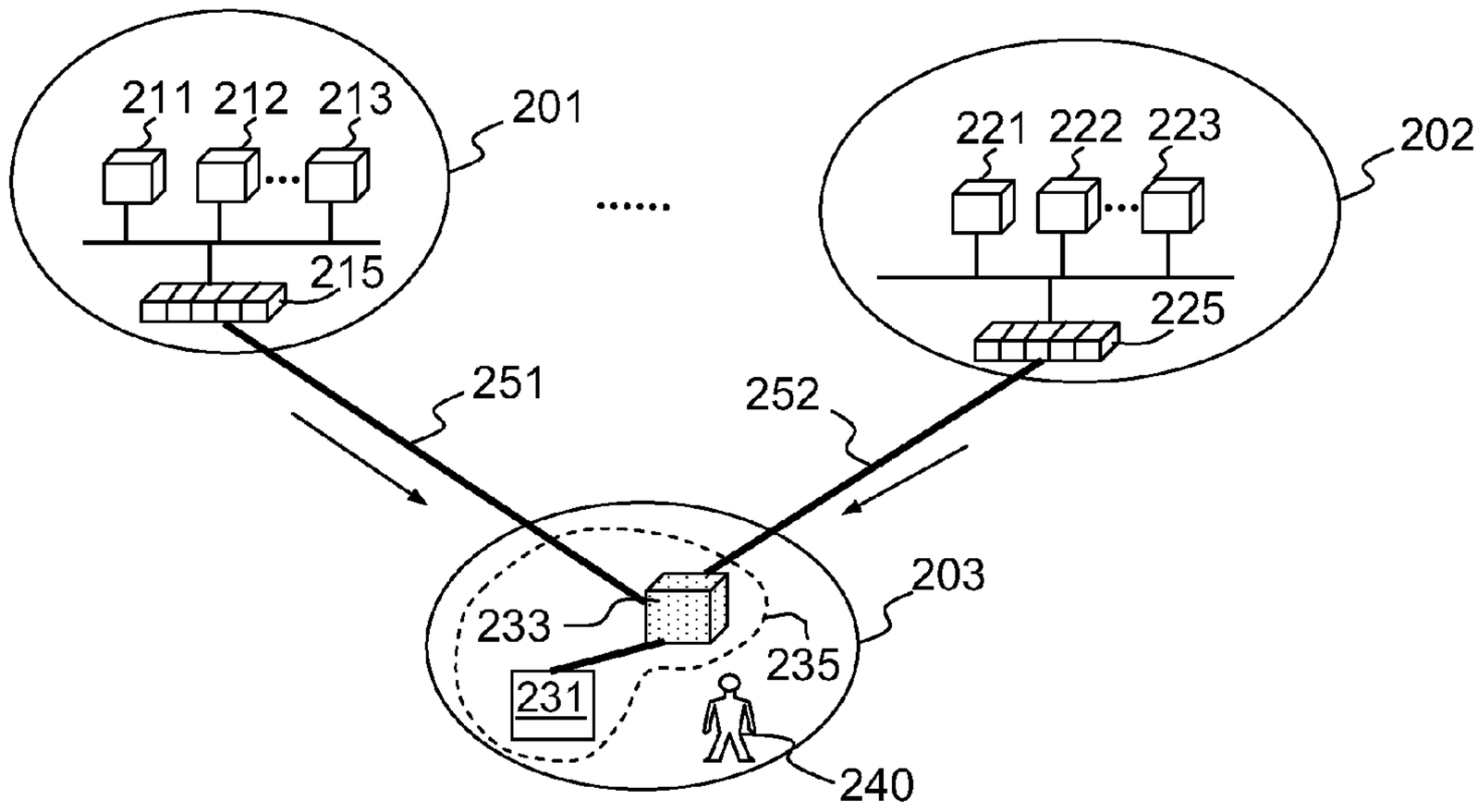
211 212 213
201
215
221 222 223
202
225
.....
251
252
233
203
235
231
240

