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Audet et al.

(54) **METHOD OF EXPANDING STACKED ELEMENTS**

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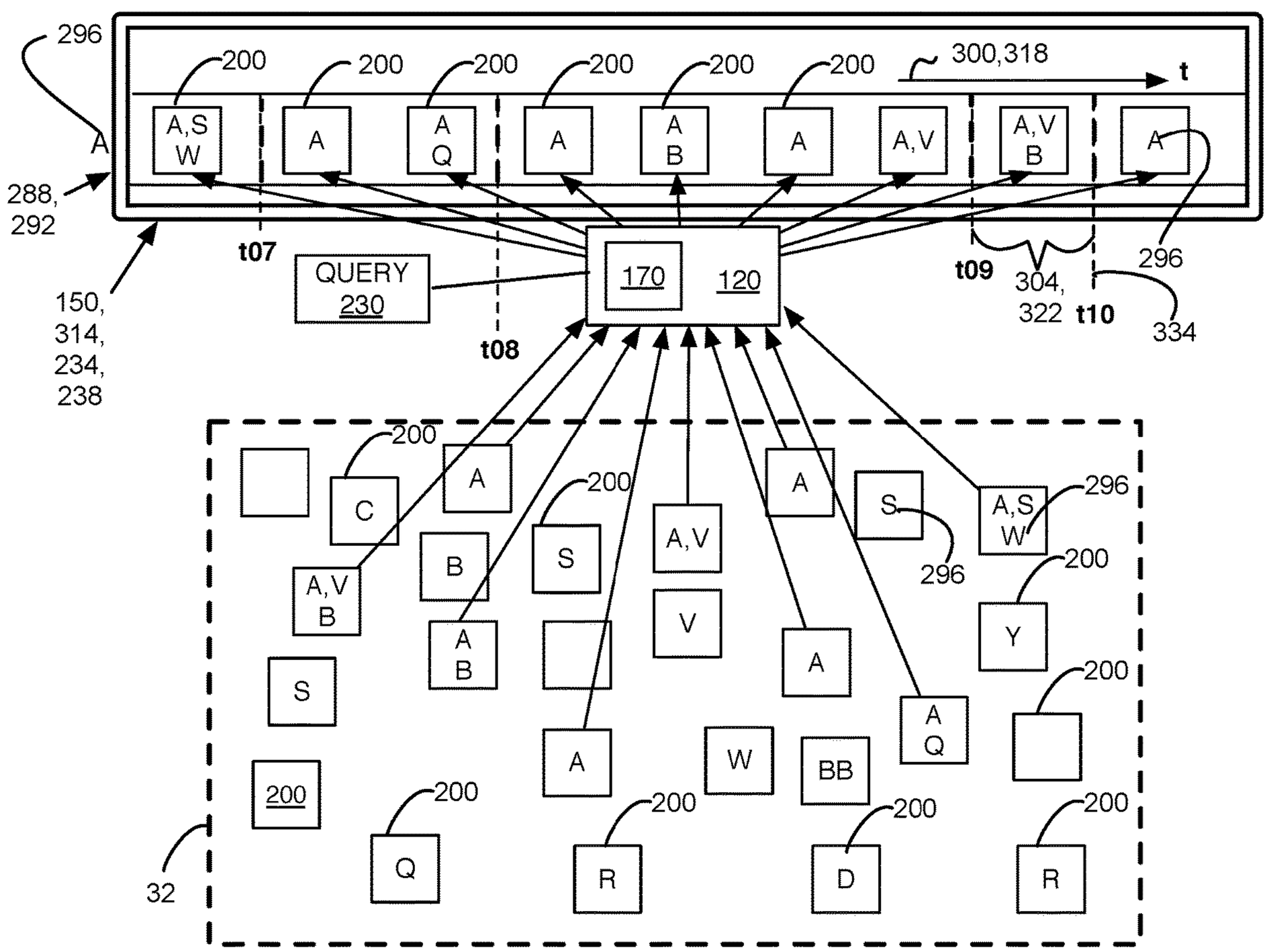
G06F 40/103	(2006.01)

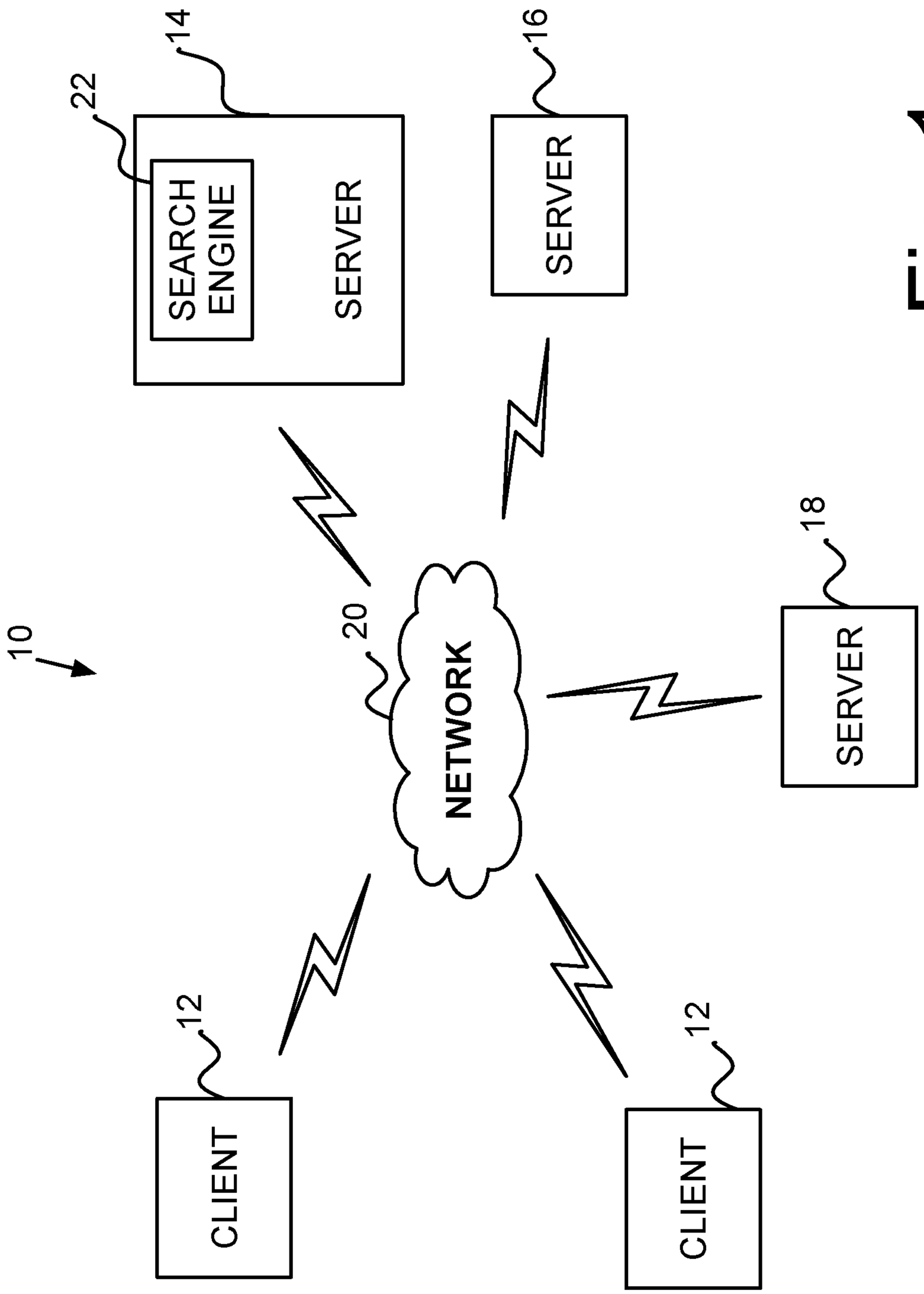
(52) **U.S. Cl.**

CPC ***G06F 40/106*** (2020.01); ***G06F 16/904*** (2019.01); ***G06F 3/0481*** (2013.01); *G06F 3/0485* (2013.01); ***G06F 3/04817*** (2013.01); ***G06F 40/103*** (2020.01); ***G06F 3/0482*** (2013.01)

(57) **ABSTRACT**

The present invention provides solutions to the potential undesirable effects the insertion and removal of information elements and documents may have on axes of elements using a collation function and collation units and further allows for displaying the elements with a first layout until the number of elements to be displayed in the collation unit exceeds a maximum number of elements displayable with the first layout, the elements displayed in the collation unit being displayed with a second layout when the number of elements to be displayed in the collation unit exceeds the number of elements displayable with the first layout. The invention can be effectuated as a method, a device and an apparatus carrying out the method described herein.

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22
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SEARCH ENGINE
SERVER
16
SERVER
20
NETWORK
18
SERVER
12
CLIENT
12
CLIENT

Fig. 1

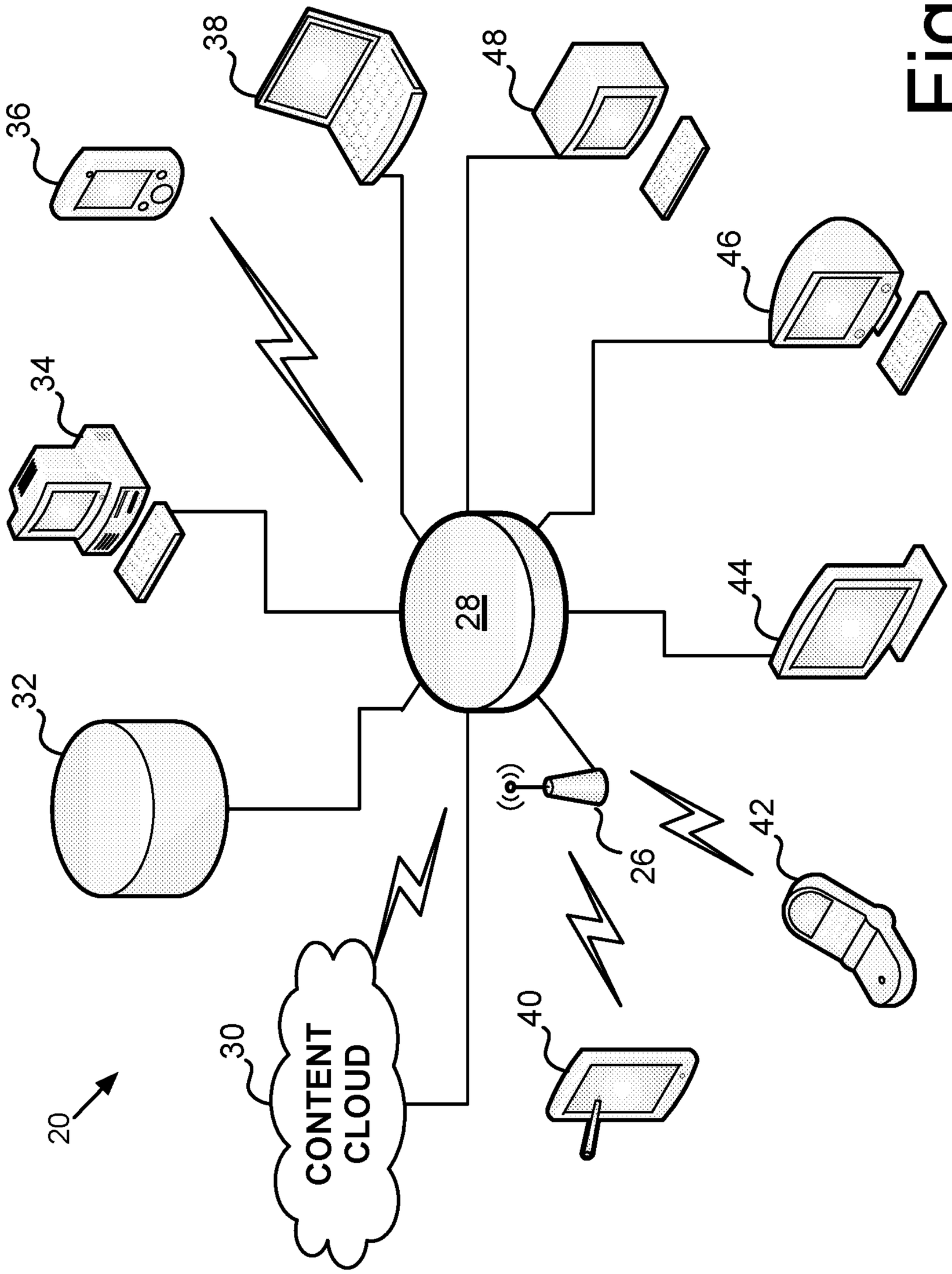
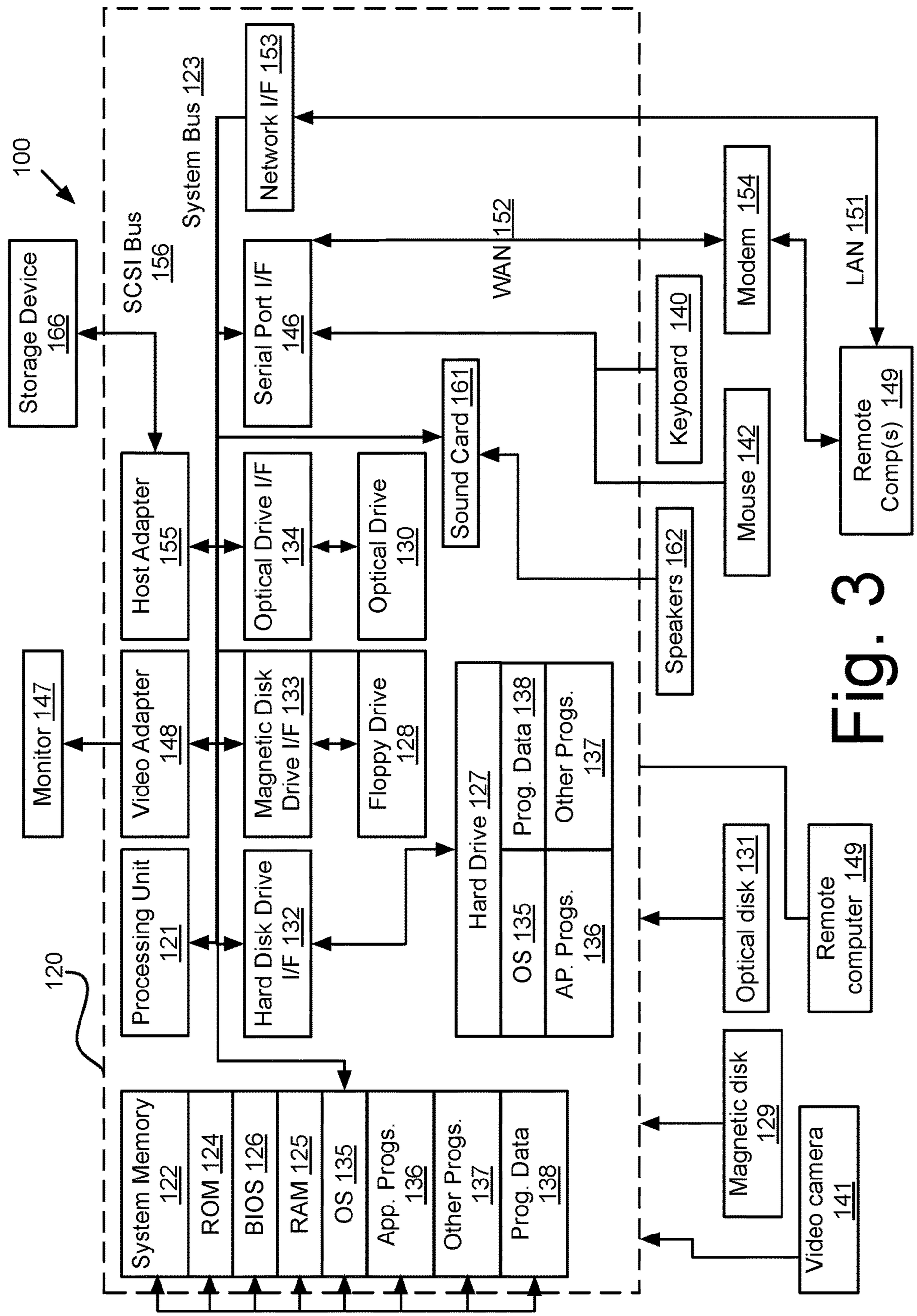


Fig. 2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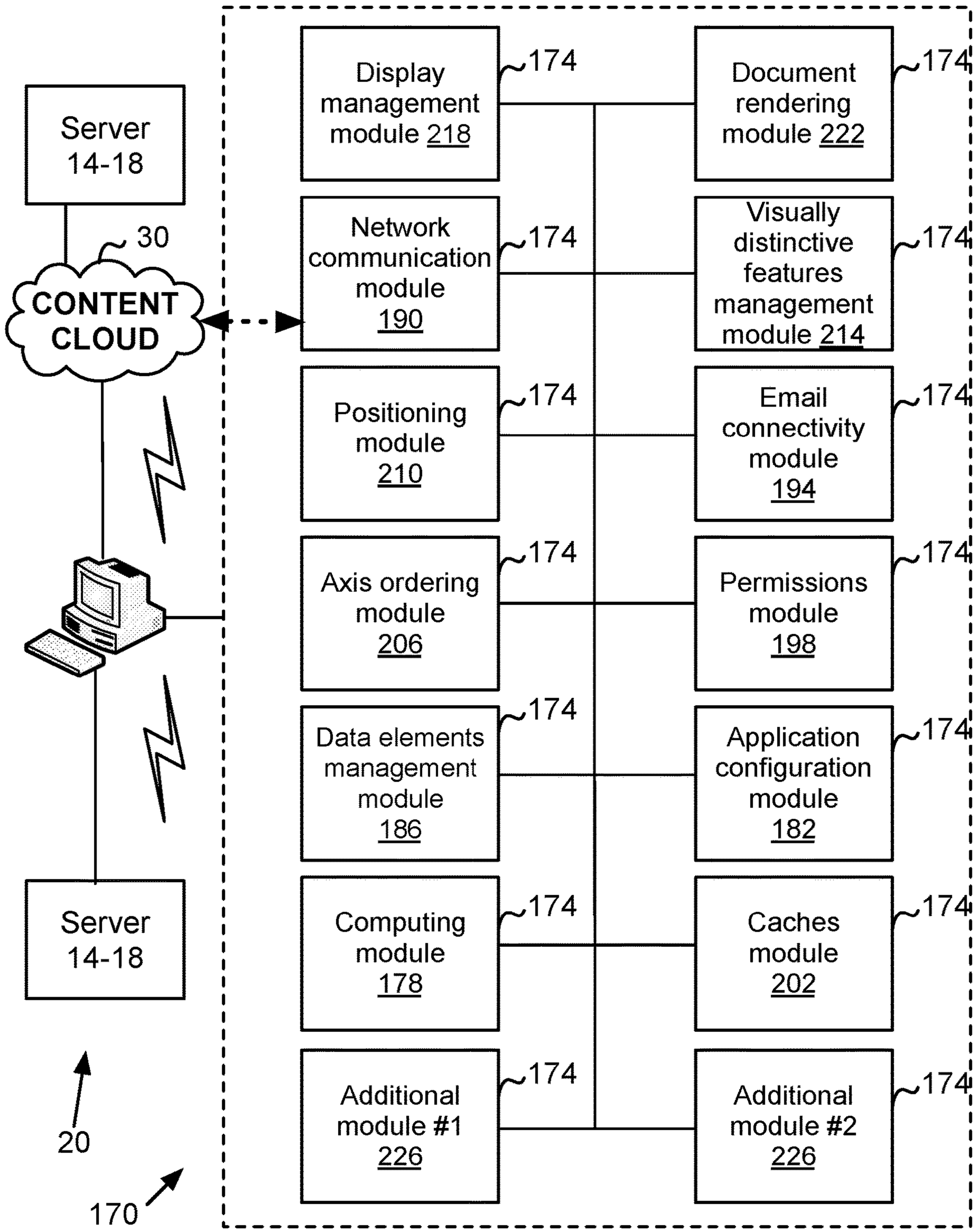
120
System Bus 123
SCSI Bus 156
Storage Device 166
Network I/F 153
WAN 152
Serial Port I/F 146
Modem 154
LAN 151
Keyboard 140
Mouse 142
Remote Comp(s) 149
Sound Card 161
Speakers 162
Host Adapter 155
Optical Drive I/F 134
Optical Drive 130
Monitor 147
Video Adapter 148
Magnetic Disk Drive I/F 133
Floppy Drive 128
Processing Unit 121
Hard Disk Drive I/F 132
Hard Drive 127
Prog. Data 138
Other Progs. 137
OS 135
AP. Progs. 136
Optical disk 131
Remote computer 149
Magnetic disk 129
Video camera 141
System Memory 122
ROM 124
BIOS 126
RAM 125
OS 135
App. Progs. 136
Other Progs. 137
Prog. Data 138

Fig. 3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30
CONTENT
CLOUD
Server
14-18
20
170
Display
management
module 218
174
Network
communication
module
190
174
Positioning
module
210
174
Axis ordering
module
206
174
Data elements
management
module
186
174
Computing
module
178
174
Additional
module #1
226
174
Document
rendering
module 222
174
Visually
distinctive
features
management
module 214
174
Email
connectivity
module
194
174
Permissions
module
198
174
Application
configuration
module
182
174
Caches
module
202
174
Additional
module #2
226
174