FIG.2

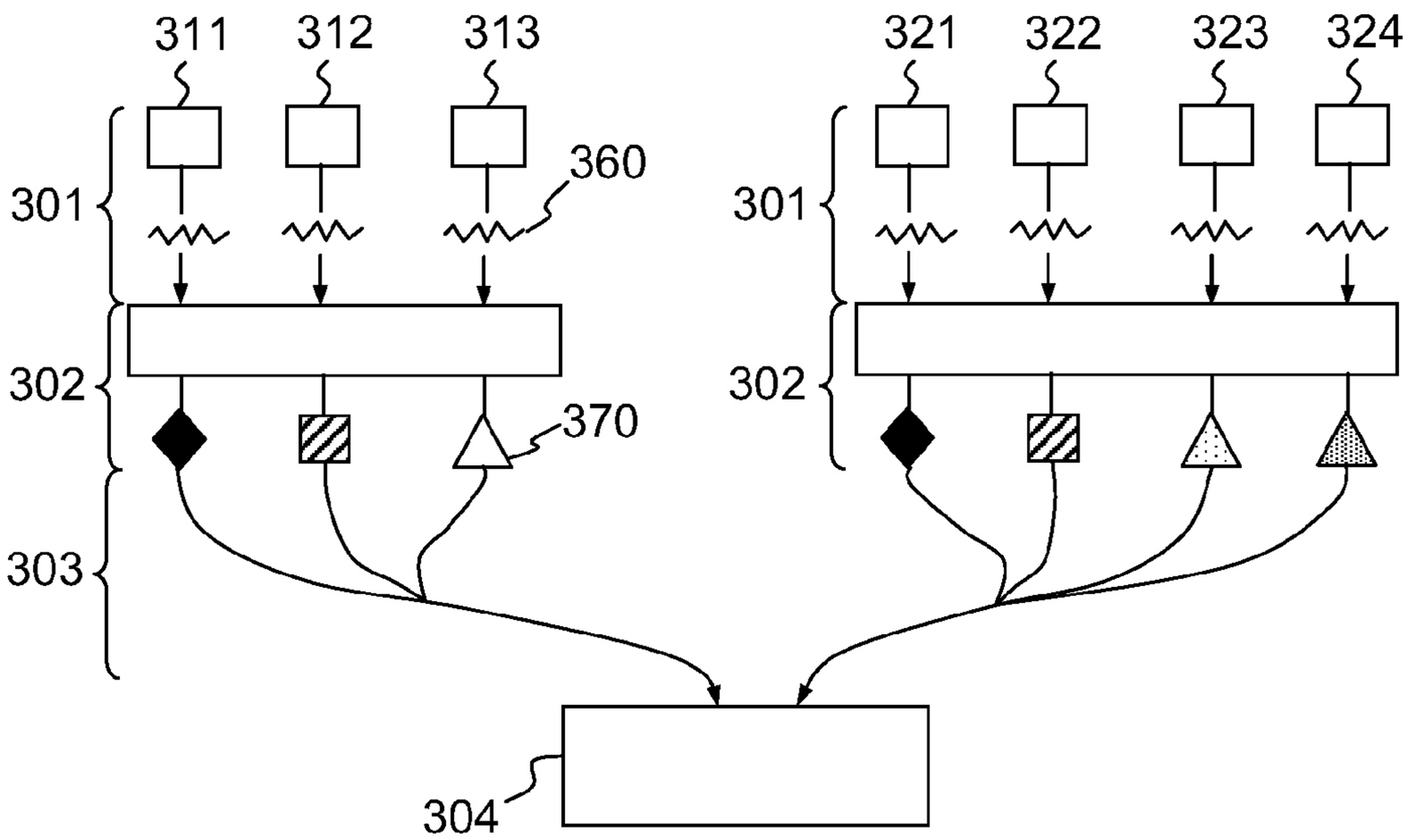
311
312
313
321
322
323
324
360
301
302
303
370
304

FIG.3

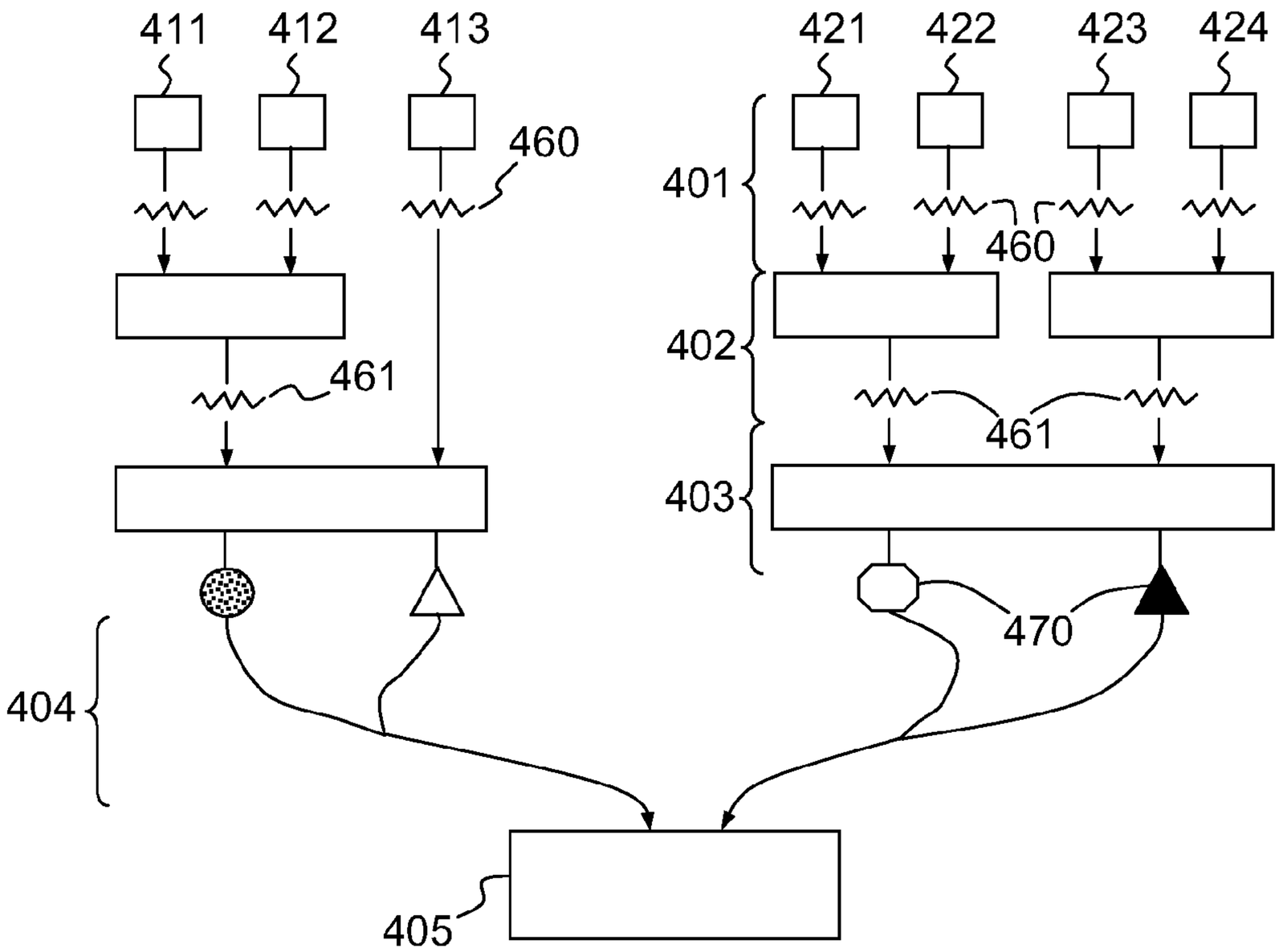
411
412
413
421
422
423
424
460
401
461
402
403
470
404
405

FIG.4

TOOL FOR THE CENTRALIZED SUPERVISION AND/OR HYPERVISION OF A SET OF SYSTEMS HAVING DIFFERENT SECURITY LEVELS

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a National Stage of International patent application PCT/EP2009/064003, filed on Oct. 23, 2009, which claims priority to foreign French patent application No. FR 0805918, filed on Oct. 24, 2008, the disclosures of which are incorporated by reference in their entirety.