Fig. 4

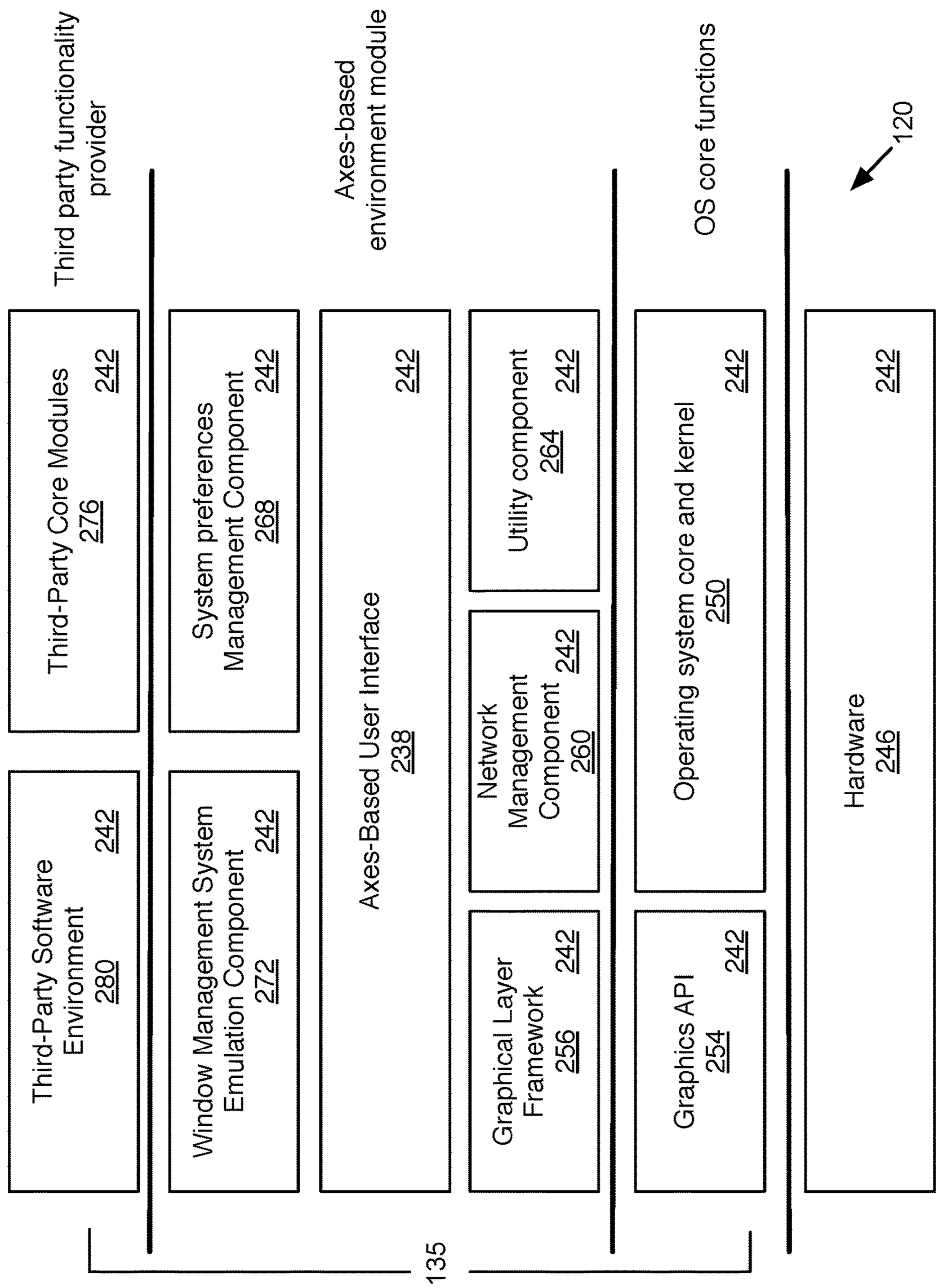
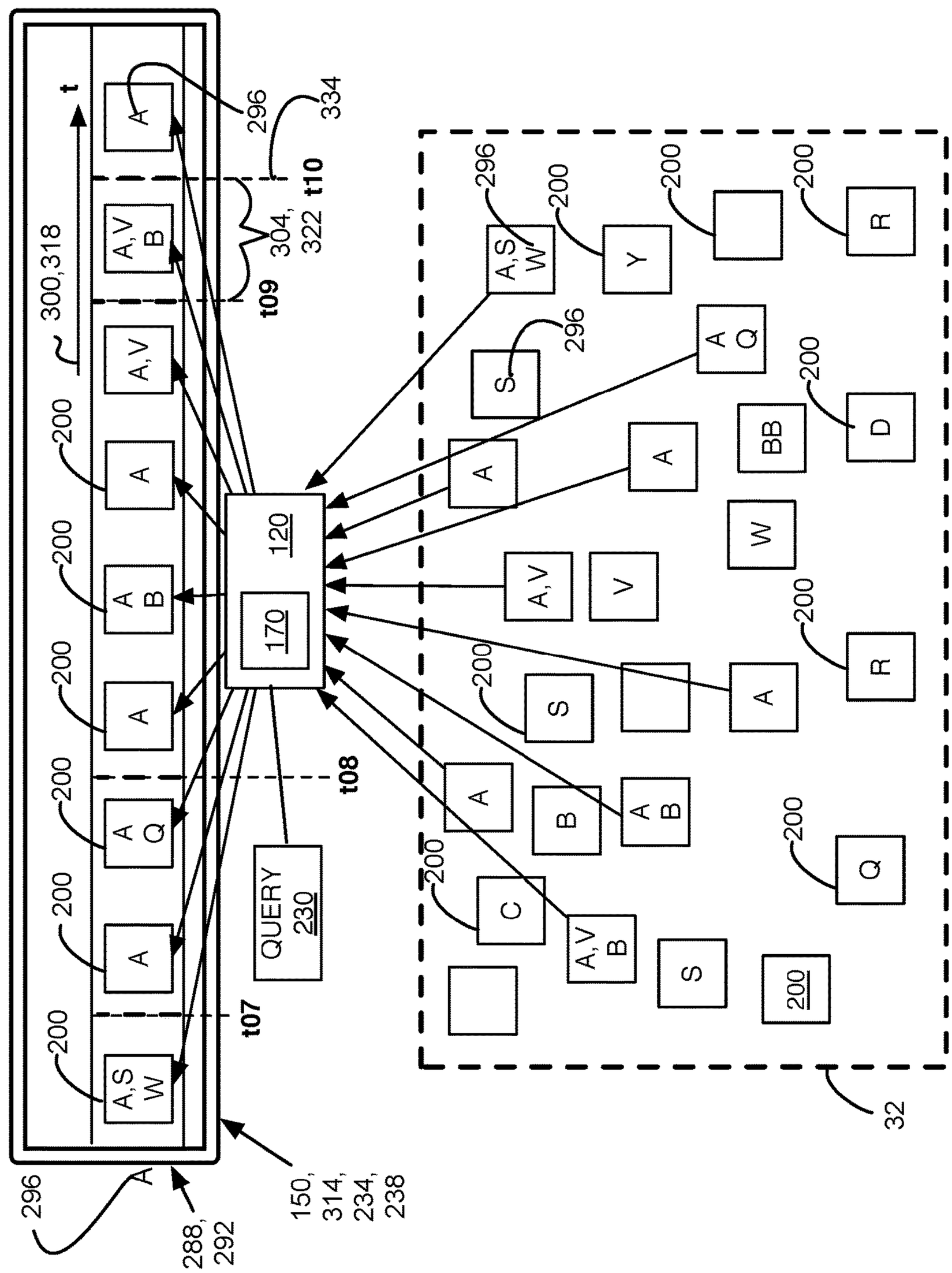

Third party functionality provider
Axes-based environment module
OS core functions
120
Third-Party Core Modules 276 242
Third-Party Software Environment 280 242
System preferences Management Component 268 242
Window Management System Emulation Component 272 242
Axes-Based User Interface 238 242
Utility component 264 242
Network Management Component 260 242
Graphical Layer Framework 256 242
Operating system core and kernel 250 242
Graphics API 254 242
Hardware 246 242
135

Fig. 5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t10
304,
322
t09
t08
t07
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QUERY
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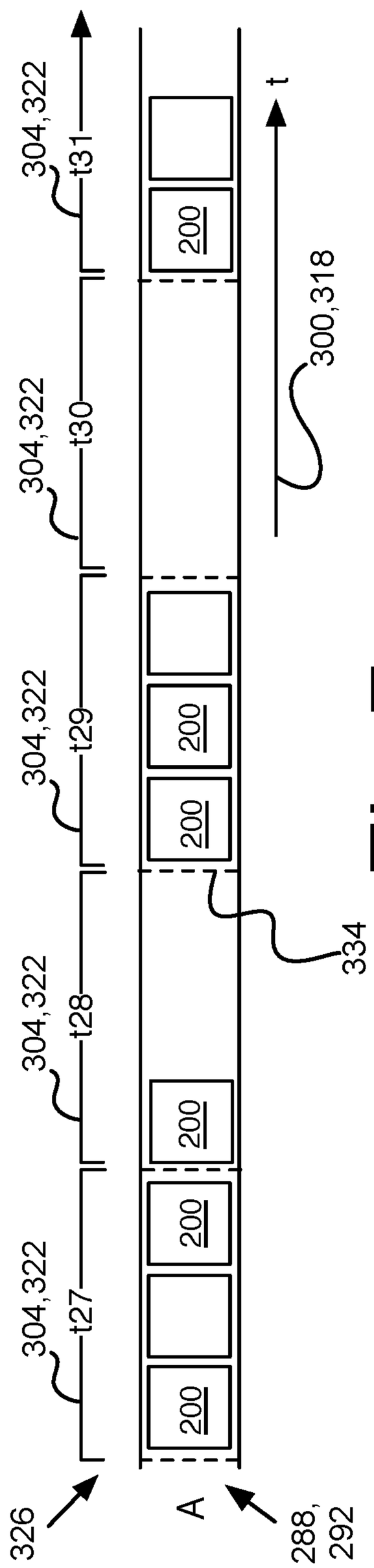
234,
238
288,
292
32
200

Fig.6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t27
304,322
t28
304,322
t29
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t30
304,322
t31
200
200
200
200
200
334
A
288,
292
300,318
t

Fig. 7

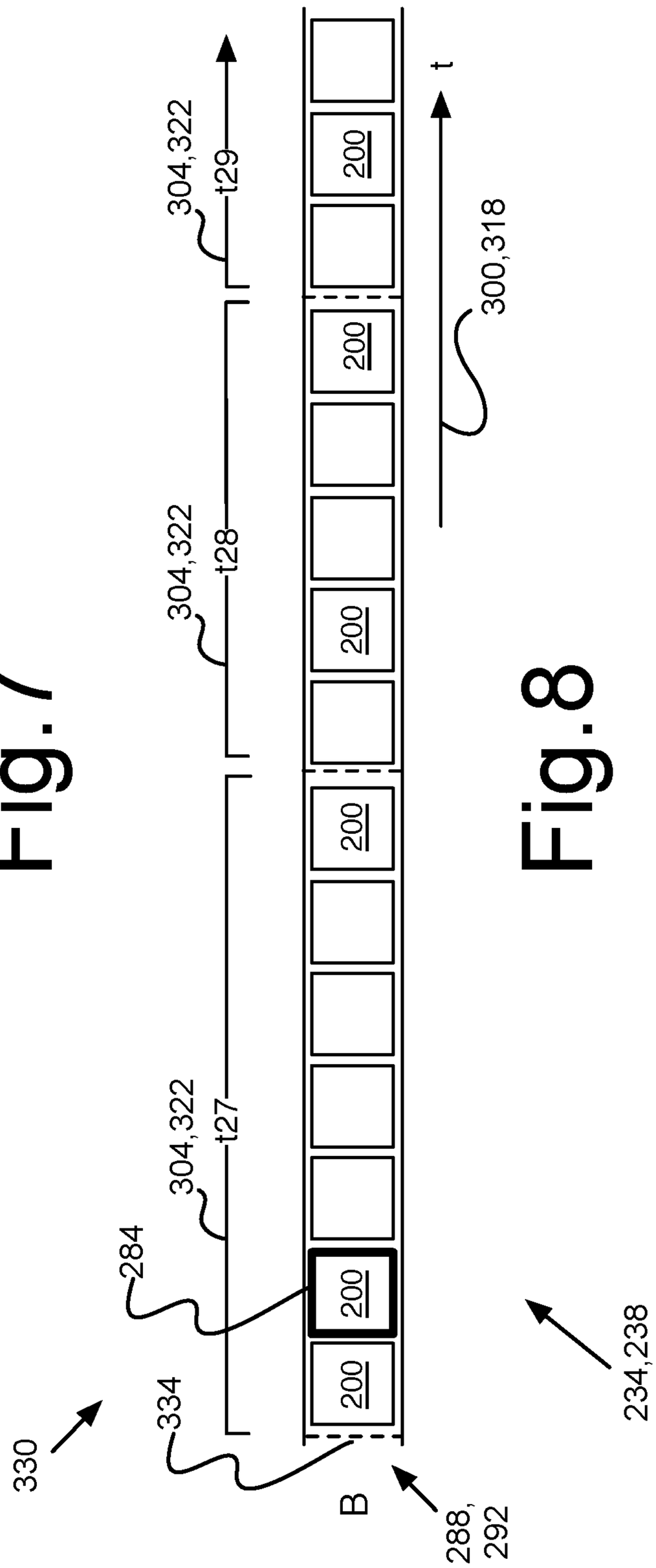
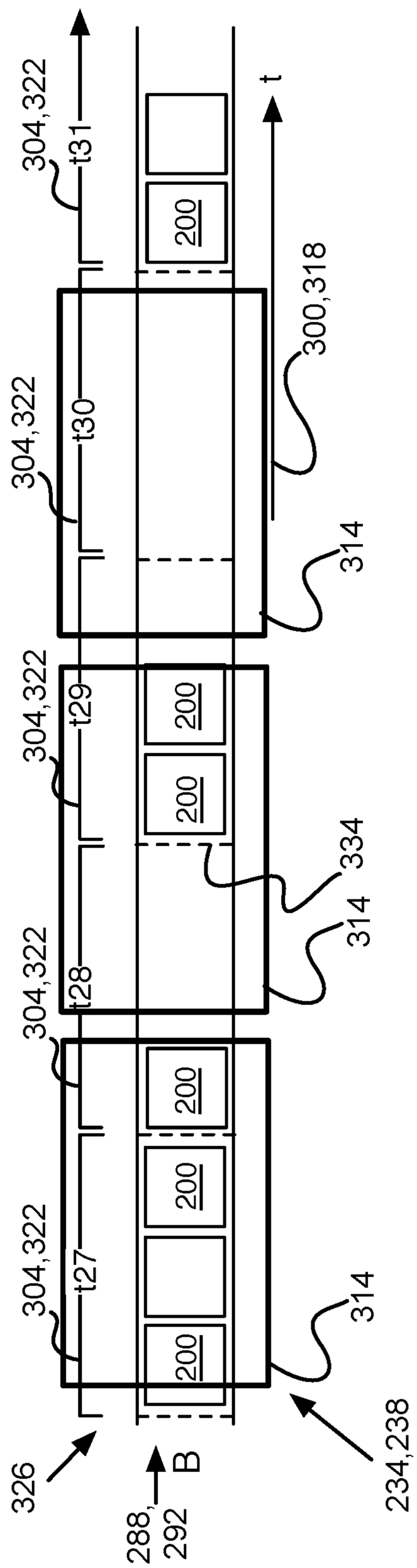

330
334
284
304,322
t27
304,322
t28
304,322
t29
304,322
t29
200
200
200
200
200
B
288,
292
234,238
300,318
t

Fig. 8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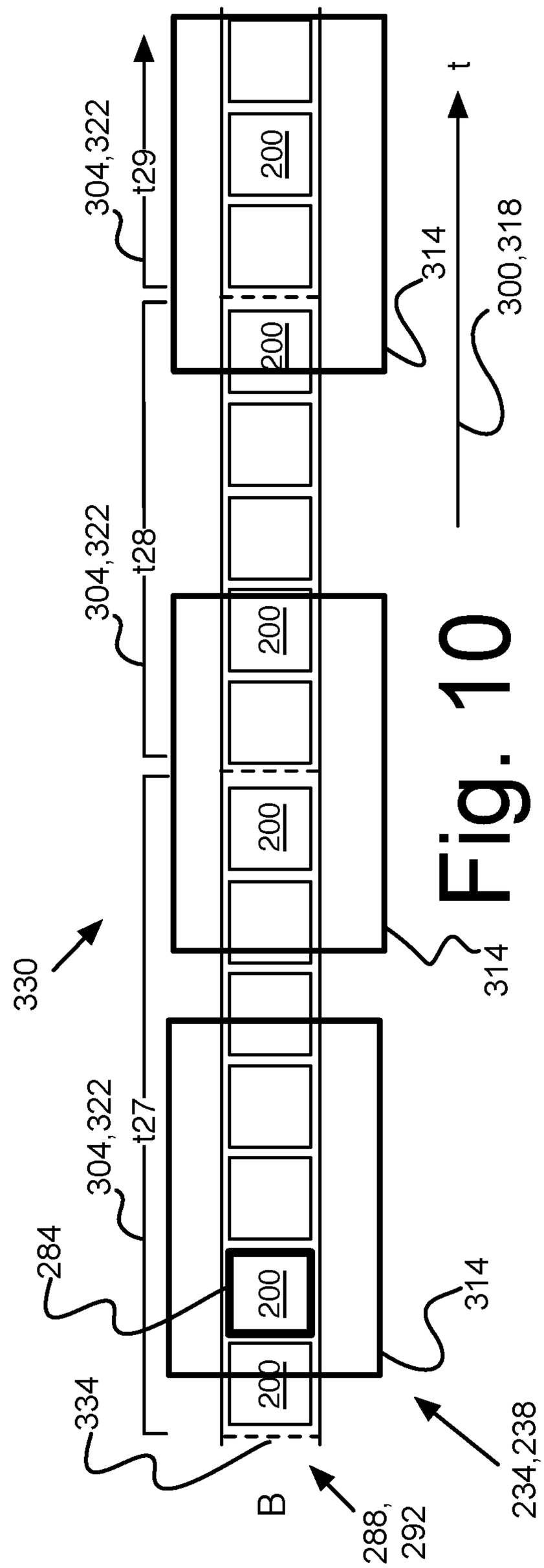
t27
314
326
288,
292
B
234,238

Fig. 9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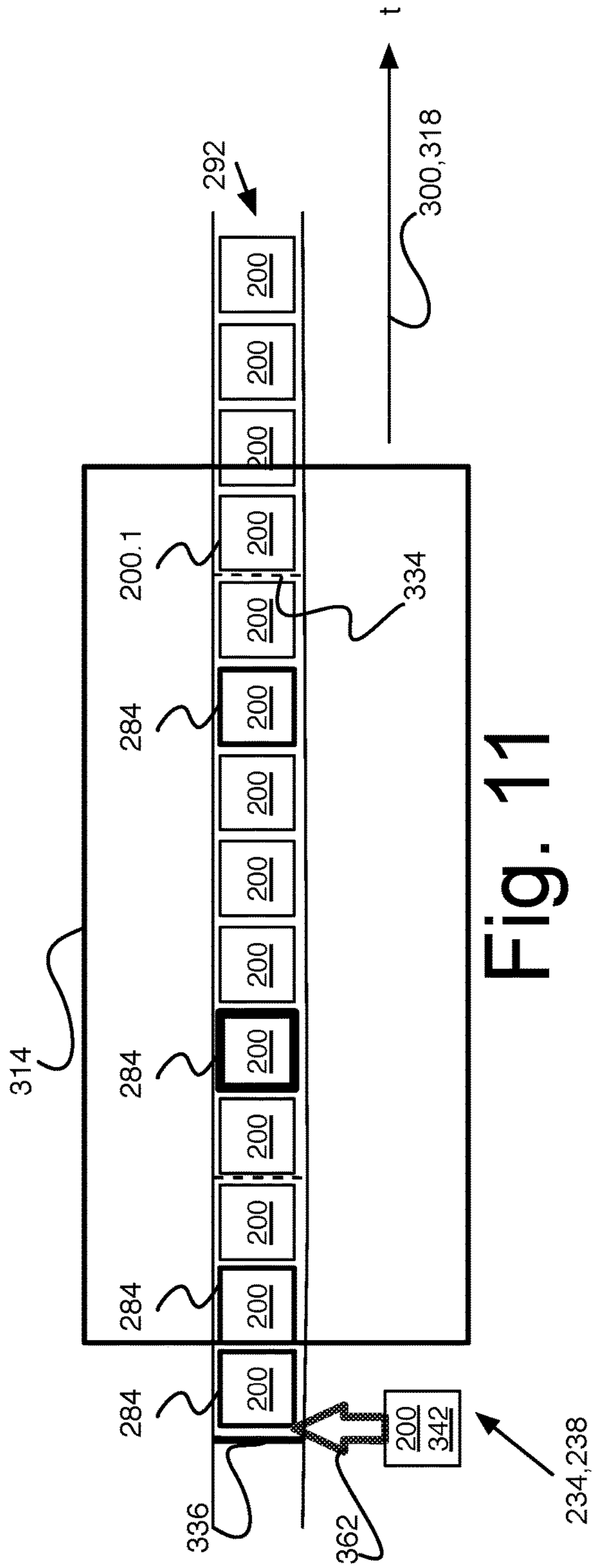
B
288,
292
234,238

Fig. 10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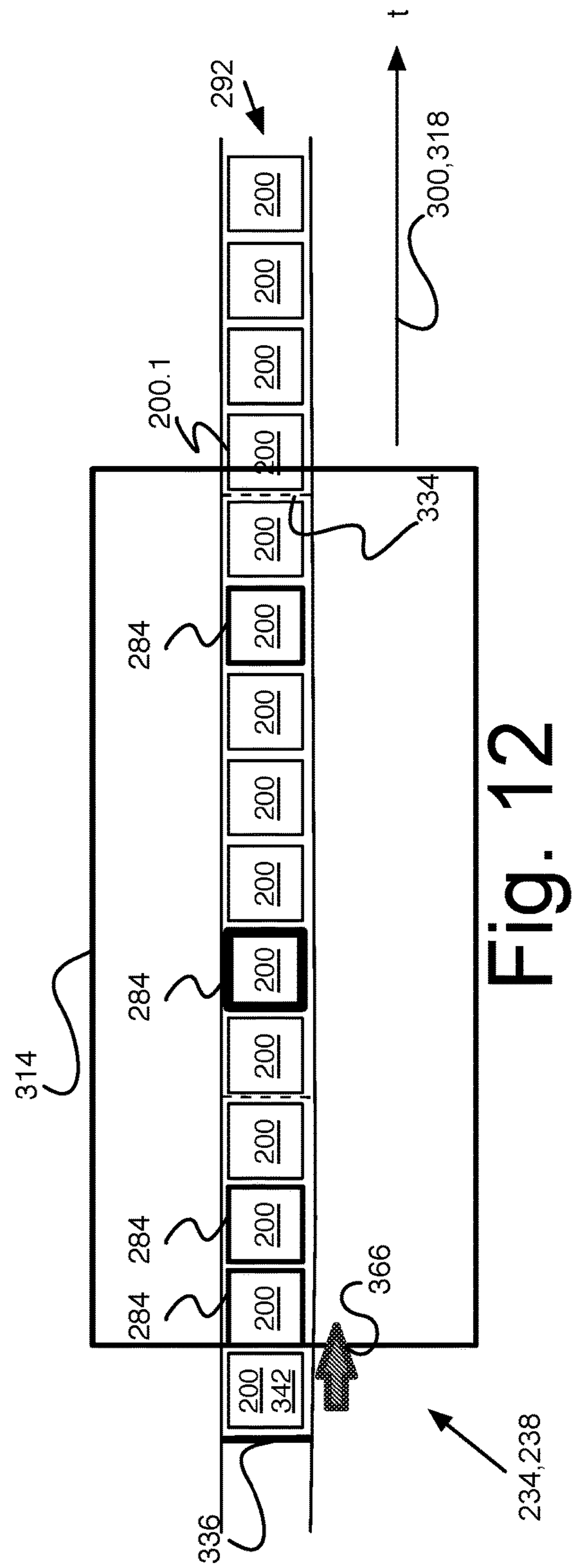
234,238
Fig. 11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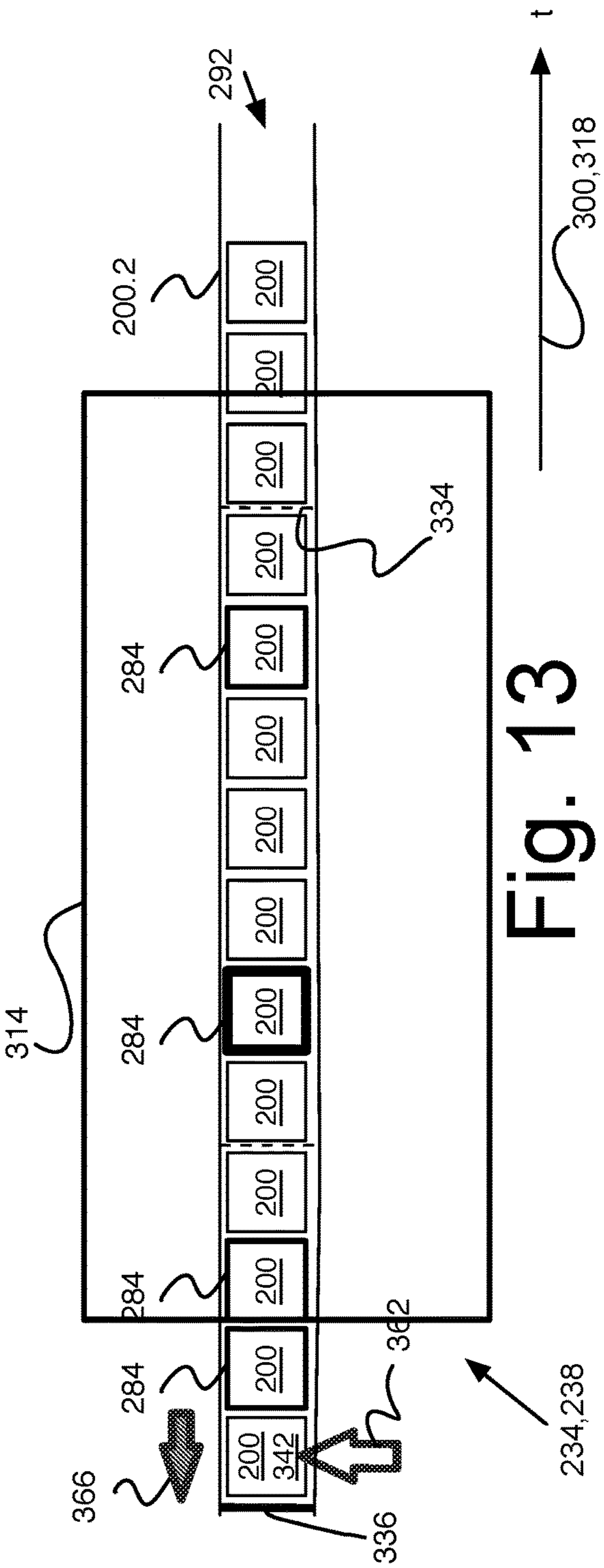
234,238
Fig. 12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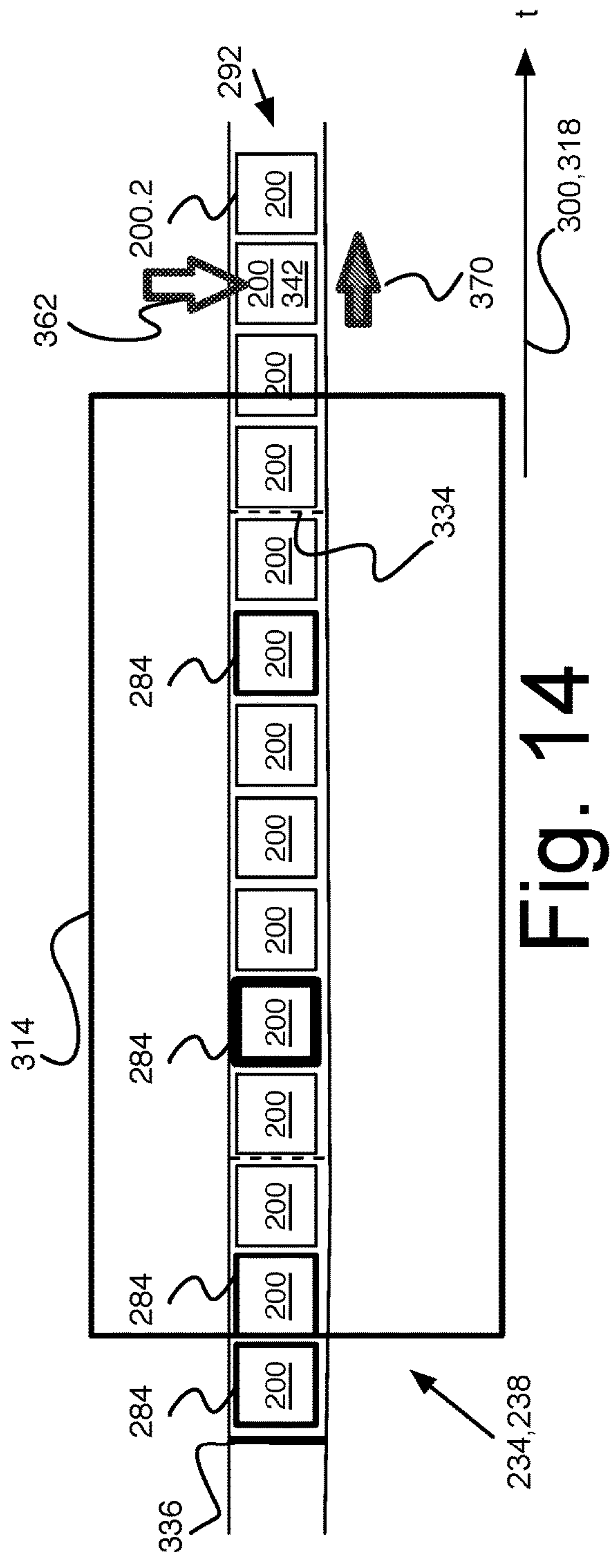
234,238