BACKGROUND OF THE INVENTION

The present invention relates to a tool for the supervision and/or hypervision of a set of systems of different security levels. It applies notably to the centralized supervision of several information systems when said systems are subjected to unequal security constraints.

In order to supervise entities such as information systems, protected rooms, production or control systems, it is known practice to employ a centralized supervision or hypervision tool. A supervision tool assembles in one and the same location indicators originating from various supervised entities in order to offer an overview of the state of said entities. A hypervision tool offers, in addition to the supervision tool, a synthetic view of the state indicators, correlations being able to be made between indicators originating from distinct entities.

However, when the levels of sensitivity of the data handled on each of the networks are different, the centralized supervision of said networks becomes difficult because of the constraints imposed by the rules aimed at protecting the data. The interconnection of a first system, with a high security level, with a second system, with a lower security level, poses at least two types of problems: the leakage of sensitive information from the first system to the second system and the intrusions originating from the second system.

Conventionally, the supervision centers are then installed in the network of highest security, the other networks being linked via one-way links to the supervision center in order to feed said center with state indicators. Since communications are made only in the uplink direction, no leakage of information present in the network of highest security level is possible. However, the regulation applied to the level of the network of highest security usually induces the application of costly constraints, both from the technical point of view and in matters of training, organization and personnel authorization.

In order to place a supervision center in a network of lower security, in order to avoid the abovementioned constraints, it is known practice to use an interconnection system of multiple security levels. According to one operating mode, such a multilevel system is first configured in order to define what types of data are confidential. Labeling of the data streams is carried out in order to distinguish the confidential data streams from the data streams that are not very sensitive. It is therefore necessary to define manually, for each of the communication protocols used, labels and filtering rules to be applied. This manual configuration phase is protracted and costly. Moreover, the labels applied to the data streams must be signed by cryptographic keys, which requires the use of a key-management infrastructure.

Finally, a supervision and/or hypervision tool must be able to transmit possible alarms in real time, which also excludes the solutions that make use of a manual operation for filtering the sensitive information.

SUMMARY OF THE INVENTION

One object of the invention is to propose a less costly supervision and/or hypervision system capable of operating in a network of relatively low security and making it possible to collect and centralize in real or virtually real time, without risk of compromising sensitive data, information originating from networks of higher security levels. Accordingly, the subject of the invention is a tool for the centralized supervision and/or hypervision of a set of systems of different security levels, said systems transmitting messages, said tool comprising a display system, the tool being characterized in that at least one supervised system comprises one or more gateways for converting the transmitted messages to image data, said gateways transmitting said image data via a one-way link to the display system, at least one of the supervised systems being of a higher security level than the security level of the area in which the display system is placed.

The tool according to the invention carries out a semantic break of the information. One advantage of this break is that the image data originating from the conversion is difficult to interpret by a programmable controller, unlike textual data, that can be directly used by an analysis software program. The creation of auxiliary channels is therefore made difficult. Moreover, unlike what is done conventionally in the matter of security, the one-way link transmits information from the network of high protection level to a network of lower protection level.

According to one embodiment of the centralized supervision and/or hypervision tool according to the invention, at least one supervised system comprises a gateway capable of assembling several messages transmitted by said supervised system in order to generate a message with coarser semantic content.

This message assembly makes it possible to mix several items of information in order to reduce the risks of compromising sensitive data.

According to one embodiment of the centralized supervision and/or hypervision tool according to the invention, the one-way links are video links carrying out a display transfer from a gateway to a screen. This embodiment reduces the risks of information technology intrusion, the link being dedicated solely to the display of images. The display system may then comprise one or more screens, at least one screen being associated with each supervised system, a one-way link linking a supervised system to the screen or screens that are associated therewith. A "wall of images" can therefore be produced so that a human operator having access to the display system has at his disposal an overview of the networks of different security levels.