Fig. 13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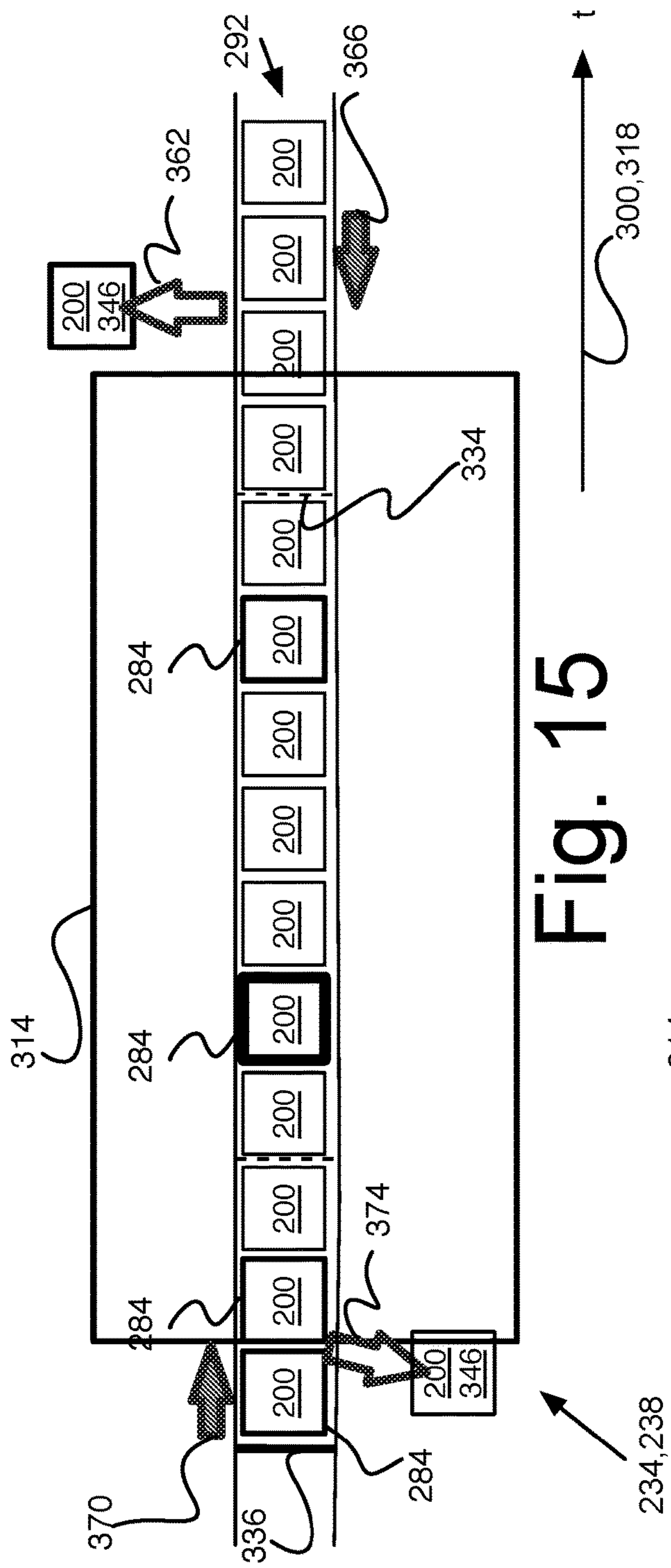
234,238

Fig. 14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234,238

Fig. 15

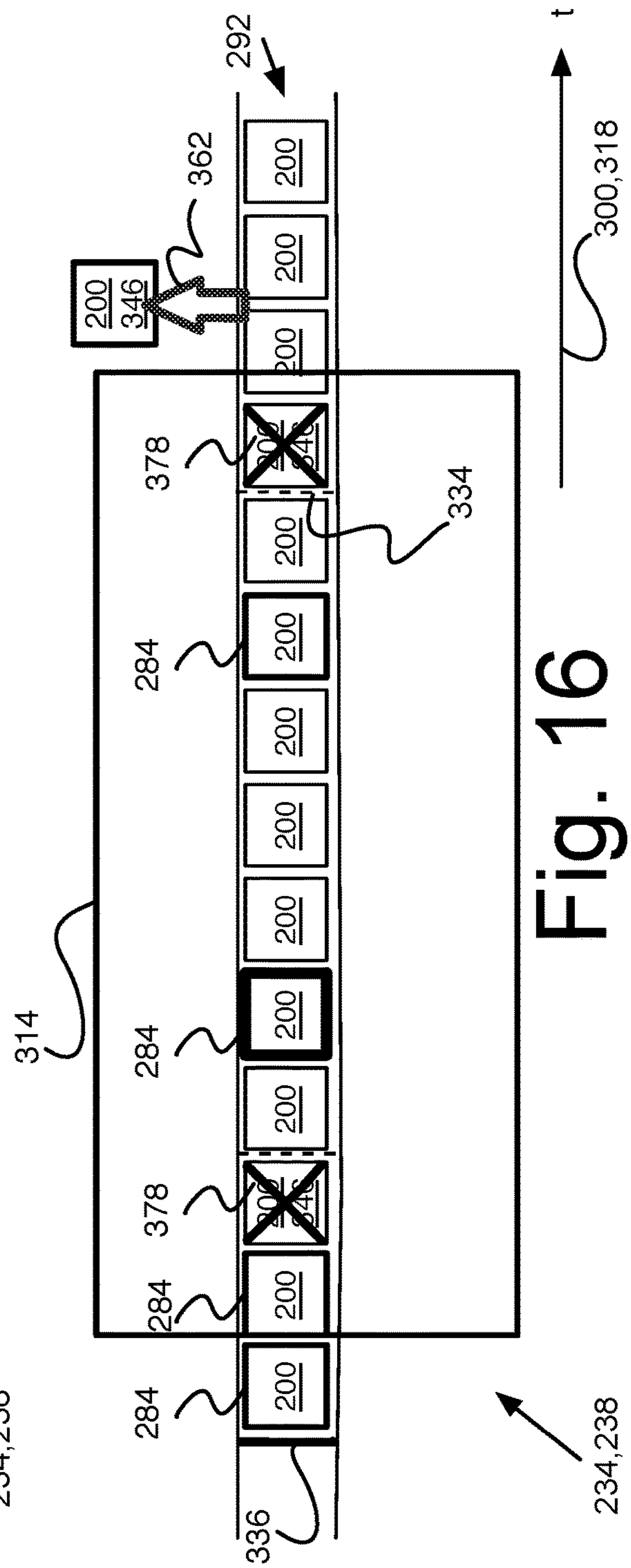
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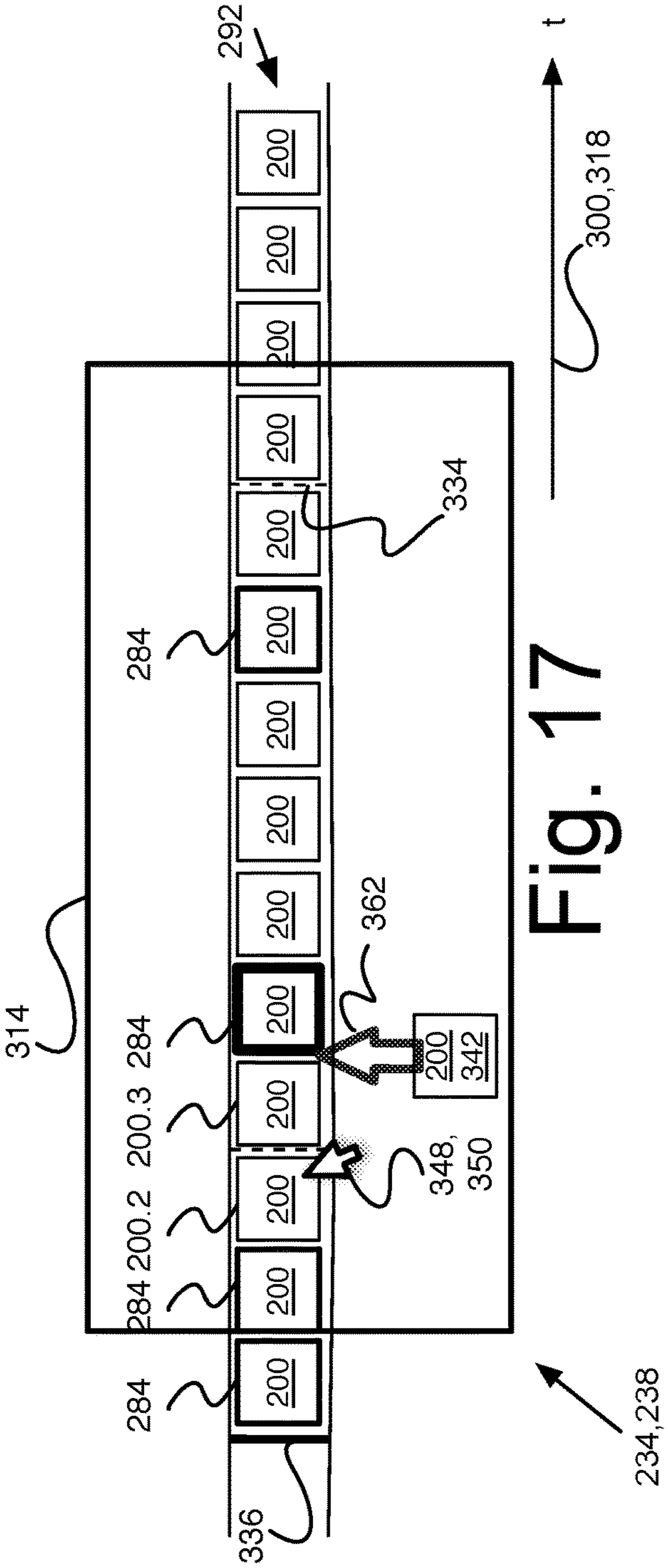
Fig. 16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200
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284
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200.3
200.2
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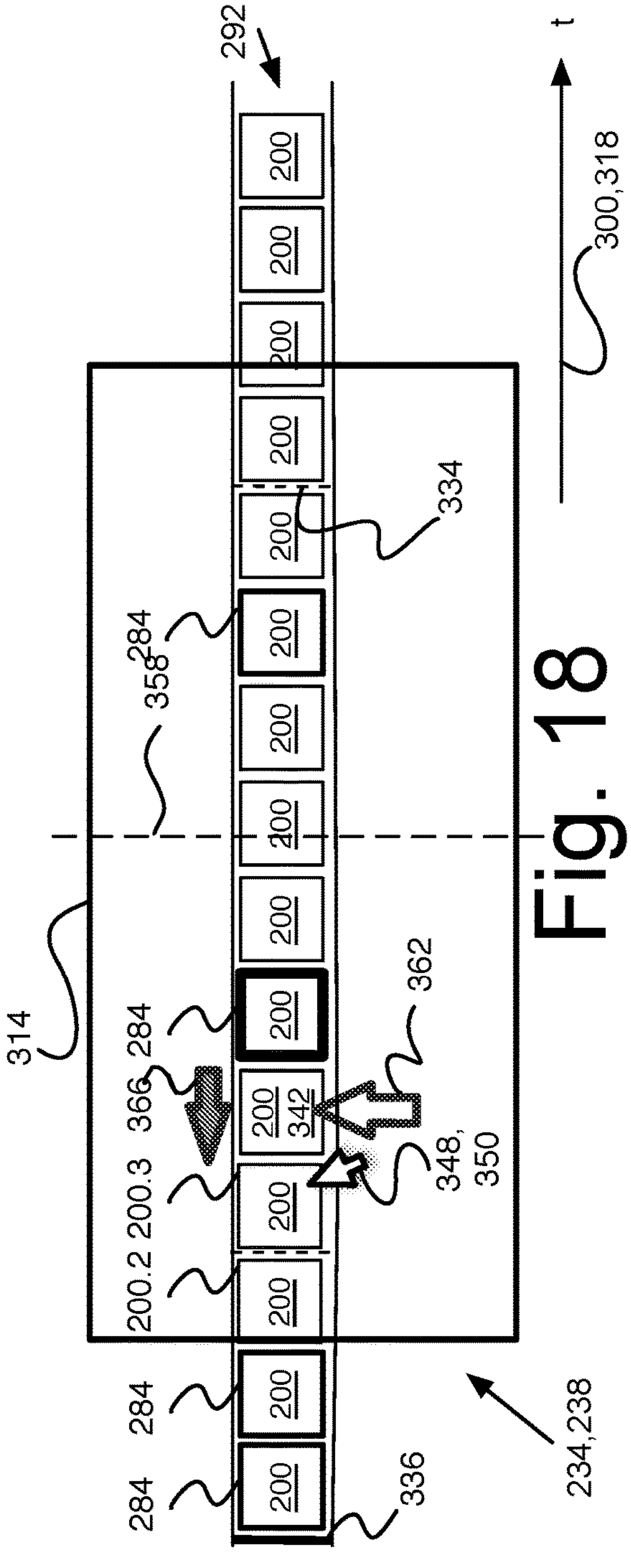
350
336
234,238

Fig. 17


292
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366
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200.3
200.2
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350
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234,238

Fig. 18

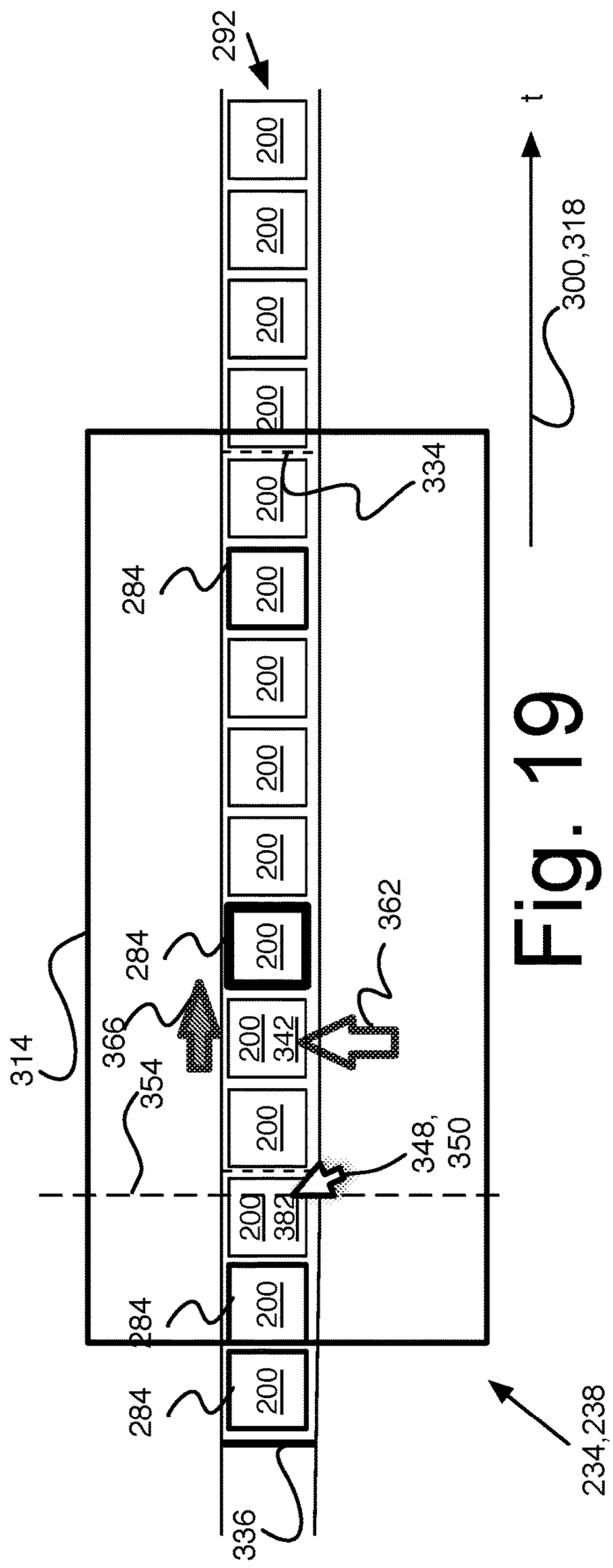
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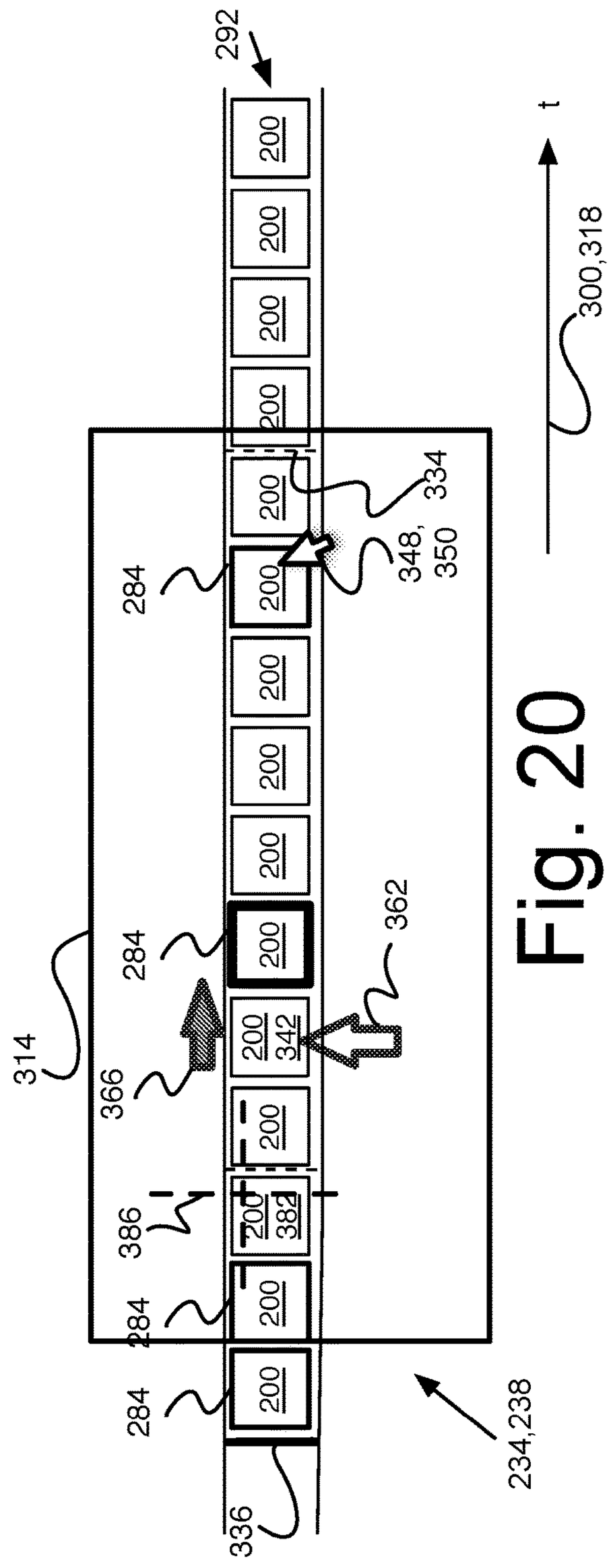
Fig. 19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334
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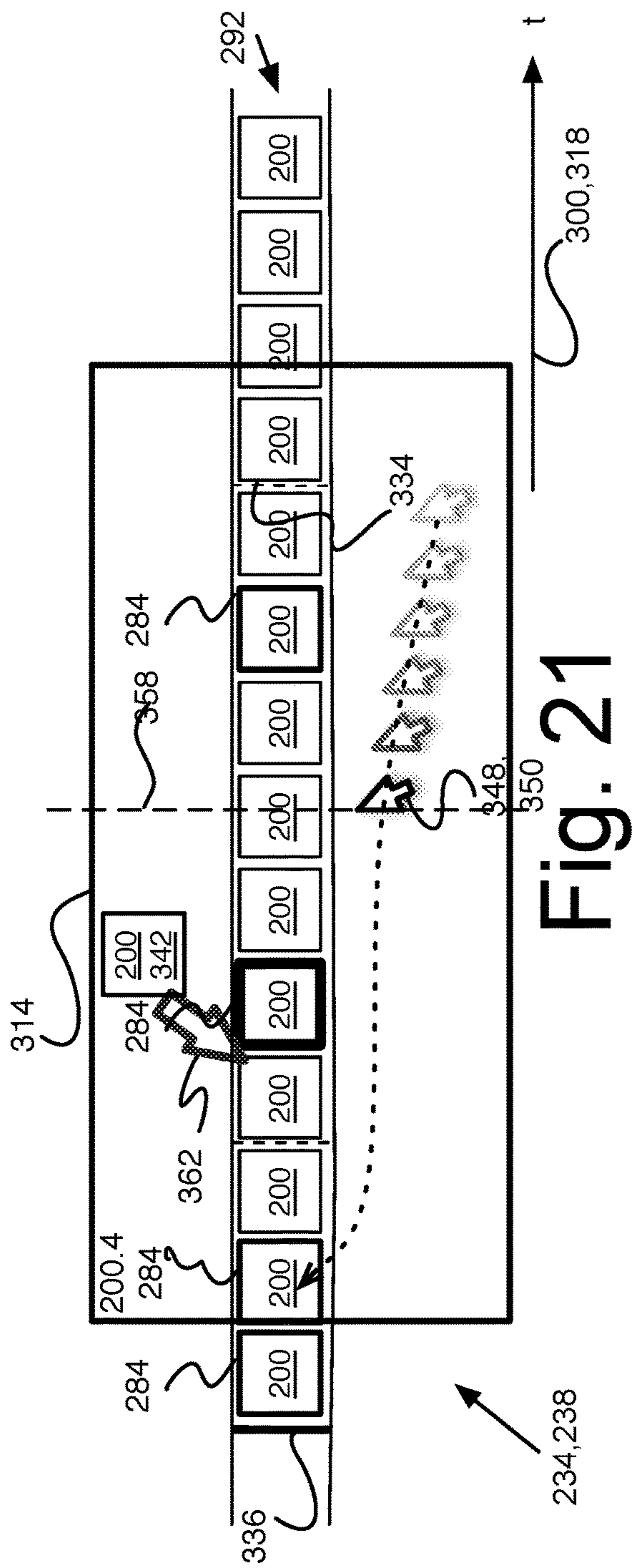
336
234,238