According to another embodiment of the centralized supervision and/or hypervision tool according to the invention, at least one one-way link is a network link capable of transporting the image data, the display device comprising at least one screen linked to a processing module receiving said images, the processing module being fitted with a software program capable of representing the images originating from several networks on the same screen. This embodiment makes it possible to obtain a synthetic representation of the state of the various networks on one and the same screen.

According to one embodiment of the centralized supervision and/or hypervision tool according to the invention, the

messages are SNMP/UDP ("Simple Network Management Protocol"/"User Datagram Protocol") messages, the gateway comprising an adapter capable of converting the SNMP/UDP messages to images.

According to one embodiment of the centralized supervision and/or hypervision tool according to the invention, at least one gateway is suitable for converting the messages to image data as a function of the semantic content of said messages, unlike what is done conventionally by simple tools for converting a data format.

According to one embodiment of the centralized supervision and/or hypervision tool according to the invention, the messages are state indicators, the images originating from the conversion of said messages being symbolic representations of the semantic content of said indicators.

A further subject of the invention is a method for the centralized supervision and/or hypervision of a set of systems of different security levels, at least one supervised system comprising one or more gateways and sensors and/or alarm devices transmitting messages, said gateways being linked to one and the same display system, the method comprising, for at least one supervised system of higher security level than the security level of the area in which the display system is placed, at least the following steps:

- a gateway comprised by said supervised system receives and converts the transmitted messages to image data;
- said gateway transmits, via a one-way link, the image data to the display system.

According to one application of the method according to the invention, the method also comprises a step during which a gateway assembles several messages in order to create a message with coarser semantic content.

BRIEF DESCRIPTION OF THE DRAWINGS

Other features will appear on reading the following non-limiting detailed description given as an example and made with respect to the appended drawings which represent:

FIG. **1**, a first embodiment of the hypervision tool according to the invention,

FIG. **2**, a second embodiment of the hypervision tool according to the invention,

FIG. **3**, a block diagram illustrating a first example of the method according to the invention,

FIG. **4**, a block diagram illustrating a second example of the method according to the invention.

DETAILED DESCRIPTION

FIG. **1** presents a first embodiment of the supervision/hypervision tool according to the invention. The supervision/hypervision tool of FIG. **1** is designed to supervise independent networks **101**, **102** from an area **103** subjected to a lower level of security than at least one of the supervised networks **101**, **102**. In the example, the first supervised network **101** is subjected to a maximum security level, the second supervised network **102** is subjected to an intermediate security level, and the area **103** from which the networks are supervised is subjected to a minimal security level.

The tool according to the invention comprises a display system **135** placed in the area **103** of minimal security, the display system **135** comprising at least one screen, two screens **131**, **132** in the example of FIG. **1**. The display system **135** allows a supervision agent **140** to know at all times the situation of the supervised networks **101**, **102**.

The first supervised network **101** comprises sensors and/or alarm devices **111**, **112**, **113** linked to a gateway **115**. The sensors and/or alarm devices **111**, **112**, **113** generate messages, for example to indicate their state. As an illustration, a temperature sensor **111** is capable of transmitting a message that can take optionally three different values: "normal temperature", "high temperature", "fire"; an alarm device **112** placed on a safe can transmit two optional states: "safe open" or "safe closed"; a workstation provided with an anti-intrusion detection software program can transmit optionally four states: "normal operation", "intrusion attempt", "intrusion detected" or "out of service". The messages are transmitted to the gateway **115**, for example via a computer network **117** of the Ethernet type. According to one embodiment of the supervision/hypervision tool according to the invention, the simple network management protocol SNMP is used to raise alarms. The messages can then be conveyed to the gateway **115** via UDP "User Datagram Protocol") datagrams, for example.

The gateway **115** converts the messages from the sensors and/or alarm devices **111**, **112**, **113** to images. In other words, the codes or the textual data contained in the messages are interpreted by the gateway **115** which, depending on the nature and/or the value of the message, creates an image symbolizing the semantic content of the message. Thus, the gateway receives messages as an input, but produces only images as an output, so that a considerable formal break is made by the gateway **115**. As an example, to reuse the aforementioned example of the temperature sensor, an image in the form of a green diamond is produced when the received message is "normal temperature", an orange diamond for the value "high temperature" and a red diamond when the message takes the "fire" value. The images can be produced at frequent intervals so as to generate a video stream.