Fig. 20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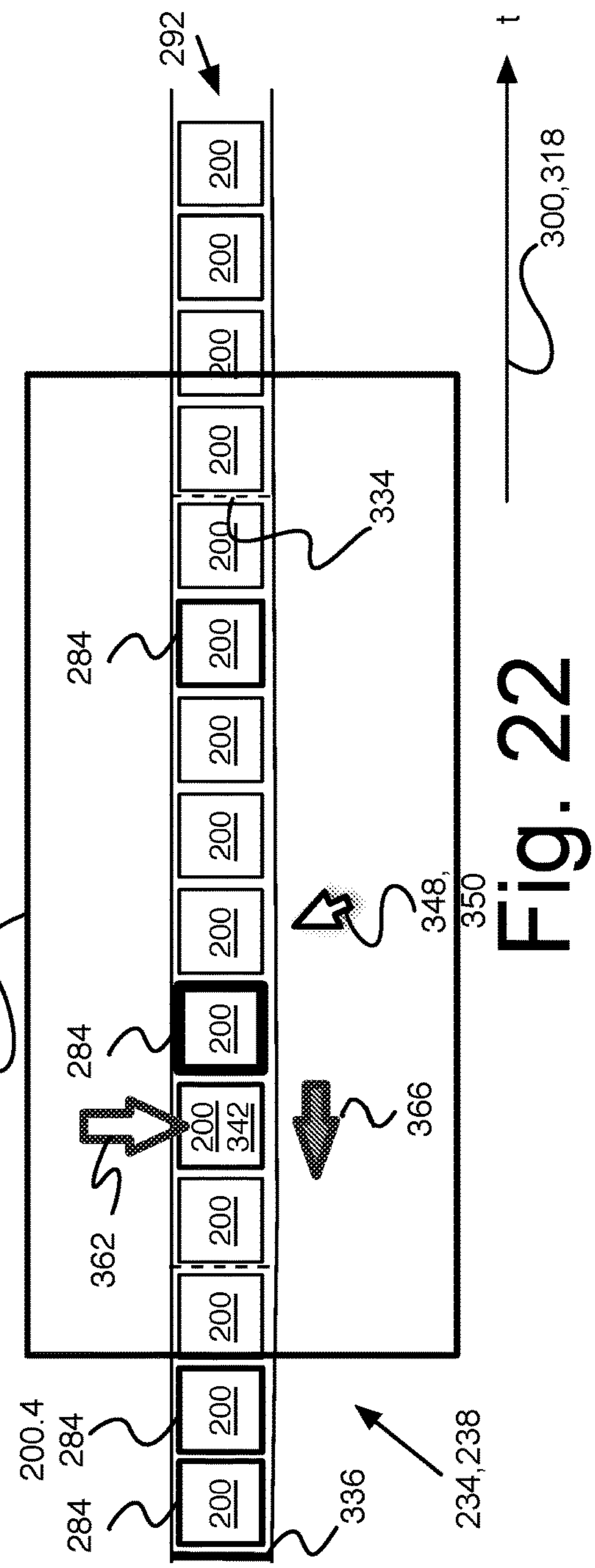
234,238

Fig. 21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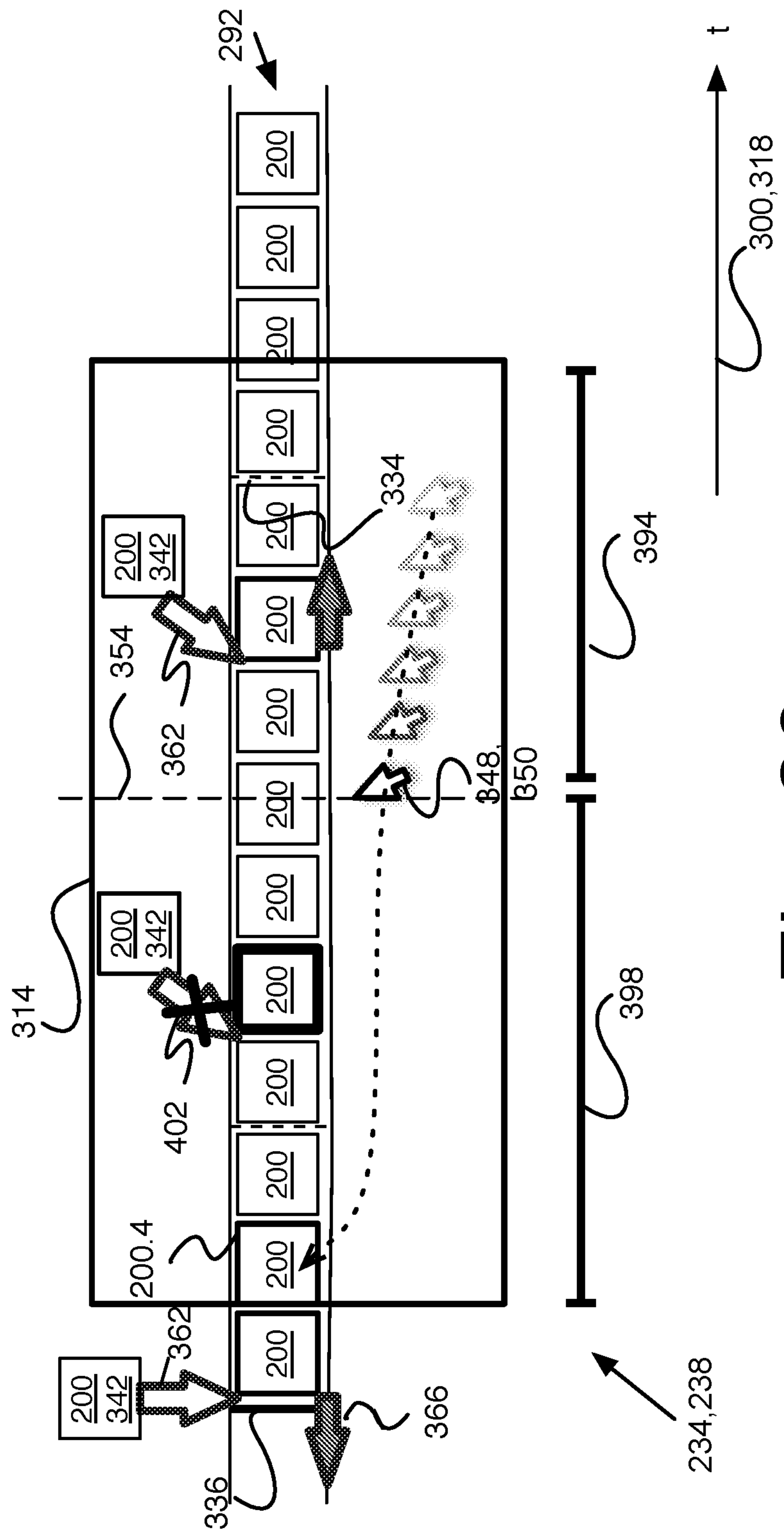
336
234,238

Fig. 22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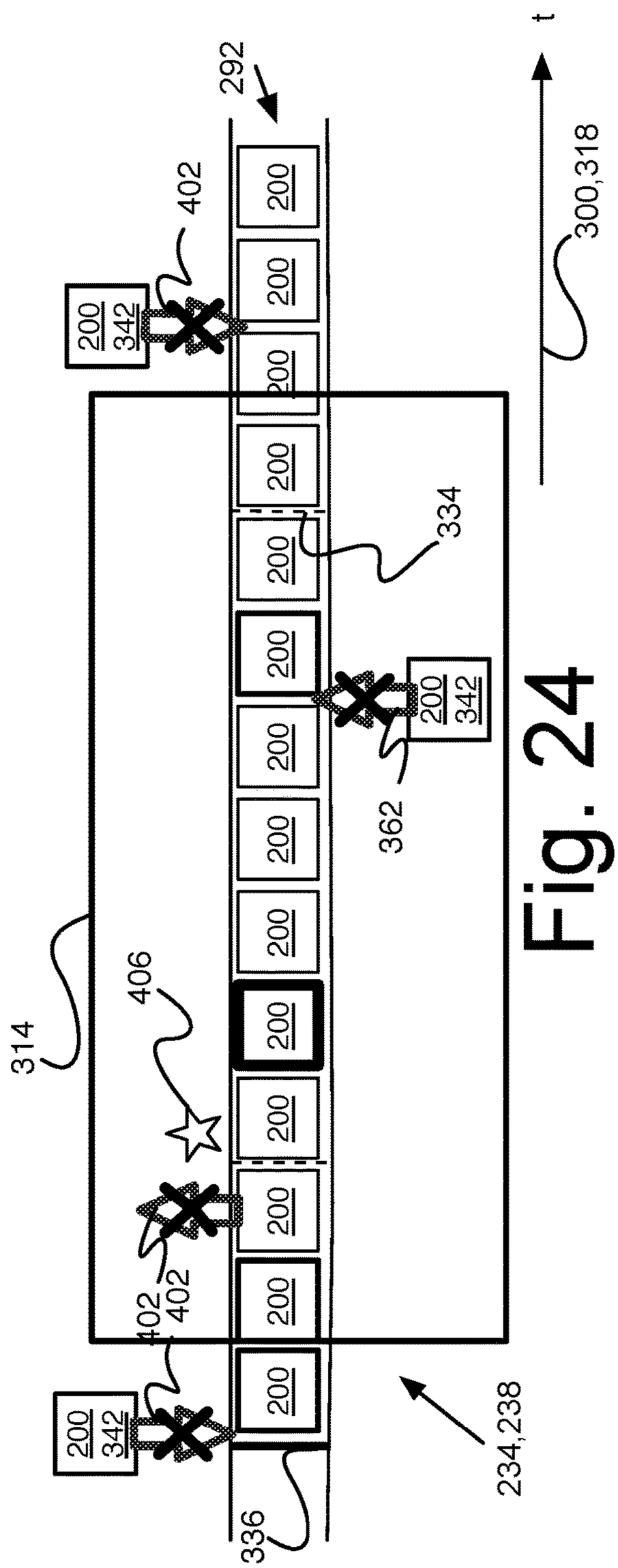
234,238
300,318
t

Fig. 23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300,318
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Fig. 24

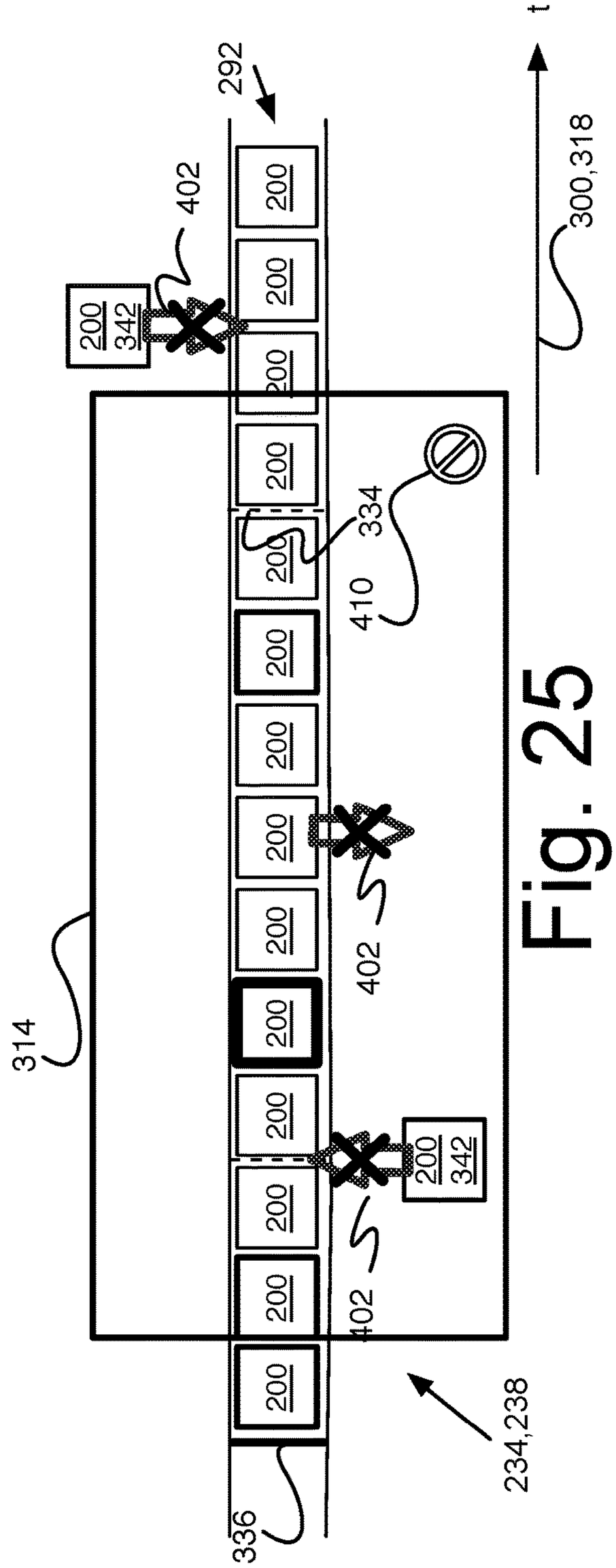
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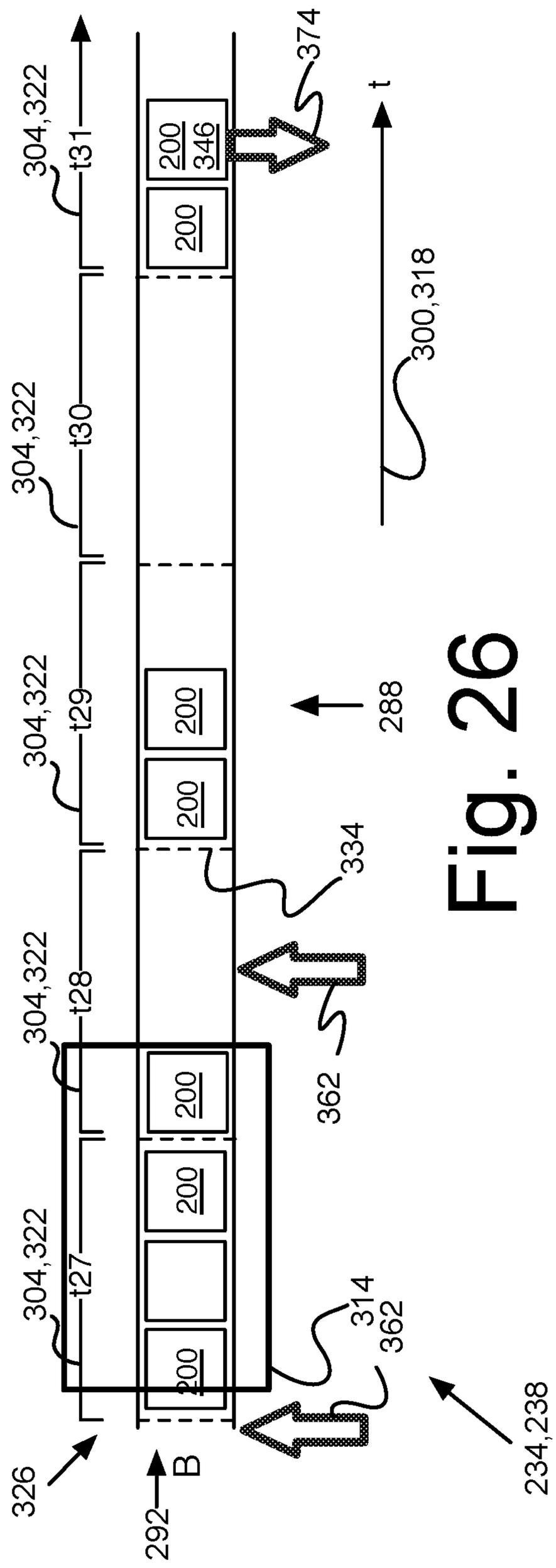
Fig. 25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t28
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t30
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t31
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326
292
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334
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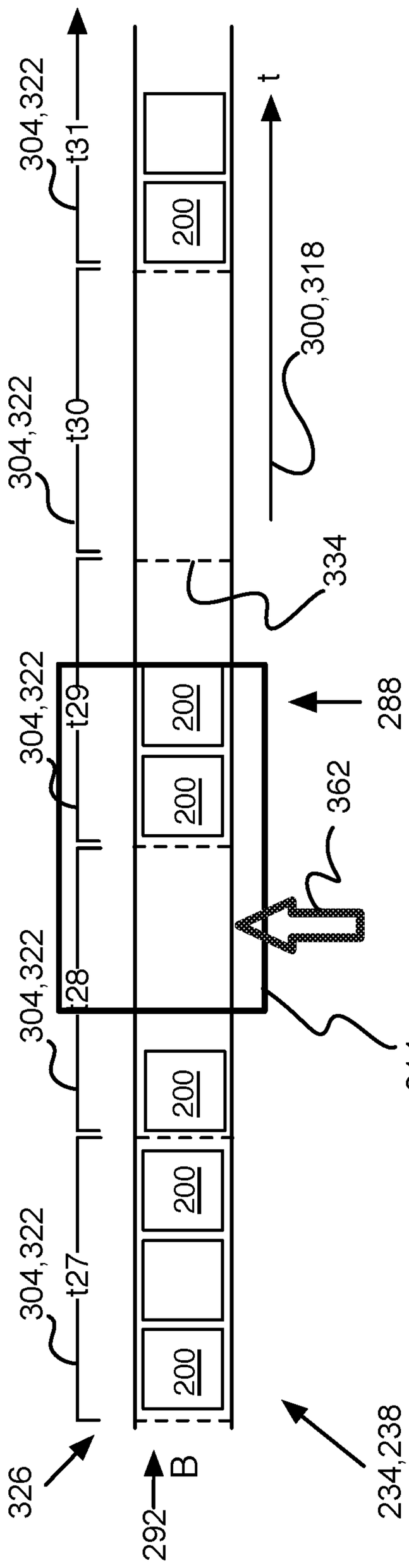
374
t
300,318
234,238

Fig. 26


304,322
t31
304,322
t30
304,322
t29
304,322
t28
304,322
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t
300,318
334
288
362
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292
B
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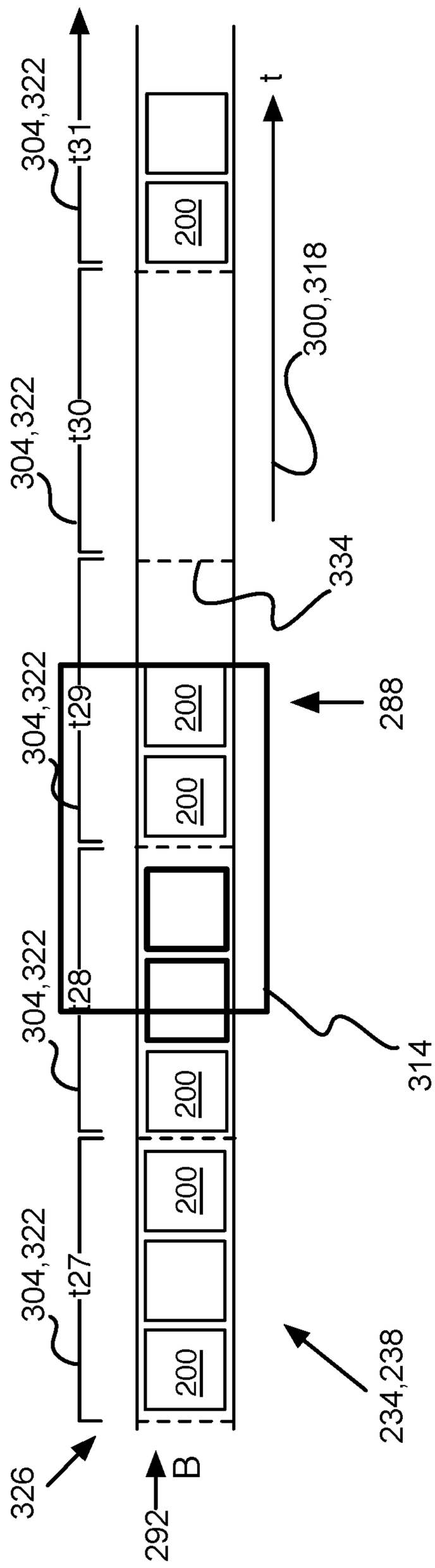
Fig. 27


304,322
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234,238

Fig. 28

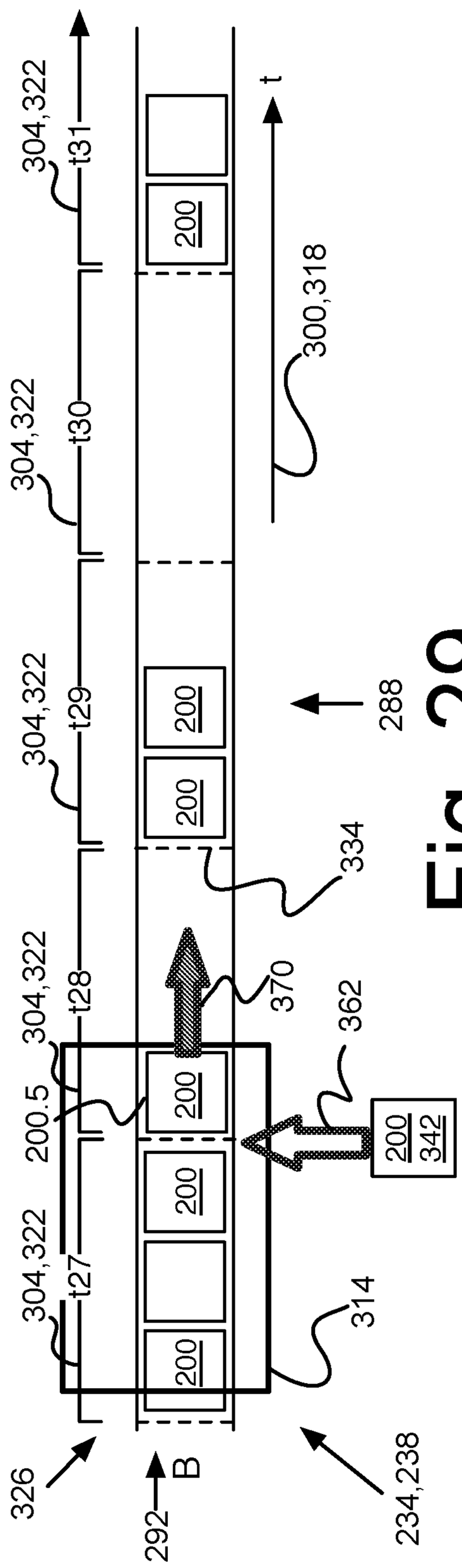
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Fig. 29

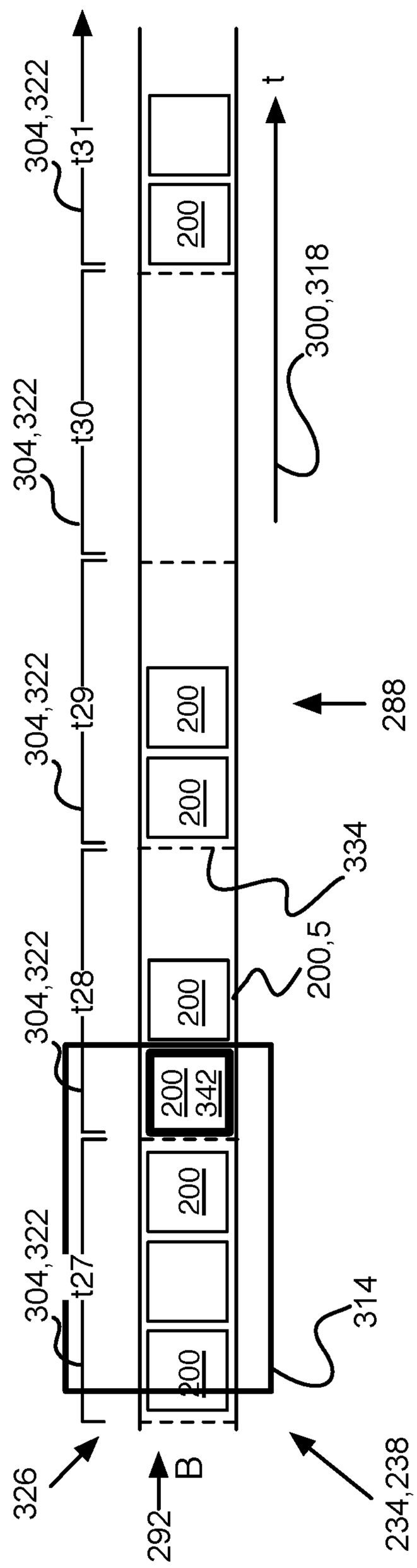
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Fig. 30

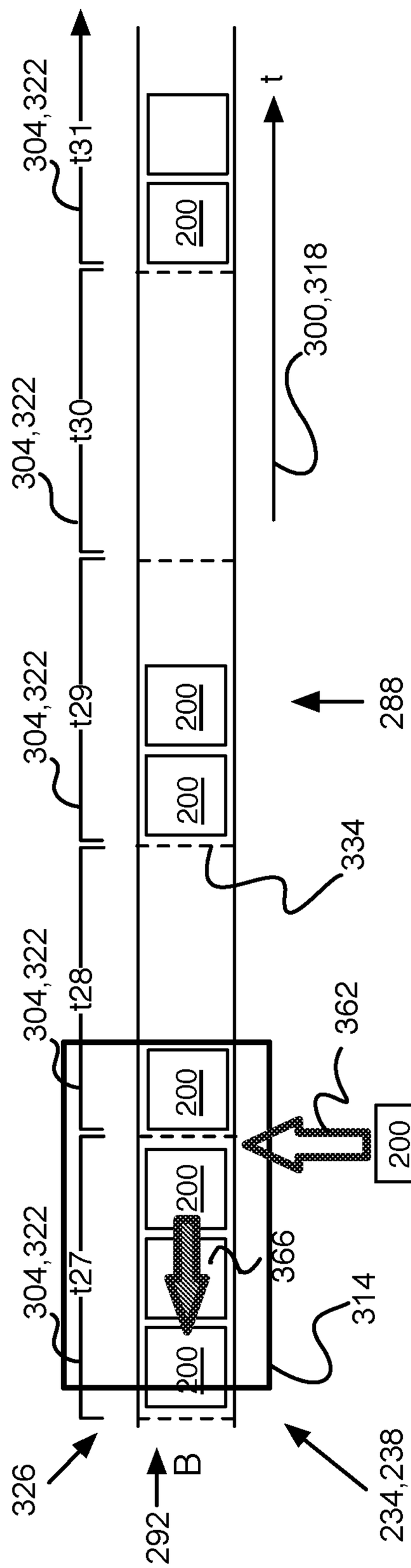
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Fig. 31

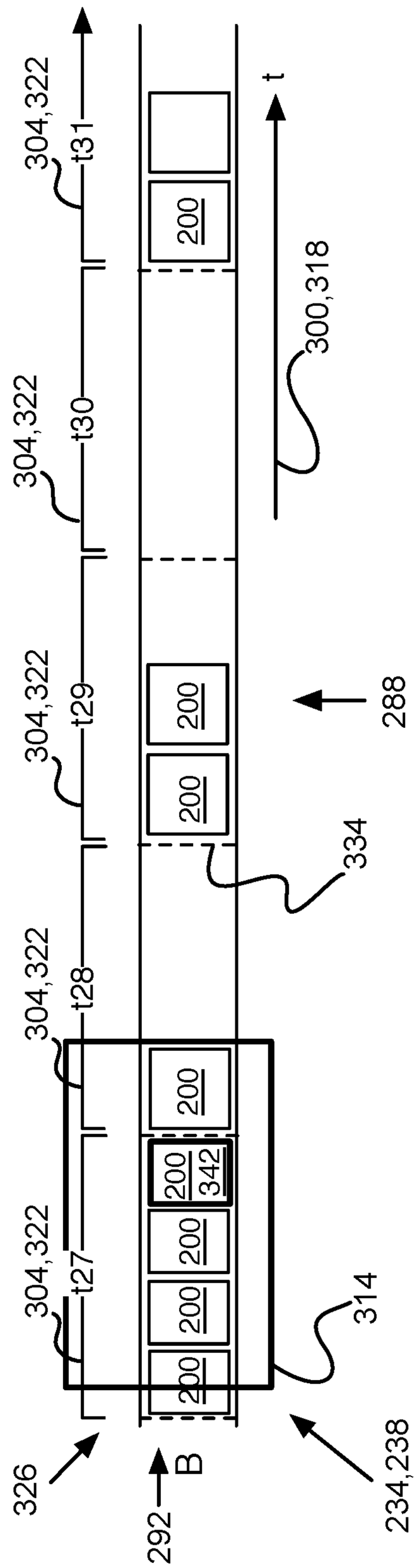
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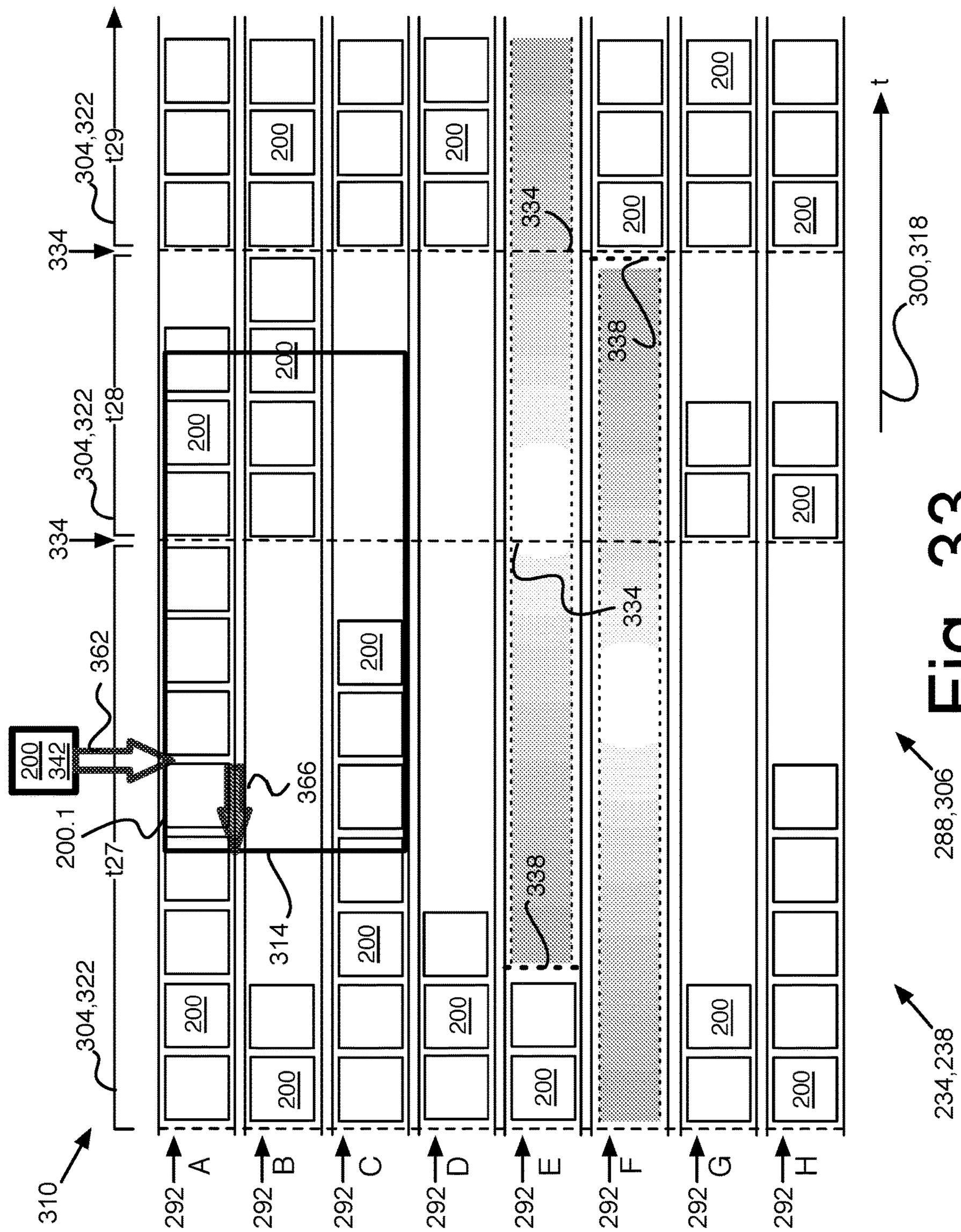
Fig. 32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292 G
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300,318
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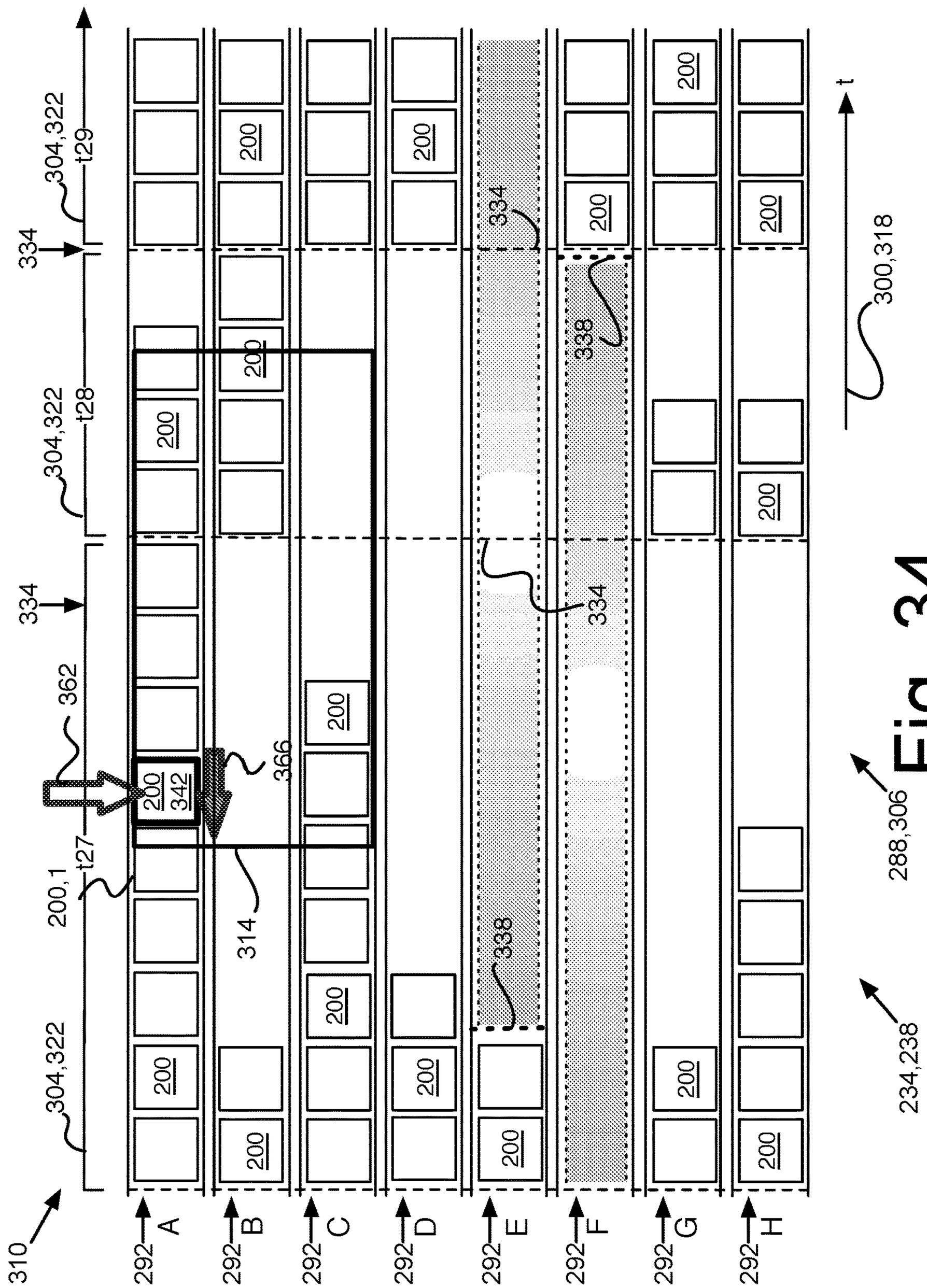
Fig. 33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t28
t29
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288,306
234,238

Fig. 34

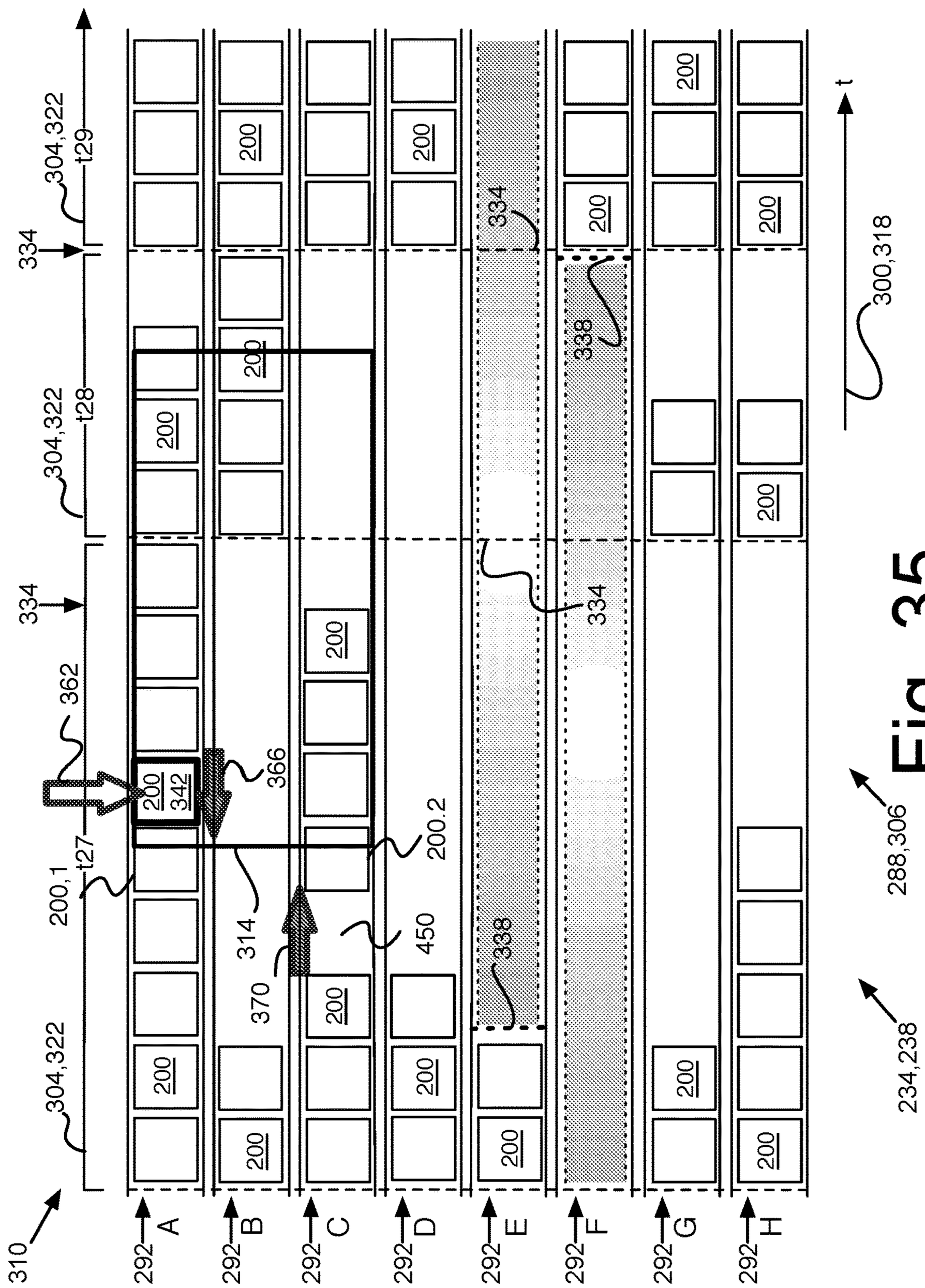
310
292 A
292 B
292 C
292 D
292 E
292 F
292 G
292 H
304,322
200,1
t27
t28
t29
334
362
200
342
366
314
370
200.2
450
338
288,306
234,238
300,318
t

Fig. 35

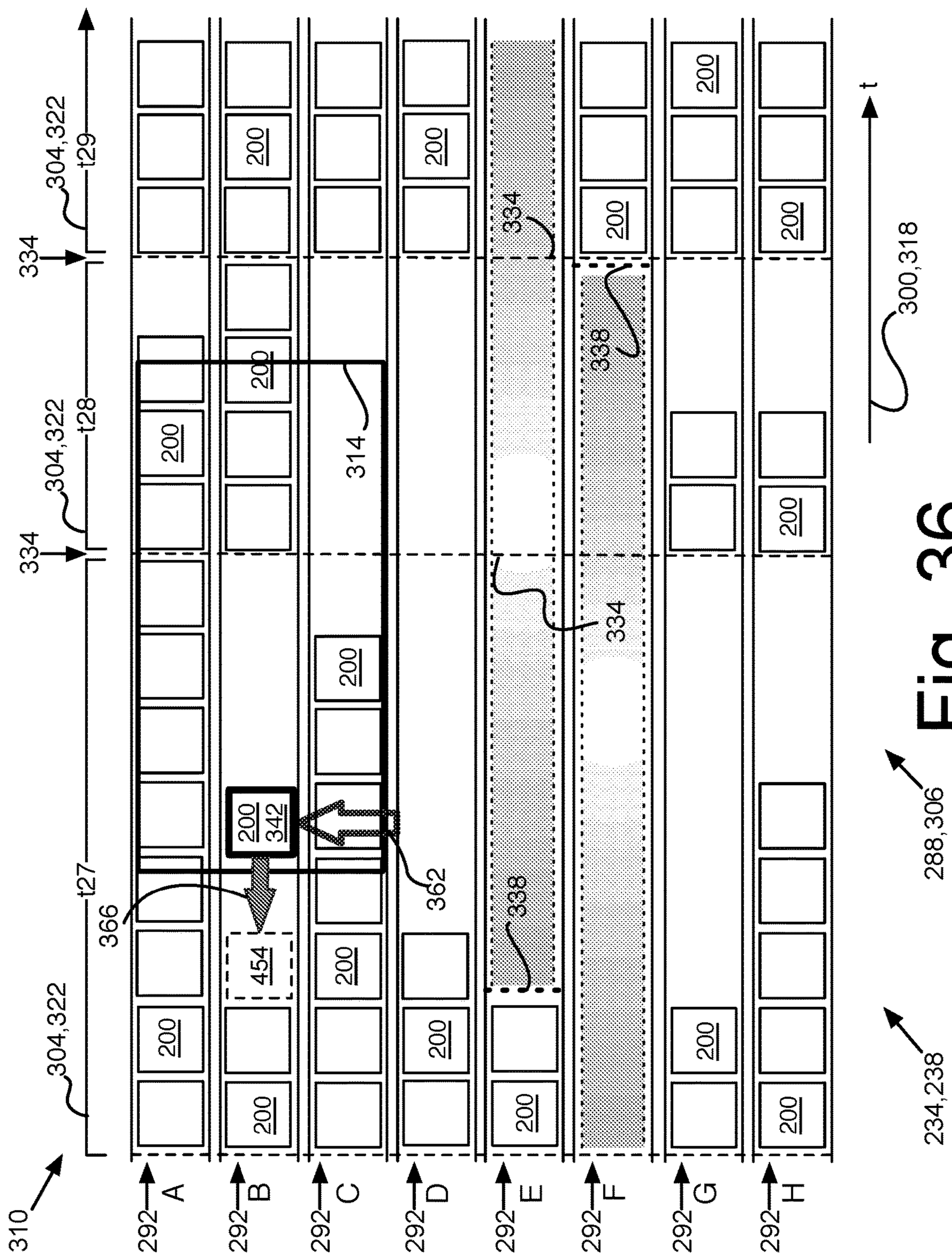
310
292 A
292 B
292 C
292 D
292 E
292 F
292 G
292 H
304,322
334
t27
t28
t29
t
300,318
288,306
234,238
200
200/342
366
362
314
454
338
334