Moreover, according to one embodiment of the tool according to the invention, the gateway **115** combines several messages before converting the result of this combination to an image. For example, if the gateway **115** receives a "normal temperature" message from a first temperature sensor and another "high temperature" message from a second sensor that is present in the same network as the first sensor, then a synthetic form in order to represent these two items of information combined is generated, for example an orange hexagon instead of two respectively green and orange diamonds. This assembly of information makes it possible to generate an image with coarser semantic content, in this instance, the generated image means "at least one of the two sensors has detected too high a temperature". Thus, from an external point of view, only this coarse information can be known, thus limiting the risk of compromising sensitive data. In the example, this assembly of data can be used if knowledge of the temperature on only one of the two sensors is confidential information. According to this embodiment, the gateway **115** therefore carries out two processes to limit the leakage of confidential data: the assembly of information carried by the messages and the formal break described above.

Once an image has been produced by the gateway **115**, this image is transmitted to the first screen **131** of the display system **135** via a one-way video link **151**. In other words, the link **151** is produced so that no data can travel from the display device **135** to the gateway **115**. According to the embodiment shown in FIG. **1**, the link **151** does not transport computer data packages; this link simply allows the transfer of display to a screen **131** that is remote from the gateway **115**.

The second supervised network **102** comprises a structure similar to that of the first network **101**, that is to say sensors and/or alarm devices **121**, **122**, **123**, **124** linked to a gateway **125** which transmits image data to the second screen **132** of the display device **135** via a second one-way link **152**.

According to another embodiment, each of the supervised networks **101**, **102** can comprise several gateways, the display transfer then being carried out for each of the gateways.

FIG. **2** shows a second embodiment of the supervision/hypervision tool according to the invention. The supervision/hypervision tool of FIG. **2** is designed to supervise independent networks **201**, **202** from an area **203** subjected to a lower security level than at least one of the supervised networks **201**, **202**. In the example, the first supervised network **201** is subjected to a maximum security level, the second supervised network **202** is subjected to an intermediate security level, and the area **203** from which the networks are supervised is subjected to a minimal security level.

According to this second embodiment, the tool according to the invention comprises a display system **235** placed in the area **203** of minimal security, the display system **235** comprising at least one screen **231** and a processing module **233** which is for example a computer station.

In the same manner as in the first embodiment shown in FIG. **1**, at least one gateway **215**, **225** that is present in a supervised network **201**, **202** converts the messages transmitted by sensors **211**, **212**, **213**, **221**, **222**, **223** to images.

Nevertheless, unlike the first embodiment, the images are transmitted from each of the gateways **215**, **225** to the display device **235** via a one-way network link **251**, **252** and the use of a nonconnected protocol. The images are then received by the processing module **233** which combines the images received from the various networks in order to produce a synthetic graphic representation, this representation being displayed on the screen **231** associated with the processing module **233**.

FIG. **3**, a block diagram illustrating a first example of the method according to the invention.

For a network to be supervised, initially **301**, sensors **311**, **312**, **313**, **321**, **322**, **323**, **324** of the network produce messages **360**, for example in the form of code or of text. Secondly **302**, the semantic content of the messages **360** is interpreted and converted to image **370** by a gateway. Thirdly **303**, the previously produced images **370** are transmitted via a one-way link to the display device.

Fourthly **304**, the display device uses the images **370** originating from the various networks to produce a graphic representation of the supervised situation.

FIG. **4**, a block diagram illustrating a second example of the method according to the invention comprising an additional step of semantic assembly of messages.

For a network to be supervised, initially **401**, sensors **411**, **412**, **413**, **421**, **422**, **423**, **424** of the network produce messages **460**, for example in the form of code or of text. Secondly **402**, messages **460** are assembled to form a message **461** with coarser semantic content. Thirdly **403**, the semantic content of the messages **460**, **461** is interpreted and converted to image **470** by a gateway.