Fig. 36

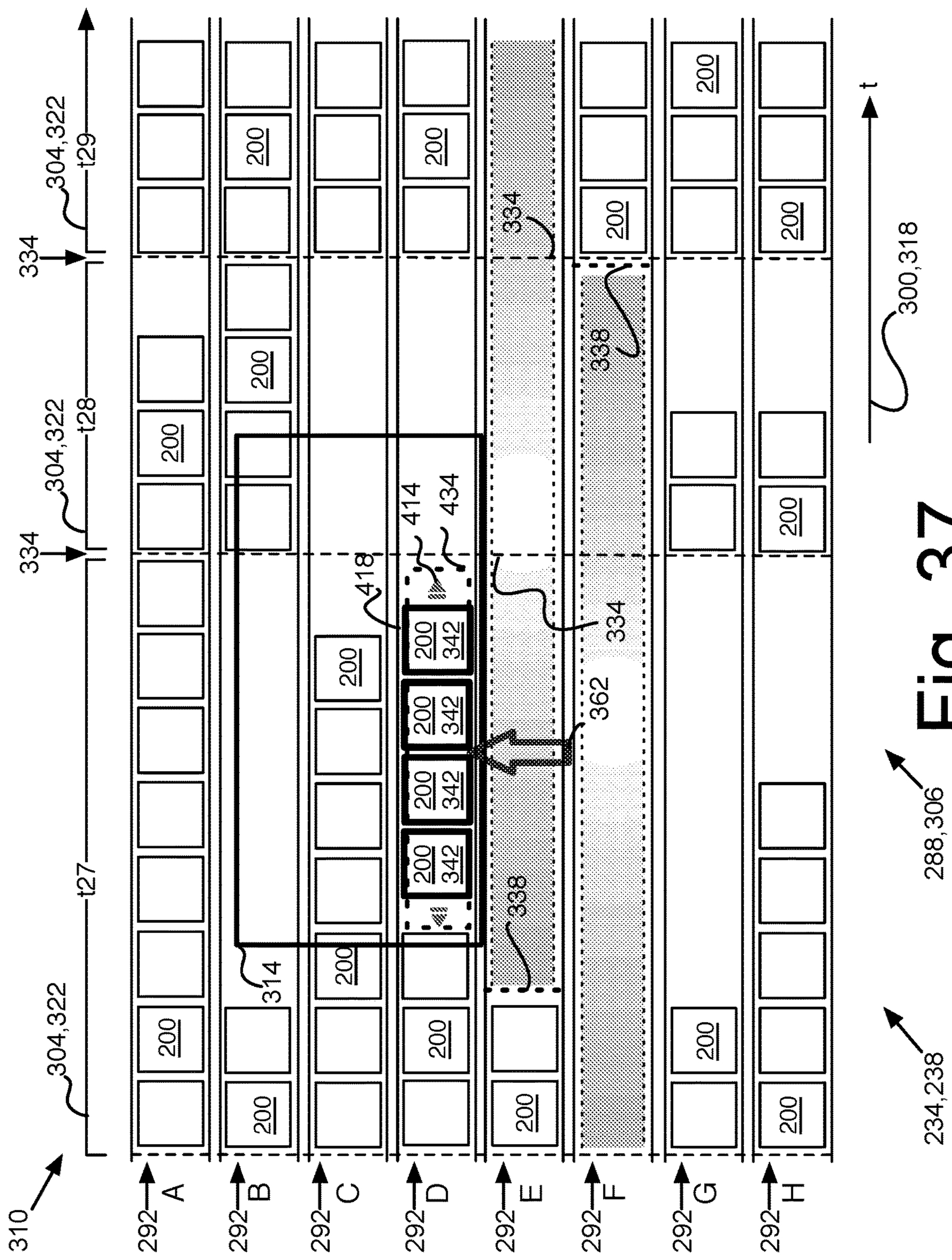
310
304,322
t27
334
304,322
t28
334
304,322
t29
334
292 A
292 B
292 C
292 D
292 E
292 F
292 G
292 H
200
200
342
314
418
414
434
362
338
334
t
300,318
288,306
234,238

Fig. 37

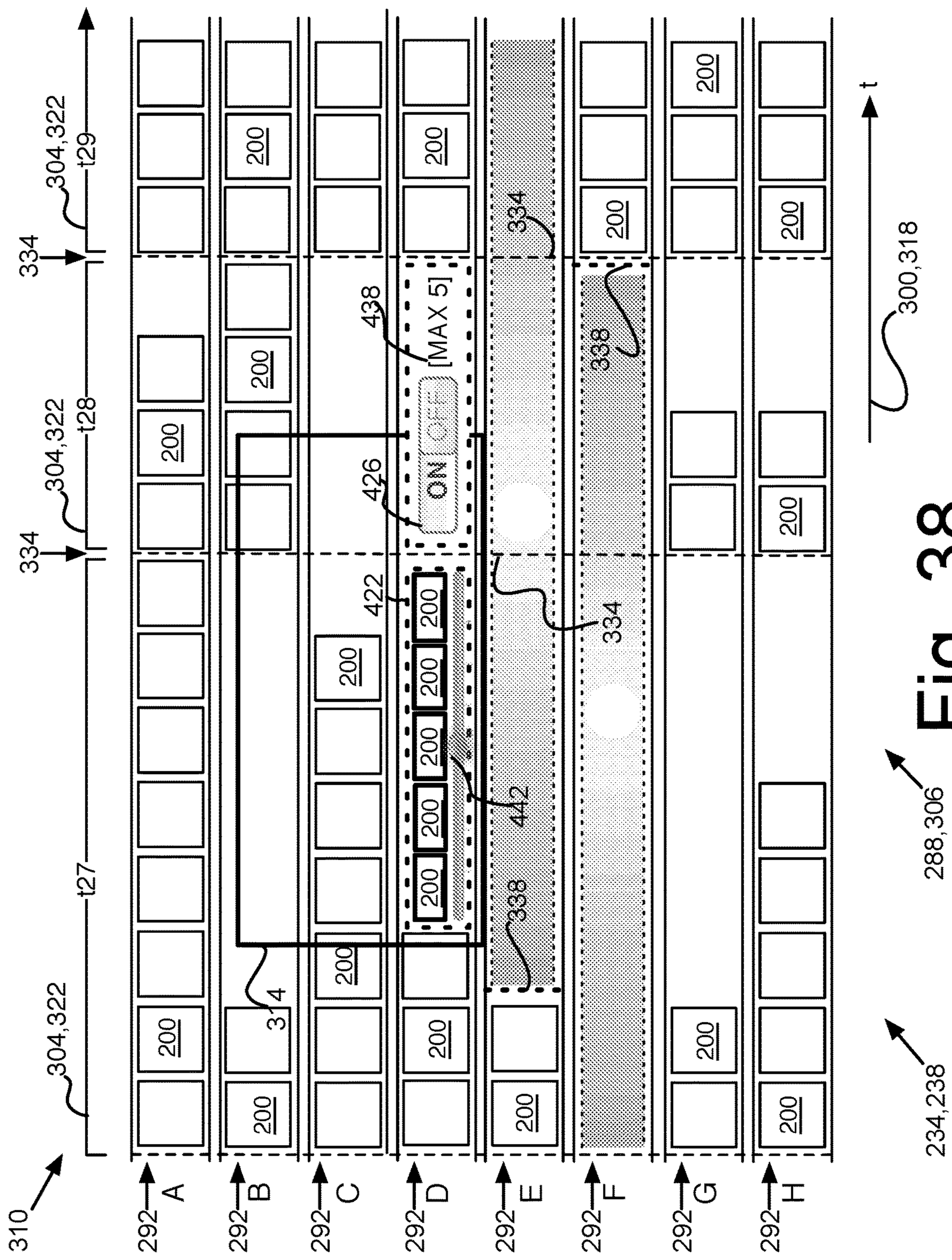
310
304,322
t27
334
304,322
t28
334
304,322
t29
334
292 A
292 B
292 C
292 D
292 E
292 F
292 G
292 H
200
ON
OFF
[MAX 5]
426
438
422
442
338
334
300,318
t
288,306
234,238

Fig. 38

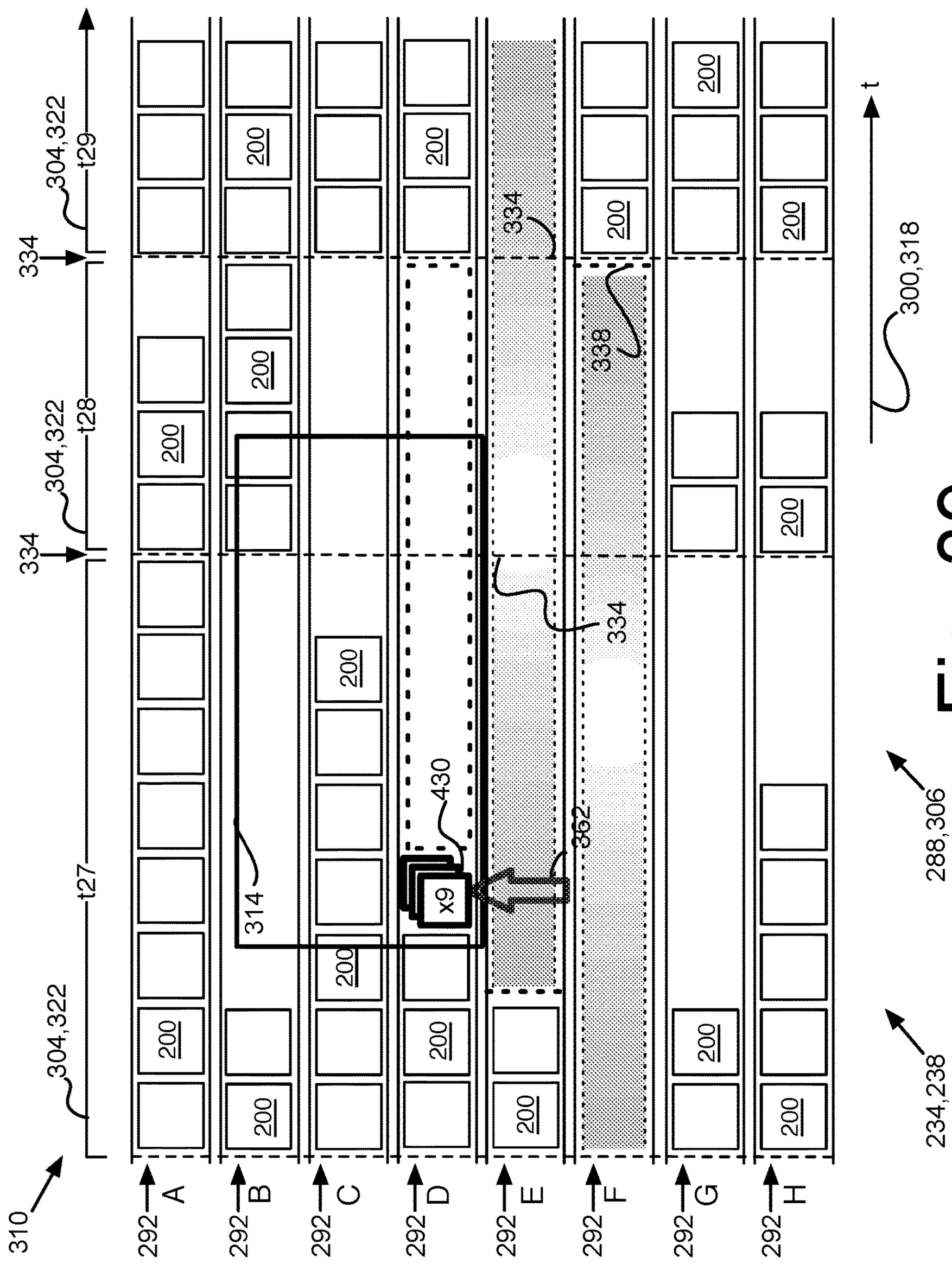
310
304,322
t27
304,322
t28
304,322
t29
334
334
334
292 A
292 B
292 C
292 D
292 E
292 F
292 G
292 H
200
314
430
x9
362
334
338
334
t
300,318
288,306
234,238

Fig. 39

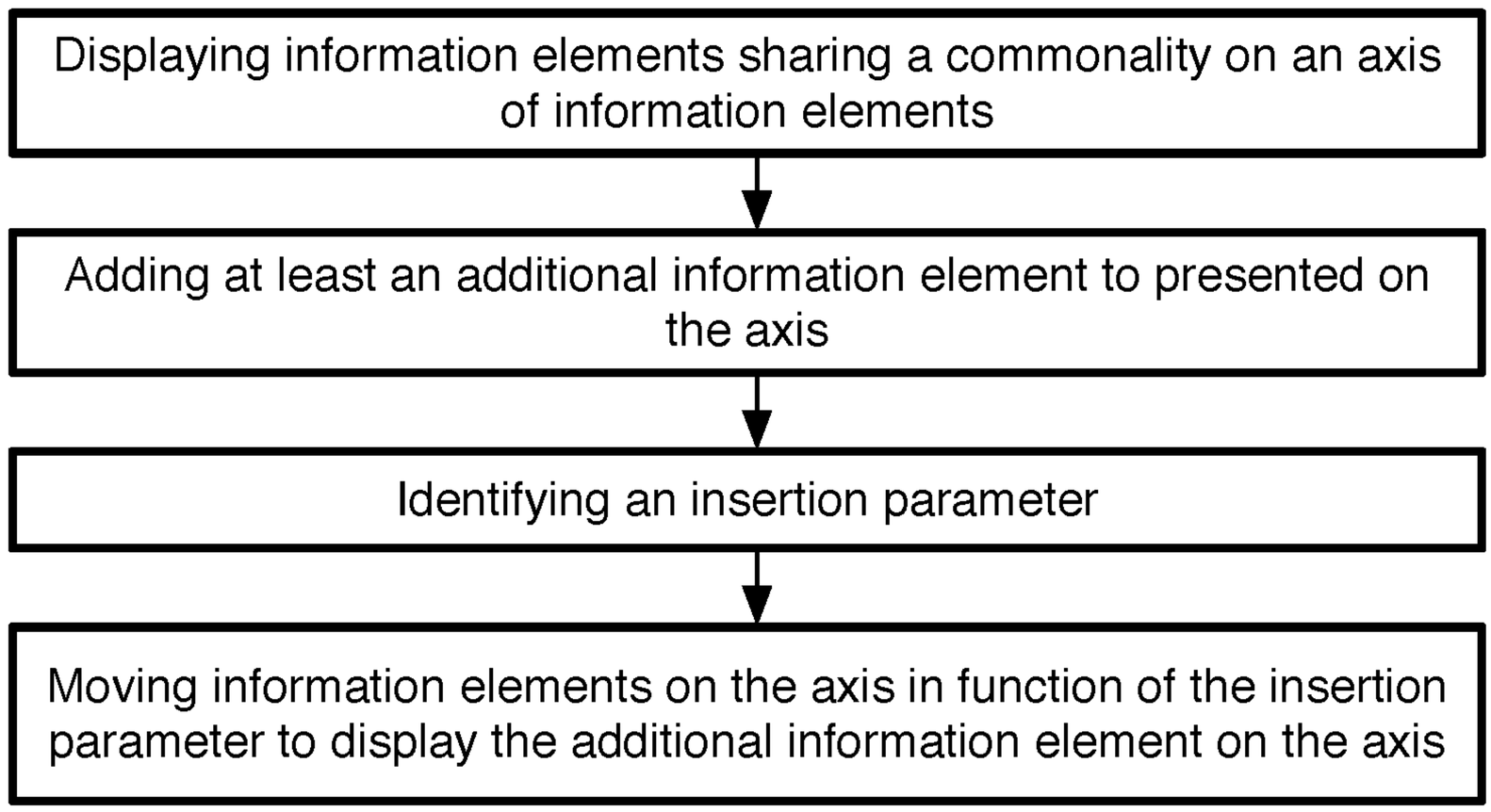
Displaying information elements sharing a commonality on an axis of information elements
Adding at least an additional information element to presented on the axis
Identifying an insertion parameter
Moving information elements on the axis in function of the insertion parameter to display the additional information element on the axis

Fig. 40

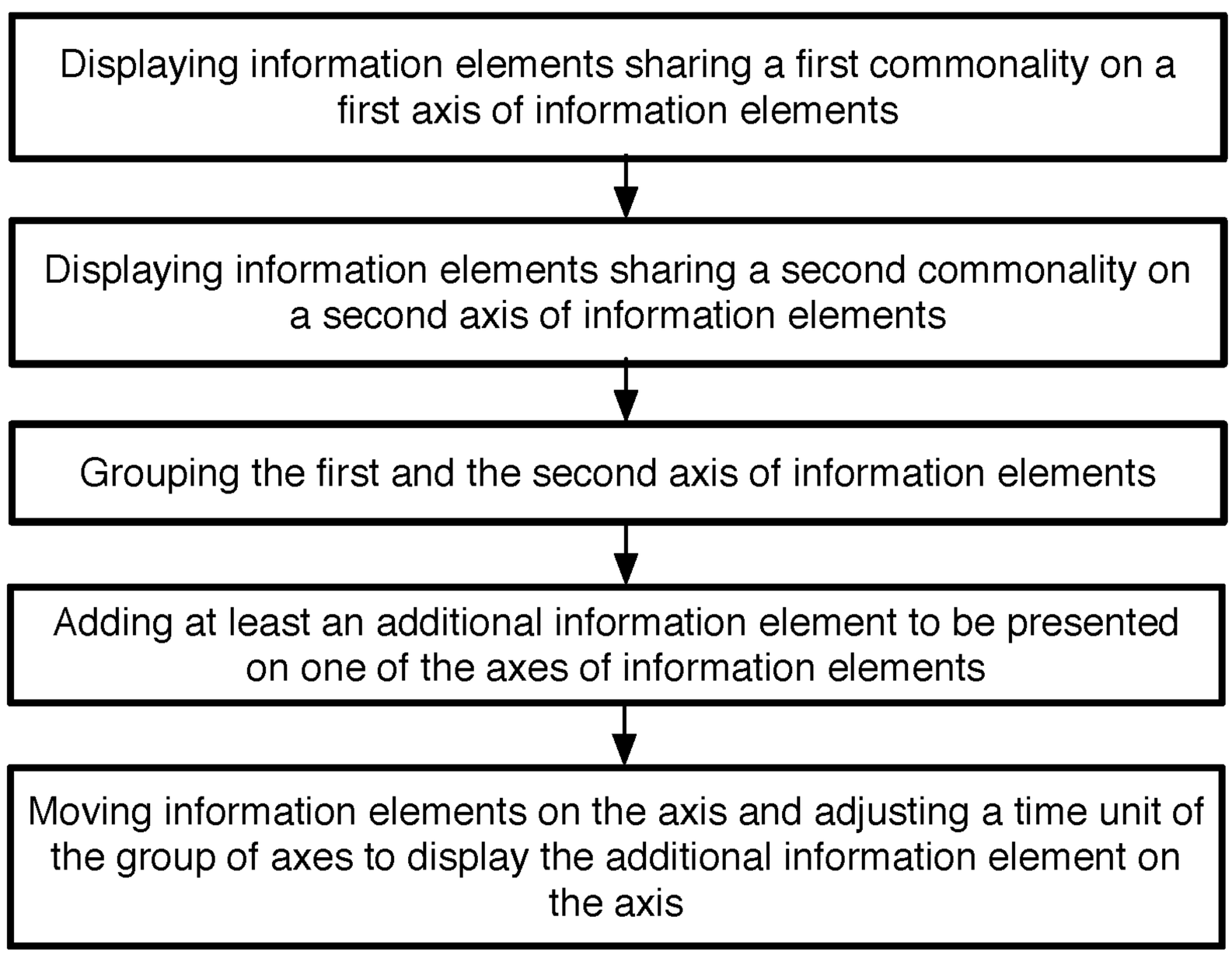
Displaying information elements sharing a first commonality on a first axis of information elements
Displaying information elements sharing a second commonality on a second axis of information elements
Grouping the first and the second axis of information elements
Adding at least an additional information element to be presented on one of the axes of information elements
Moving information elements on the axis and adjusting a time unit of the group of axes to display the additional information element on the axis

Fig. 41

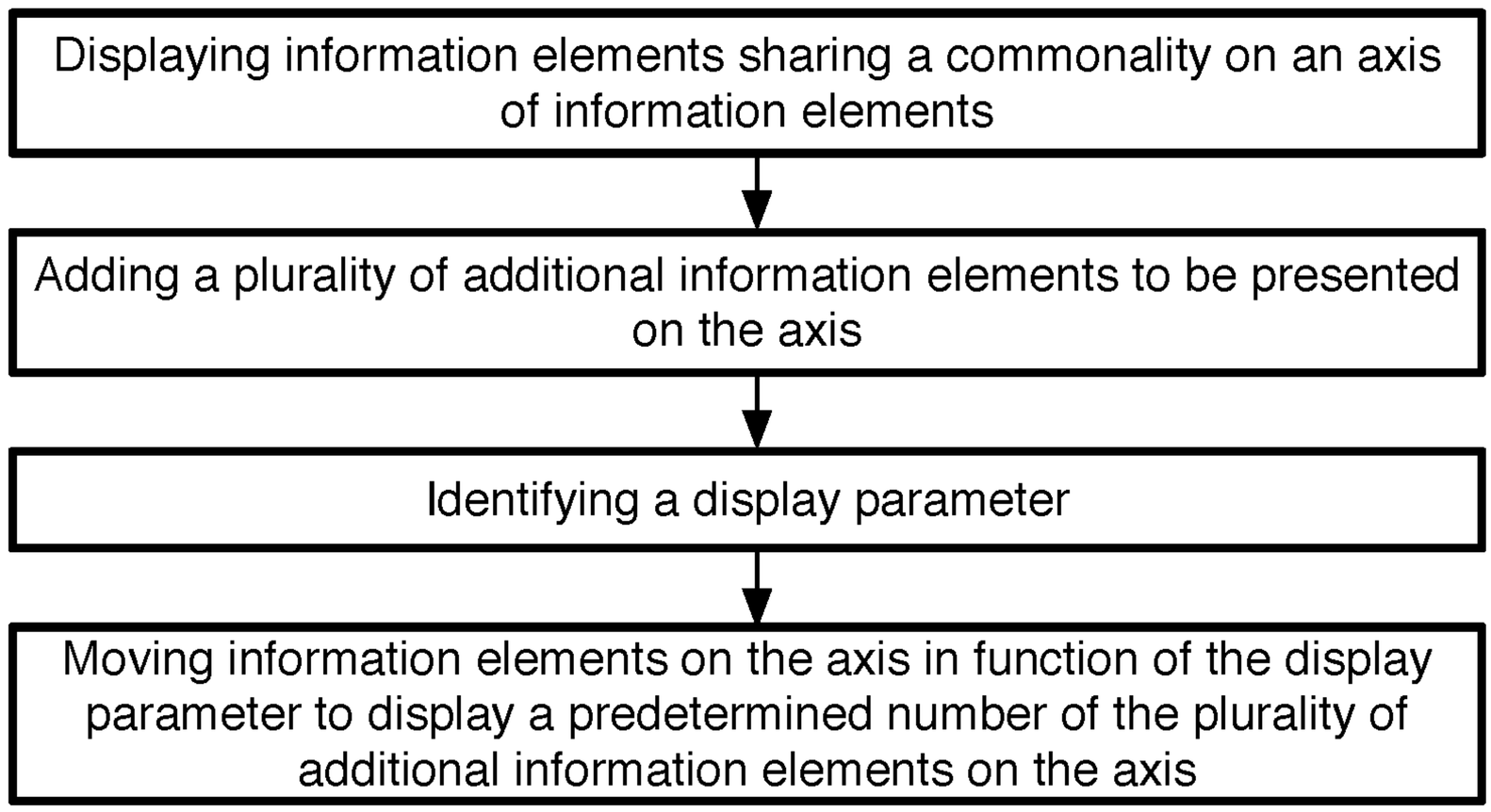
Displaying information elements sharing a commonality on an axis of information elements
Adding a plurality of additional information elements to be presented on the axis
Identifying a display parameter
Moving information elements on the axis in function of the display parameter to display a predetermined number of the plurality of additional information elements on the axis

Fig. 42

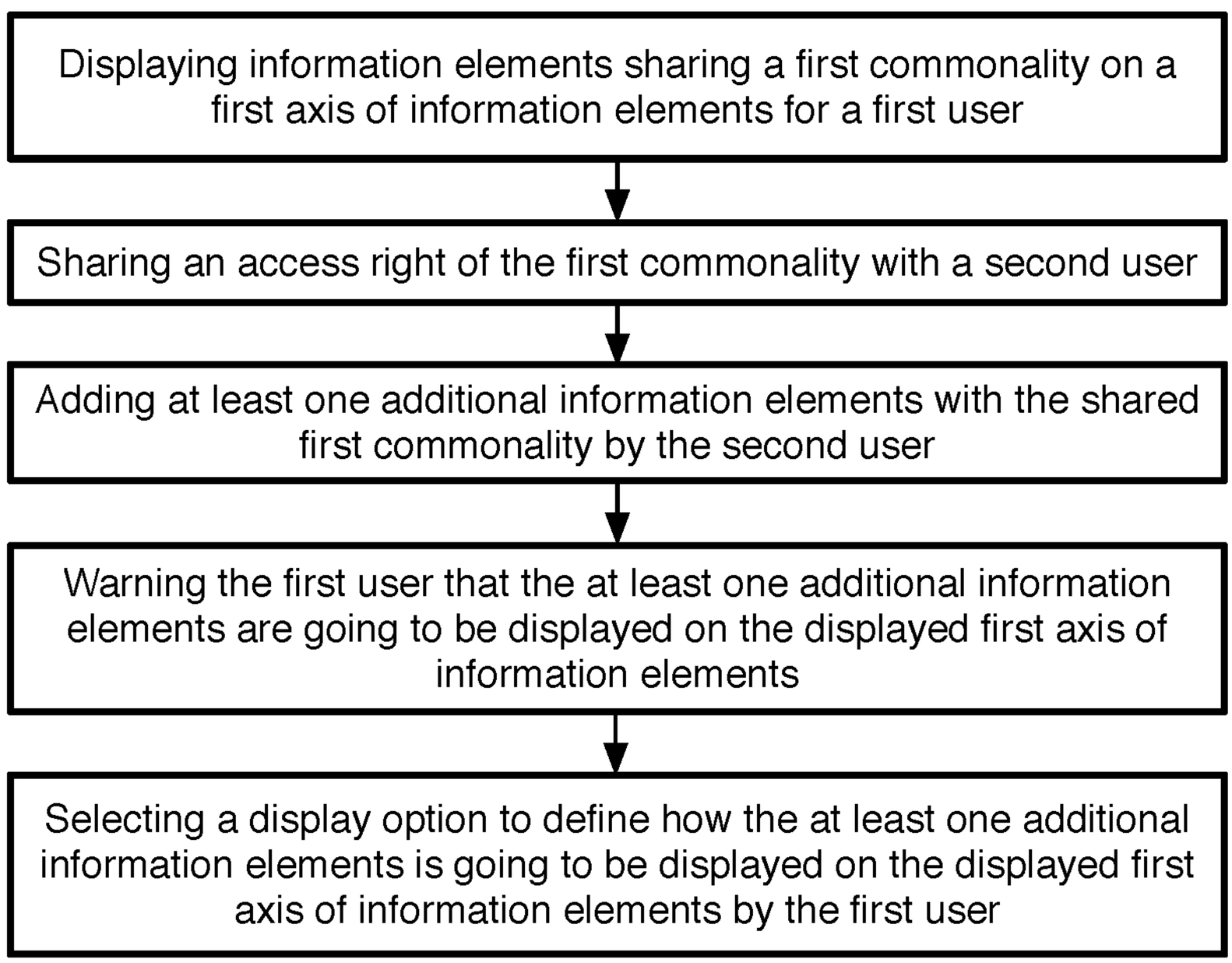
Displaying information elements sharing a first commonality on a first axis of information elements for a first user
Sharing an access right of the first commonality with a second user
Adding at least one additional information elements with the shared first commonality by the second user
Warning the first user that the at least one additional information elements are going to be displayed on the displayed first axis of information elements
Selecting a display option to define how the at least one additional information elements is going to be displayed on the displayed first axis of information elements by the first user

Fig. 43

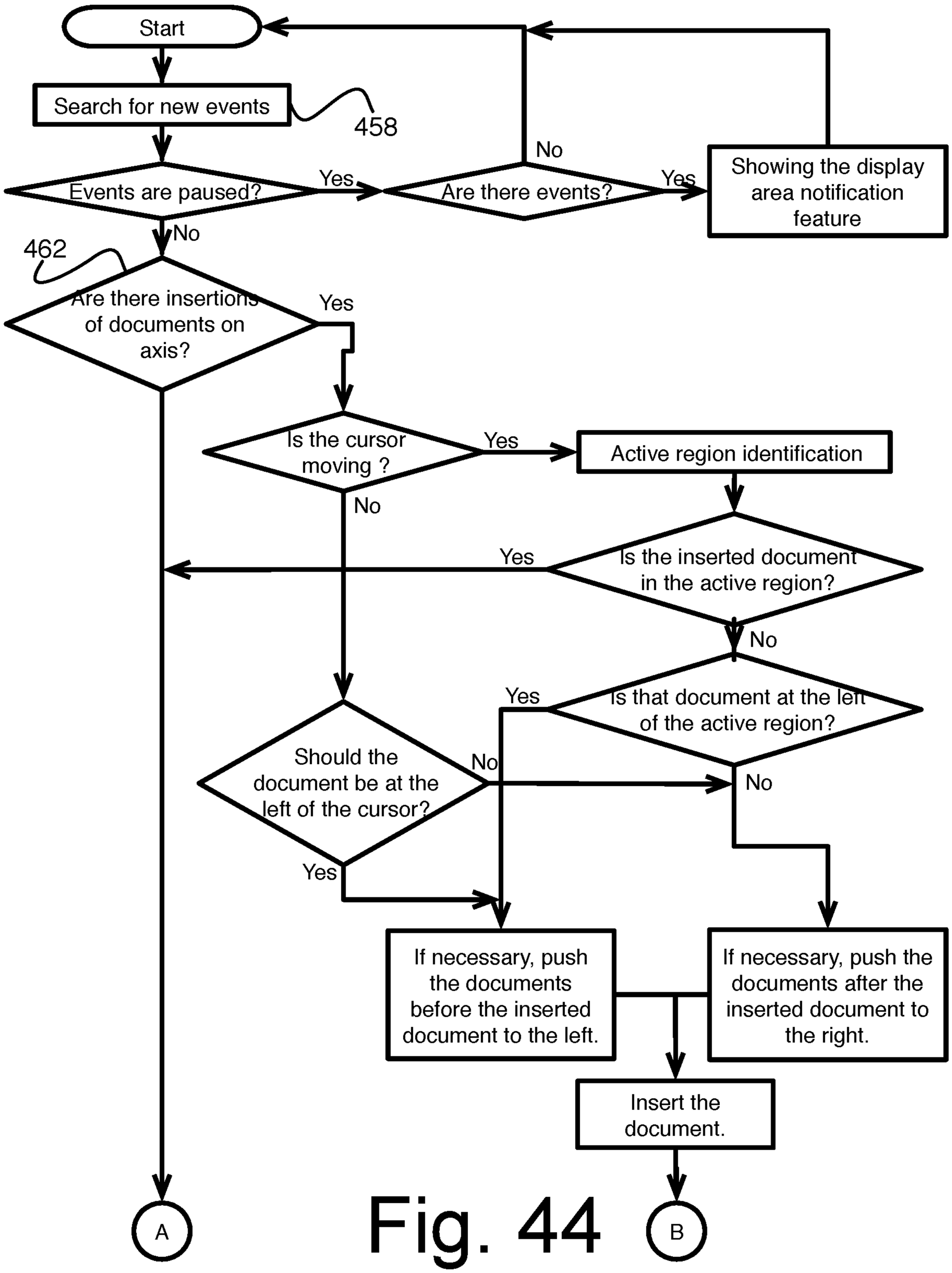
Start
Search for new events
458
Events are paused?
Yes
No
Are there events?
No
Yes
Showing the display area notification feature
462
Are there insertions of documents on axis?
Yes
Is the cursor moving ?
Yes
No
Active region identification
Is the inserted document in the active region?
Yes
No
Is that document at the left of the active region?
Yes
No
Should the document be at the left of the cursor?
No
Yes
If necessary, push the documents before the inserted document to the left.
If necessary, push the documents after the inserted document to the right.
Insert the document.
A
B

Fig. 44

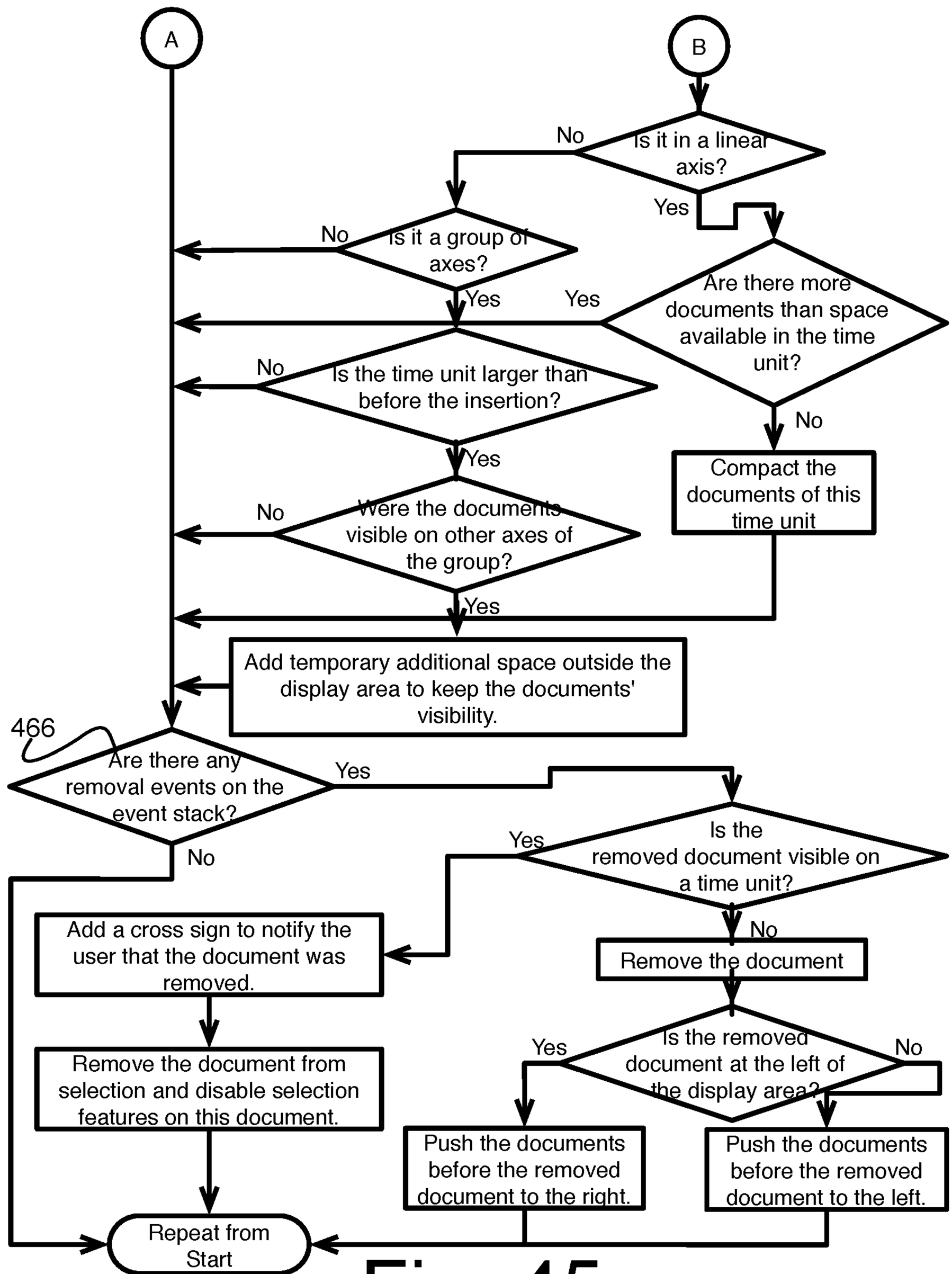
A
B
Is it in a linear axis?
No
Yes
Is it a group of axes?
No
Yes
Are there more documents than space available in the time unit?
Yes
No
Is the time unit larger than before the insertion?
No
Yes
Compact the documents of this time unit
Were the documents visible on other axes of the group?
No
Yes
Add temporary additional space outside the display area to keep the documents' visibility.
466
Are there any removal events on the event stack?
Yes
No
Is the removed document visible on a time unit?
Yes
No
Remove the document
Add a cross sign to notify the user that the document was removed.
Remove the document from selection and disable selection features on this document.
Is the removed document at the left of the display area?
Yes
No
Push the documents before the removed document to the right.
Push the documents before the removed document to the left.
Repeat from Start

Fig. 45

METHOD OF EXPANDING STACKED ELEMENTS

CROSS-REFERENCES

[0001] The present invention relates to, claims priority from and is a continuing application of U.S. patent application Ser. No. 13/626,692, filed Sep. 25, 2012, entitled METHOD OF INSERTING AND REMOVING INFORMATION ELEMENTS IN ORDERED INFORMATION ELEMENT ARRAYS, which claims priority from U.S. Provisional Patent Application No. 61/538,879, filed Sep. 25, 2011, entitled METHOD AND APPARATUS FOR DISPLAYING INFORMATION ELEMENT AXES, which is incorporated herein by reference in its entirety.

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0002] This invention relates generally to computer systems adapted to insert information elements in information element axes. The present invention more specifically relates to methods and apparatuses for reducing and preventing confusion when information elements are inserted in displayed array of information elements.

2. Description of the Related Art

[0003] Axes of documents present documents thereon in a predetermined fashion. They are displayed on the axis in a collated manner; that is, they are sorted on an axis in a specific order, often chronological. Moreover, documents displayed on these axes share one or more attributes. The attribute is a certain descriptive element ascribed to a document by a user.

[0004] A document can have one or more attributes. For example, one's picture taken on a vacation trip to Mexico can have the following attributes: "Mexico **2012** trip," "Mary and the dog on the beach," and "June 2012 cocktail party." The picture, therefore, was taken during someone's trip to Mexico, which took place sometimes in June of 2012. Moreover, this picture is one where Mary, the protagonist of the picture, is with her dog on the beach.

[0005] The number of documents displayed on an axis varies. The length of the axes upon which these documents are displayed fluctuates as well in dependence of the number of documents they contain. Given their nature and purpose to graphically display the documents of which they are composed, axes' actual lengths differ in dependence of the number of documents they have. Some axes might have as little as one document, while others might contain more.

[0006] Axes are visible on a display area, for example, a computer screen. The display area can reveal more than one axis at a time. Some axis, with a small number of documents, can be fully displayed on the display area, as their lengths are relatively short and can easily fit within the frame of the display area. Others, however, which have a relatively high number of documents, cannot be fully shown on the display area and, therefore, are partially visible on a display area. The viewer, consequently, can access the non-displayed documents of the axes by scrolling to the right or to the left of the display area in dependence of the location of the document(s) searched.

[0007] Changes made to documents in an axis can drastically change the location of the documents on the respective axis. For example, if a certain axis contains "10" documents, and if "20" more of such similar documents are added to the respective axis within a small time frame (a few seconds), the initial "10" documents which were present on the axis can either be dislocated to the right or the left sides of the axis so that the other "20" documents can now be aligned on the axis. The axis becomes larger as a result of this very addition of documents.

[0008] Similarly, documents can also be removed from a certain axis. If the initial number of documents on an axis were "30" and if "20" documents were simultaneously removed from the axis, the remaining "10" documents would be subject to an automatic movement towards the center of the axis.

[0009] Documents are added on an axis when they receive one attribute that defines the rest of the documents on that respective axis. Documents are removed or, consequently, deleted from an axis when they are no longer defined by the attribute that once linked them to that respective axis.

[0010] The addition and the removal of documents on an axis are less significant to the viewer when the specific axis is not visible on the display area. Stating differently, if someone were to look at an axis containing five documents sharing the common attribute "higher education in Canada" (the five documents being all displayed on the display area), s/he would not notice any changes on the visual display if "20" other documents were simultaneously being added to two other axes nonvisible on the display area. This scenario, however, would not apply if the same "20" documents were being added to the axis with the five documents on "higher education in Canada". The viewer would notice the graphical enlargement of the axis displayed on the screen as a result of this addition. Moreover, the initial five documents on the axis would be consequently displaced either to the right or left of the axis to provide the necessary space for the new documents' addition.

[0011] Changes in the number of documents present on an axis are, therefore, more significant to the viewer when the axis is visible on the display area. By significant, one refers to the effects these changes can have on the viewer(s). Document displacements on the display area can lead to various undesirable consequences to the viewer, such as loss of focus on a document(s); occurrence of at least one unintended error in the viewing, modification and/or management of a document(s); possible disorientation, perplexity and/or puzzlement of the viewer caused by the change in the layout of document(s); and unforeseen and unintended dissatisfaction and frustration of the viewer. These are mere examples, and do not embody the total number of possible outcomes that might arise as a result of document displacements and/or axes dislocations on the display area.

[0012] Documents' dislocations on axes may cause the axes to displace. Stated differently, axes to which documents were inserted and/or removed may move themselves to the right or to the left of the display area in order to adjust to the updated number of documents they contain. This phenomenon, also, can cause unwanted consequences on the viewer, some of which were listed above.

[0013] A user can manage one's own documents. In other words, one can add and/or remove documents from an axis. This axis may or not be visible on the display area. Its visibility on the display area is caused by the user's exploration of one or more of its documents on the display area.

[0014] Moreover, a user can manage attributes associated with these respective documents. When the managing of attributes by the user does occur, significant changes in the way documents are sorted, and, therefore, listed on an axis can occur. Documents on an axis may be dislocated to the right or to the left of the axis.

[0015] Needless to say, there is a positive correlation between the number of documents added and/or removed on a certain axis and the potential undesirable impact these changes have on the user. The greater is the number of documents that are added or removed from an axis, the greater is the impact on the layout and the graphical display of the documents on this axis.

[0016] More than one user can manage and share documents on a specific axis at a given time. By "sharing," on refers to the act of holding the right to assign and/or remove attributes to documents. For example, a first user can manage one's attributes. However, the association and/or disassociation of attributes will affect another user. Needless to explain, the impact of these changes can be significant, especially when the other user views on the display area an axis or several axes presenting documents associated with the attributes subjected to simultaneous changes by another user.

[0017] Documents can modify their location on the axes in a precipitous manner and without prior warning. This increases the likelihood of confusion and frustration caused to the viewer of these axes, both most likely arising from the potential unintended error(s) one can commit as a result of these sudden changes on the axes.

[0018] It is therefore highly desirable to have a mechanism preventing or reducing confusion and frustration caused by the addition and/or removal of documents from displayed axes.

[0019] It is also desirable to orderly present the changes on the axes visible on the display area, in order to help the viewer understand the changes that are taken place.

[0020] It is yet desirable to display warnings of the changes that are occurring on the axes as a result of the addition and/or removal of the documents and to offer the viewer of the display area choices of actions matching one's needs.

[0021] It is desirable, also, to inform the viewer of the number and identity of the user(s) who have added and/or removed documents on the displayed axes.

[0022] Moreover, it is also necessary to have a system that would analyze and assess the viewer's behavior in respect to the display area in order to decide the best action(s) to be undertaken in terms of the location where a document or documents may be best added and/or removed on axis shown on the display area so that its/their insertion and/or removal would cause little or no undesirable effects on the viewer.

[0023] It is equally desirable to offer the viewer the proper means to control and manage the number of, and time when, at least modifications to documents viewable in the display area can take place.

[0024] Other deficiencies will become apparent to one skilled in the art to which the invention pertains in view of the following summary and detailed description with its appended figures.

SUMMARY OF THE INVENTION

[0025] One aspect of the present invention aims to alleviate one or more of the shortcomings of the background art by addressing one or more of the existing needs in the art.

[0026] The following presents a simplified summary of the invention in order to provide a basic understanding of some aspects of the invention. This summary is not an extensive overview of the invention. It is not intended to identify key/critical elements of the invention or to delineate the scope of the invention. Its sole purpose is to present some concepts of the invention in a simplified form as a prelude to the more detailed description that is presented later.

[0027] The invention is generally described as a method, a system, a device and/or a graphical user interface used to represent multiple computer files, documents, or other data on axes in an axis-based graphical user interface (GUI).

[0028] Aspects of our work provide a method and system preventing and reducing viewer's confusion and potential errors the viewer might commit when documents are added or removed from displayed axes. The system allows the viewer to efficiently navigate the documents on axes present on the display area, or a portion thereof, when additional documents are being added and/or removed on the displayed axes simultaneously and/or at later time. This is made possible by the indications provided by the system concerning these modifications and by the means to manage these modifications accordingly, in accordance with at least one embodiment.

[0029] One aspect of the instant invention provides a method, an apparatus and a graphical user interface adapted to present arrays of documents as a single axis, row, or column or a plurality thereof, and in which the distribution of documents is graphically affected by the addition and/or the removal of other documents therefrom. The respective method, apparatus and graphical user interface allow for a smooth transition from the original graphical layout of documents to the final one, caused by the addition and/or removal of documents therefrom, in accordance with at least one embodiment.

[0030] Another aspect of the invention provides a method and a system intended for the user to be warned and, consequently, offered choices of action in light of the addition and/or removal of documents on the displayed axes, in accordance with at least one embodiment.

[0031] Another aspect of the invention offers a method and a system where the displayed longitudinal side of the axis wider to the pointing device remains motionless on the screen and the opposite longitudinal side of the axis adjusts to make room for the new documents to be displayed or removed from an axis, in accordance with at least one embodiment.

[0032] Another aspect of the invention presents a method, a system and a graphical user interface where the displayed longitudinal side of the axis in respect with the insertion location remains fixed on the screen while its opposite side adjusts to make room for new documents to be displayed and/or removed on the axis, in accordance with at least one embodiment.

[0033] The present invention provides a mechanism adapted to prevent a viewer of displayed documents from being confused by the modifications caused to the documents by another user. Given that these modifications are not performed by the viewer, the latter may find them confusing, especially when documents' presence (and lack thereof) and

location on a specific axis are being subject to constant and impromptu changes, in accordance with at least one embodiment.

[0034] In one aspect of the invention, the user can decide a fixed and/or maximum space one would allow for supplementary documents to be added and/or removed from a specific axis shown on the display area, in accordance with at least one embodiment.

[0035] A further aspect of the instant invention provides a functionality adapted to move and or/remove documents shared by another user immediately and/or after a predetermined delay, in accordance with at least one embodiment.

[0036] Another aspect of the present invention provides a functionality adapted to display the added and/or removed documents in an expanded or contracted manner, and/or or within a fixed set space, dictated or not by the viewer, in accordance with at least one embodiment.

[0037] In one other aspect of the instant invention, a mechanism is provided to identify the documents that have been added and/or removed from a specific axis as a result of the actions of another user(s), in accordance with at least one embodiment.

[0038] One aspect of the invention provides a method of managing elements in a collation unit of an axis of elements, the method comprising displaying a plurality of elements along the axis of elements, the elements being displayed in a substantially rectilinear arrangement on a display on a basis of a collation function, the elements being displayed in collation units along the axis of elements, each collation unit including a receiving space thereof along a longitudinal length of the axis of elements, the elements displayed in a collation unit being displayed with a first layout until the number of elements to be displayed in the collation unit exceeds a maximum number of elements displayable with the first layout, the elements displayed in the collation unit being displayed with a second layout when the number of elements to be displayed in the collation unit exceeds the number of elements displayable with the first layout.

[0039] One other aspect of the invention provides a non-transitory computer-readable medium having stored thereon computer-readable instructions that, when executed by a computer, cause the computer to perform operations for managing elements in a collation unit of an axis of elements, the operations comprising: displaying a plurality of elements along the axis of elements, the elements being displayed in a substantially rectilinear arrangement on a display on a basis of a collation function, the elements being displayed in collation units along the axis of elements, each collation unit including a receiving space thereof along a longitudinal length of the axis of elements, the elements displayed in a collation unit being displayed with a first layout until the number of elements to be displayed in the collation unit exceeds a maximum number of elements displayable with the first layout, the elements displayed in the collation unit being displayed with a second layout when the number of elements to be displayed in the collation unit exceeds the number of elements displayable with the first layout.