Fourthly **404**, the previously produced images **470** are transmitted via a one-way link to the display device.

Fifthly **405**, the display device uses the images **470** originating from the various networks to produce a graphic representation of the supervised situation.

The supervision/hypervision tool according to the invention may, for example, be used by an enterprise for supervising the integrity of its computer networks and of its safe rooms, these networks and rooms being independent of one another, certain networks and rooms being more sensitive than others. In this context, the supervision/hypervision tool is preferably placed in a not very sensitive area, for example in the reception of the place of business. A supervision agent with no particular need for qualification or accreditation is then responsible for monitoring the tool in order to transmit to the qualified people a possible alarm raised on one of the supervised systems. The tool according to the invention is therefore used to carry out passive supervision by the agent, who has no role of intervening on the network that has raised the alarm.

The invention claimed is:

1. A supervision system for centralized supervision or hypervision of a plurality of systems having different security levels, said supervision system comprising:

a display system comprising one or more displays;

a plurality of systems configured to transmit messages, each of the messages comprising semantic content, and the plurality of systems being located in a different area than the display system; and

one or more gateways within at least one of the plurality of systems, wherein:

the one or more gateways are configured to convert each of the transmitted messages to a symbolic representation of its semantic content, the symbolic representation to be transmitted as image data, and the symbolic representation of the semantic content of each message being different from its corresponding message,

the one or more gateways are configured to transmit said image data via one or more one-way links to the display system to create a semantic break of the semantic content of the messages between the plurality of systems and the display system, and

at least one of the plurality of systems has a higher security level than the security level of an area in which the display system is located.

2. The supervision system as claimed in claim **1**, wherein the one or more gateways are configured to assemble several messages transmitted by the at least one system to generate image data symbolizing coarser semantic content.

3. The supervision system as claimed in claim **1**, wherein the one-way links are video links transferring the image data from the one or more gateways to the one or more displays of the display system.

4. The supervision system as claimed in claim **3**, wherein at least one display of the one or more displays is associated with each of the plurality of systems, and one of the one or more one-way links connects each of the plurality of systems to the associated at least one display.

5. The supervision system as claimed in claim **1**, wherein at least one of the one or more one-way links is a network link configured to transport the image data, and wherein the display system comprises a processing module connected to the one or more displays, the processing module configured to receive the image data, and the processing module configured to execute a software program enabling presentation of the image data from the plurality of systems on the same display of the display system.

6. The supervision system as claimed in claim **1**, wherein the transmitted messages are SNMP/UDP messages, and the one or more gateways further comprise an adapter configured to convert semantic content of the SNMP/UDP messages to the image data.

7. The supervision system as claimed in claim **1**, wherein the transmitted messages are state indicators.

8. A method for centralized supervision or hypervision of a plurality of systems having different security levels using a display system, the plurality of systems being located in a different area than the display system, at least one of the plurality of systems comprising one or more gateways configured to transmit messages, each of the messages compris-

ing semantic content, said one or more gateways being linked to the same display system, the method comprising, for at least one of the plurality of systems having a higher security level than the security level of an area in which the display system is located:

receiving, by the one or more gateways within the at least one of the plurality of systems, the transmitted messages;

converting, by the one or more gateways, each of the transmitted messages to a symbolic representation of its semantic content, the symbolic representation to be transmitted as image data, and the symbolic representation of the semantic content of each message being different from its corresponding message; and

transmitting, by the one or more gateways and via a one-way link, the image data to the display system to create a semantic break of the semantic content of the messages between the plurality of systems and the display system.

9. The method as claimed in claim **8**, further comprising assembling, by the gateway, several transmitted messages to create a message symbolizing coarser semantic content.

10. The supervision system as claimed in claim **1**, wherein the one or more gateways are configured to transmit only said image data via the one or more one-way links to the display system.

11. The method as claimed in claim **8**, wherein transmitting the image data to the display system comprises transmitting, by the one or more gateways and via the one-way link, only the image data to the display system.

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