[0040] An aspect of the present invention provides a device, comprising a processor configured to present a graphical user interface for displaying and managing elements in a collation unit of an axis of elements, the graphical interface comprising areas adapted to provides the operations comprising: displaying a plurality of elements along the axis of elements, the elements being displayed in a substantially rectilinear arrangement on a display on a basis of a collation function, the elements being displayed in collation units along the axis of elements, each collation unit including a receiving space thereof along a longitudinal length of the axis of elements, the elements displayed in a collation unit being displayed with a first layout until the number of elements to be displayed in the collation unit exceeds a maximum number of elements displayable with the first layout, the elements displayed in the collation unit being displayed with a second layout when the number of elements to be displayed in the collation unit exceeds the number of elements displayable with the first layout.

[0041] Each of the embodiments of the present invention has at least one of the above-mentioned objects and/or aspects, but does not necessarily have all of them. It should be understood that some aspects of the present invention that have resulted from attempting to attain the above-mentioned objects may not satisfy these objects and/or may satisfy other objects not specifically recited herein.

[0042] Additional and/or alternative features, aspects, and advantages of embodiments of the present invention will become apparent from the following description, the accompanying drawings, and the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0043] FIG. **1** is a schematic illustration of an exemplary network;

[0044] FIG. **2** is a schematic illustration of an alternate exemplary network;

[0045] FIG. **3** is a schematic illustration of an exemplary computer system;

[0046] FIG. **4** is a schematic illustration of an exemplary software system;

[0047] FIG. **5** is a schematic illustration of an axis-based interface and operating system;

[0048] FIG. **6** is a schematic illustration of an exemplary axis layout;

[0049] FIG. **7** is a schematic illustration of a linear and non-linear axis configurations;

[0050] FIG. **8** is a schematic illustration of an exemplary axis layout in accordance with an embodiment of the present invention;

[0051] FIG. **9** is a schematic illustration of an exemplary axis layout in accordance with an embodiment of the present invention;

[0052] FIG. **10** is a schematic illustration of an exemplary axis layout with three display areas thereon in accordance with an embodiment of the present invention;

[0053] FIG. **11** is a schematic illustration of a magnified display area partially showing an exemplary axis layout in accordance with an embodiment of the present invention;

[0054] FIG. **12** is a schematic illustration of a magnified display area partially showing an exemplary axis layout in accordance with an embodiment of the present invention;

[0055] FIG. **13** is a schematic illustration of a magnified display area partially showing an exemplary axis layout in accordance with an embodiment of the present invention;

[0056] FIG. **14** is a schematic illustration of a magnified display area partially showing an exemplary axis layout in accordance with an embodiment of the present invention;

[0057] FIG. **15** is a schematic illustration of a magnified display area partially showing an exemplary axis layout in accordance with an embodiment of the present invention;

[0058] FIG. **16** is a schematic illustration of a magnified display area partially showing an exemplary axis layout in accordance with an embodiment of the present invention;

[0059] FIG. **17** is a schematic illustration of a magnified display area partially showing an exemplary axis layout in accordance with an embodiment of the present invention;

[0060] FIG. **18** is a schematic illustration of a magnified display area partially showing an exemplary axis layout in accordance with an embodiment of the present invention;

[0061] FIG. **19** is a schematic illustration of a magnified display area partially showing an exemplary axis layout in accordance with an embodiment of the present invention;

[0062] FIG. **20** is a schematic illustration of a magnified display area partially showing an exemplary axis layout in accordance with an embodiment of the present invention;

[0063] FIG. **21** is a schematic illustration of a magnified display area partially showing an exemplary axis layout in accordance with an embodiment of the present invention;

[0064] FIG. **22** is a schematic illustration of a magnified display area partially showing an exemplary axis layout in accordance with an embodiment of the present invention;

[0065] FIG. **23** is a schematic illustration of a magnified display area partially showing an exemplary axis layout in accordance with an embodiment of the present invention;

[0066] FIG. **24** is a schematic illustration of a magnified display area partially showing an exemplary axis layout in accordance with an embodiment of the present invention;

[0067] FIG. **25** is a schematic illustration of a magnified display area partially showing an exemplary axis layout in accordance with an embodiment of the present invention;

[0068] FIG. **26** is a schematic illustration of an exemplary linear axis layout in accordance with an embodiment of the present invention;

[0069] FIG. **27** is a schematic illustration of an exemplary linear axis layout in accordance with an embodiment of the present invention;

[0070] FIG. **28** is a schematic illustration of an exemplary linear axis layout in accordance with an embodiment of the present invention;

[0071] FIG. **29** is a schematic illustration of an exemplary linear axis layout in accordance with an embodiment of the present invention;

[0072] FIG. **30** is a schematic illustration of an exemplary linear axis layout in accordance with an embodiment of the present invention;

[0073] FIG. **31** is a schematic illustration of an exemplary linear axis layout in accordance with an embodiment of the present invention;

[0074] FIG. **32** is a schematic illustration of an exemplary linear axis layout in accordance with an embodiment of the present invention;

[0075] FIG. **33** is a schematic illustration of a group of axes layout in accordance with an embodiment of the present invention;

[0076] FIG. **34** is a schematic illustration of a group of axes layout in accordance with an embodiment of the present invention;

[0077] FIG. **35** is a schematic illustration of a group of axes layout in accordance with an embodiment of the present invention;

[0078] FIG. **36** is a schematic illustration of a group of axes layout in accordance with an embodiment of the present invention;

[0079] FIG. **37** is a schematic illustration of a group of axes layout in accordance with an embodiment of the present invention;

[0080] FIG. **38** is a schematic illustration of a group of axes layout in accordance with an embodiment of the present invention;

[0081] FIG. **39** is a schematic illustration of a group of axes layout in accordance with an embodiment of the present invention;

[0082] FIG. **40** is an exemplary flowchart of one of the methods based upon which several aspects of the present invention are based.

[0083] FIG. **41** is an exemplary flowchart of one of the methods based upon which several aspects of the present invention are based.

[0084] FIG. **42** is an exemplary flowchart of one of the methods based upon which several aspects of the present invention are based.

[0085] FIG. **43** is an exemplary flowchart of one of the methods based upon which several aspects of the present invention are based.

[0086] FIG. **44** is an exemplary flowchart of one of the methods based upon which several aspects of the present invention are based.

[0087] FIG. **45** is an exemplary flowchart of one of the methods based upon which several aspects of the present invention are based.

DESCRIPTION OF EMBODIMENT(S) OF THE INVENTION

[0088] Our work is now described with reference to the figures. In the following description, for purposes of explanation, numerous specific details are set forth in order to provide a thorough understanding of the present invention by way of embodiment(s). It may be evident, however, that the present invention may be practiced without these specific details. In other instances, when applicable, well-known structures and devices are shown in block diagram form in order to facilitate describing the present invention.

[0089] The features provided in this specification mainly but might not exclusively relate to principles of computer software and machine-readable code/instructions adapted to instruct a computer, many computers or other machines adapted to use the instructions to provide material effects on a display, or other means enabling human-computer interactions to manage documents, menus, user-selectable elements and other computer files. These code/instructions are preferably stored on a machine-readable medium to be read and acted upon with a computer or machine having the appropriate code/instructions reading capability.

[0090] FIG. **1** illustrates an exemplary network **10** in which a system and a method, consistent with the present invention, may be implemented. The network **10** may include multiple client devices **12** connected to multiple servers **14**, **16**, **18** via a network **20**. The network **20** may include a local area network (LAN), a wide area network (WAN), a phone network, such as the Public Switched Phone Network (PSTN), an intranet, the Internet, Wi-Fi, WiMAX or a combination thereof. Two client devices **12** and three servers **14**, **16**, **18** have been illustrated as connected to network **20** for simplicity. In practice, there may be more or less client devices and servers **14**, **16**, **18**. Also, in some instances, a client **12** device may perform the functions

of a server **14**, **16**, **18** and a server **14**, **16**, **18** may perform the functions of a client **12** device.

[0091] The client devices **12** may include devices such as mainframes, minicomputers, personal computers, laptops, personal digital assistants, phones, or the like, capable of connecting to the network **20**. The client devices **12** may transmit data over the network **20** or receive data from the network **20** via a wired, wireless, or optical connection.

[0092] The servers **14-18** may include one or more types of computer systems, such as a mainframe, minicomputer, or personal computer, capable of connecting to the network **20** to enable servers **14-18** to communicate with the client devices **12**. In alternative implementations, the servers **14-18** may include mechanisms for directly connecting to one or more client devices **12**. The servers **14-18** may transmit data over the network **20** or receive data from the network **20** via a wired, wireless, or optical connection.

[0093] In an implementation consistent with the present invention illustratively embodied herein, the servers **14-18** may include a search engine **22** usable by the client devices **12**. The servers **14-18** may store documents **200**, such as web pages, accessible by the client devices **12**.

[0094] With reference to FIG. **2**, a network **20** includes the content cloud **30**, a content database **32**, content devices **34-38**, and other devices **40-48**. The network mediator **28** enables network devices **34-48** to communicate with each other without pre-configuring each device **34-48**. The content cloud **30** represents a content source such as the Internet, where content exists at various locations across the globe that could be reached through a wired connection and/or with a wireless connection provided by an antenna **26**. The content includes multimedia content such as audio and video. The mediator **28** allows the content cloud to provide content to devices **34-48**. The database **32** is a storage device **166** that maintains content. The database **32** may be a standalone device on an external communication network. The mediator **28** communicates with the database **32** to access and retrieve content. The content devices **34-48** include intelligent devices, such as, for example, personal computers, laptops, cell phones and personal digital assistants. The content devices **34-48** are capable or storing content data. The devices **34-48** are intelligent devices that receive content from other content devices **30-48**. However, the devices **34-48** can also operate as servers to distribute content to other client devices if desirable.

[0095] The following discussion provides a brief, general description of an exemplary computer apparatus in which at least some aspects of the present invention may be implemented. The present invention will be described in the general context of computer-executable instructions, such as program modules **174** being executed by a computerized device. However, methods of the present invention may be affected by other apparatuses. Program modules may include routines, programs, objects, components, data structures, applets, WEB 2.0 type of evolved networked centered applications, etc. that perform a task(s) or implement particular abstract data types. Moreover, those skilled in the art will appreciate that at least some aspects of the present invention may be implemented with other configurations, including hand-held devices, multiprocessor system, microprocessor-based or programmable consumer electronics, network computers, minicomputers, set top boxes, mainframe computers, gaming consoles and the like. At least some aspects of the present invention may also be carried out in distributed computing environments where tasks are performed by remote processing devices linked through a communications network as exemplified in FIG. **2**. In a distributed computing environment, program modules **174** may be located in local and/or remote memory storage devices **166**.

[0096] With reference to FIG. **3**, an exemplary apparatus **100** for implementing at least some aspects of the present invention includes a general-purpose computing device in the form of a computer **120** or in the form of a computerized portable apparatus. The computer **120** may include a processing unit **121**, a system memory **122**, and a system bus **123** that couples various system components, including the system memory **122**, to the processing unit **121**. The system bus **123** may be any of several types of bus structures including a memory bus or memory controller, a peripheral bus, and a local bus using any of a variety of bus architectures. The system memory may include read only memory (ROM) **124** and/or random access memory (RAM) **125**. A basic input/output system **126** (BIOS), containing basic routines that help to transfer data between elements within the computer **120**, such as during start-up, may be stored in ROM **124**. The computer **120** may also include a hard disk drive **127** for reading from and writing to a hard disk, (not shown), a magnetic disk drive **128** for reading from or writing to a (e.g., removable) magnetic disk **129**, and an optical disk drive **130** for reading from or writing to a removable (magneto) optical disk **131** such as a compact disk or other (magneto) optical media. The hard disk drive **127**, magnetic disk drive **128**, and (magneto) optical disk drive **130** may be coupled with the system bus **123** by a hard disk drive interface **132**, a magnetic disk drive interface **133**, and a (magneto) optical drive interface **134**, respectively. The drives and their associated storage media provide non-volatile (or persistent) storage of machine-readable instructions, data structures, program modules **174** and other data for the computer **120**. Although the exemplary environment described herein employs a hard disk, a removable magnetic disk **129** and a removable optical disk **131**, those skilled in the art will appreciate that other types of storage media, such as magnetic cassettes, flash memory cards, digital video disks, Bernoulli cartridges, random access memories (RAMs), read only memories (ROM), remote cloud storage and the like, may be used instead of, or in addition to, the storage devices **166** introduced above.

[0097] A number of program modules **174** may be stored on the hard disk **127**, magnetic disk **129**, (magneto) optical disk **131**, ROM **124** or RAM **125**, such as an operating system **135** (for example, Windows® NT® 4.0, sold by Microsoft® Corporation of Redmond, Wash.), one or more application programs **136**, other program modules **137** (such as Alice™, which is a research system developed by the User Interface Group at Carnegie Mellon University available at www.Alice.org, OpenGL® from Silicon Graphics Inc. of Mountain View Calif., or Direct 3D from Microsoft Corp. of Bellevue Wash.), and/or program data **138** for example.

[0098] A user may enter commands and data into the computer **120** through input devices, such as a keyboard **140**, a camera **141** and a pointing device **142** Other input devices (not shown) such as a microphone, joystick, game pad, satellite dish, scanner, a touch sensitive screen, accelerometers or a motion-sensor detector such as KINECT™ that are adapted to sense movements of the user or move-

ments of a device, or the like, may also be included. These and other input devices are often connected to the processing unit **121** through a serial port interface **146** coupled to the system bus **123**. However, input devices may be connected by other interfaces, such as a parallel port, a game port, blue tooth connection or a universal serial bus (USB). For example, since the bandwidth of the camera **141** may be too great for the serial port, the video camera **141** may be coupled with the system bus **123** via a video capture card (not shown). The video monitor **147** or other type of display device **150** may also be connected to the system bus **123** via an interface, such as a video adapter **148** for example. The video adapter **148** may include a graphics accelerator. One or more speakers **162** may be connected to the system bus **123** via a sound card **161** (e.g., a wave table synthesizer such as product number AWE64 Gold Card from Creative® Labs of Milpitas, Calif.). In addition to the monitor **147** and speaker(s) **162**, the computer **120** may include other peripheral output devices (not shown), such as a printer, a hi-definition television and a scanner for example. As an alternative or an addition to the video monitor **147**, a stereo video output device, such as a head mounted display or LCD shutter glasses for example, could be used.

[0099] The computer **120** may operate in a networked environment defining logical connections to one or more remote computers **120**, such as a remote computer **149**. The remote computer **149** may be another computer **120**, a server **14-18**, a router, a network PC, a peer device or other common network node, and may include many or all of the elements described above relative to the computer **120**. The logical connections depicted in FIG. **3** include a local area network (LAN) **151** and a wide area network (WAN) **152**, an intranet and the Internet.

[0100] When used in a LAN, the computer **120** may be connected to the LAN **151** through a network interface adapter (or "NIC") **153**. When used in a WAN, such as the Internet, the computer **120** may include a modem **154** or other means for establishing communications over the wide area network **152** (e.g. Wi-Fi, WinMax). The modem **154**, which may be internal or external, may be connected to the system bus **123** via the serial port interface **146** or another type of port interface. In a networked environment, at least some of the program modules depicted relative to the computer **120** may be stored in the remote memory storage device **166**. The network connections shown are exemplary and other means of establishing a communications link between the computers **120** may be used.

[0101] The exemplary network and the exemplary computer system described above are adapted to carry on the following embodiments:

[0102] A system **170** is depicted in FIG. **4** which may represent the functionalities described in the instant application when run on an apparatus **100**, for instance a computer **120**, such as has been previously described. The computer **120** may in turn be connected to a server **14-18** comprising a set of program modules **174** enabling functions including but not limited to: computing, document rendering, network communication, application configuration and local database management.

[0103] The software system **170** illustratively consists of a collection of at least twelve modules **174** independent from those of the server **14-18** that together carry out the method required for the functionalities to be visible on a graphical user interface and usable by the user. As illustrated, additional modules **226** may also be used in conjunction with the twelve base modules.

[0104] A computing module **178** provides a means to circulate data between users, the other modules **174** and the apparatus **100**. The computing module **178** is adapted to convert queries **230**, which may be system-based or user-based, into graphical rendering in accordance with at least one embodiment of the present invention. The other modules **174** are configured to send to and receive data from the computing module and to individually or collectively interact with other modules **174**.

[0105] An application configuration module **182** provides software configuration to manage application settings and open connections to other servers **14-18**. Other modules **174** may use the application configuration module **182** to manage their behavior to satisfy user-specific needs.

[0106] A data elements management module **186** may be used in conjunction with other modules to manage data elements such as documents **200** contained in a database **32** in response to a query **230**. The data elements management module **186** may use any kind of database connection and may use a network communication module **190** in order to access a database **32** through a network **28**, on a server computer **14-18**. The network communication module **190** may use several protocols in order to communicate with a server computer **14-18**, such as IPv4, IPv6, TCP, UDP, ODBC, HTTP, WebDAV, SSH, IMAP and even define its own specific communication protocol. The data elements management module **186** may also be used in conjunction with an email connectivity module **194** and network communication module **190** in order to treat and represent emails in the same way as the data elements of a database **32**. The data elements management module **186** may also be used in conjunction with the permissions module **198** (on the client or server side) in order to control the user access to elements based by some sort of sharing rules. The data elements management module **186** may also work in conjunction with a caches module **202**, providing client-side cached versions of the database **32** and files in order to respond to future requests faster. Modules **174** may be made to communicate information in a standardized way by the use of an Application Programming Interface (API) in order to simplify the data elements management module's **186** interactions with other modules **174**.

[0107] The data elements management module **186** may sort through documents **200** stored in the database **32** and connected to each other via a variety of referencing modes, may apply a filter as specified in a query **230** and may subsequently direct the filtered documents **200** to other modules **174** (this will be shown in FIG. **6**). One such module may be an axis-ordering module **206** which may distribute documents **200** filtered by the data elements management module **186** onto an axis-like array **288** or axis **292** (illustrated in FIG. **6**) according to a collation function that may be user- or system-specified and analyzed by the computing module **178**. An axis **292** or axis-like array **288** is an embodiment of graphical rendering of the functionalities described in the present specification on a device's display **150** that can be embodied as a substantially rectilinear sequence of documents **200** from which a viewer can infer meaning and/or relationships therebetween. An axial distribution **292** of documents **200** is adapted to accommodate and display a single type of documents **200** or, if

desirable, more than one type of documents **200**, computer files, multimedia contents, user-selectable elements and/or user-selectable menu elements. Generally, an axis **292** is used to graphically group information elements **200** having a commonality. Other functionalities related to axes **292** shall be described in greater detail below.

[0108] The axis-ordering module **206** may manage the ordering of single documents **200** and/or several documents **200** assembled into document sets **220** onto one or more axes **292**. In addition of managing the collation of documents **200** onto an axis **292**, the axis-ordering module **206** may also manage the order of the documents **200** contained within secondary documents sets **232** (not illustrated). The positioning module **210** manages the positioning of documents **200** within axes **240** based on interactions with other modules **174** processing the various elements contained in a query **230**. The positioning module **210** is adapted to and may interpret data contained in document sets **228** generated by the data elements management module **186** in relationship to the query **230** to identify a location for a given document set **228** within the collation of an axis **292**. Likewise, a visually distinctive features management module **214** is adapted to interpret data contained in documents **200** or document sets **228** generated by the data elements management module **186** in relationship to the query **230** to selectively apply one or more visually distinctive features **284** (not illustrated in this figure) to single documents **200** or document sets **228**. Finally, a display management module **218** may, inter alia, manage elements related to the user interface **234**, possibly interacting with a graphics card and a monitor **147**. The display management module **218** may use a document-rendering module **222** that provides instructions to render specific documents **200**, like images, text files, word-processing files, spreadsheet files, presentation files, etc. The document-rendering module **222** may also provide an API to let developers add their own extensions to deliver to renderers other document types.

[0109] FIG. **5** depicts a computer system **120** comprising an operating system **135** with an integrated axis-based user interface **238**. As illustrated in FIG. **5**, the axis-based user interface **238** could serve as a desktop environment to manipulate documents **200** (such as files, objects and applications), or could be used as a main operating system **135** user interface **234**. One can appreciate a hierarchical description of a computer system **120** and software system **170** with multiple components **242**. First, hardware **246** is used to provide users with a physical device **34-48**. Second, the axis-based system could be built on top of an existing operating system core and kernel **250**, such as, for instance, Unix™ or BSD™. A graphics API **254** like OpenGL® could also be used in order to provide basic graphical capabilities to the system via a video adapter **148**.

[0110] Multiple core functionalities could be integrated to provide core operating system **135** services. A graphical layer framework component **256** could be built over the graphics API component **254**, and could be used to provide complex drawing capabilities. The layer-based graphics layer framework component **256** may also support widget rendering and handling (like buttons, text fields, dialogs, etc.) A network management component **260** could be based on pre-existing network management capabilities in the operating system core and kernel **250**. It could serve as a tool to manage an Internet network connection through Ethernet, Bluetooth, Wi-Fi, Modem and other communication channels. A utility component **264** could handle all the other services needed to communicate with the operating system core and kernel **250**, providing functionalities such as user login, user authentication, memory, disk-access management, etc. Using these modules, the axis-based user interface **238** would use core functionalities from the graphical layer framework component **256**, the network management component **260** and the utility component **264** to provide workspaces **306** comprising multiple axes **292** that display documents **200** (not shown in FIG. **5**). The axis-based user interface **238** may also provide more integrated actions, like interface buttons, preview or magnification that may be directly docketed. Another component, a system preferences management component **268** would provide multiple functions needed by the axis-based user interface **238**, such as dialogs to manage document insertion, attribute definitions, users, permissions, application configuration, etc. Finally, the operating system **135** may comprise a window management system emulation module **272**. This module may be based on an X Window System or X11© and may use other existing client application libraries to provide a large number of applications as well as functionalities to run windowed applications on top of the axis-based user interface **238**. To provide other functionalities, third-party application providers could build third-party core modules **276** on top of the axis-based user interface **238** and system preferences management module **268**. Third-party application providers could also develop third-party software environments **280** and other applications that could be run using the window management system emulation **272**, providing the user with useful applications such as an Internet Browser, Office Business Applications, Multimedia Applications, Games, etc.

[0111] The Window Management System Emulation **272** could also offer functions to provide a more axis-based user interface **238** integration, such as, previews, player and editors for the documents **200** displayed in the axis-based user interface **238**. For example, a rich text document **200** could use a third-party module **276** or third-party software environment **280** to provide a previewer or media player for the document **200**, or a third-party application to integrate a live editor on the axis-based user interface **238**.

[0112] This computer system **120** could be used, for instance, as a business solution to provide users with an axis-based user interface **238** operating system **135** directly on multiple kinds of devices **34-48** (computers, laptop, tablets, cell phones, etc.). The computer system **120** may also illustratively be used as a business solution to sell preconfigured devices **34-48** with the axis-based user interface **284**. Since the operating system **135** has a built-in axis-based user interface **284**, the device **34-48** is likely to have a display **150** and other input device like a keyboard **140**, a mouse **142** or a touch-screen interface. The devices **34-48** may not necessarily provide such parts and may be adapted to be used by communicating information about the user interface **240** and input methods with other devices **34-48** (television set, motion sensing input device, computer or tablet over network, cell phone, etc.)

[0113] FIG. **6** illustrates the interaction of the computer system **120** and software system **170** with an axis-based graphical user interface **238**. An interface program providing a graphical user interface **234** for managing information elements **200** in accordance with an embodiment of the invention is installed on a machine, e.g. a computer system

120 as illustrated in FIG. **3**. The interface **234** can be programmed using various programming languages e.g. C++, Java or other suitable programming languages. The programming of these languages is well known in the art and is adapted to be stored on a machine-readable medium and readable therefrom to provide executable instructions to a hardware system. It is believed that a skilled reader in software art is going to recognize this portion of the system that will, therefore, not be further described herein.

[0114] The graphical user interface **234** may run through the operating system **135** and the hardware **246** of the computer system **120** or, alternatively, through a network-based system e.g. client-server, and/cloud computing system as exemplified in FIG. **1** and FIG. **2**. The interface **234** is adapted to display and manage information elements **200**, generally provided on a basis of a query **230**, which may be stored in one or many databases **32** (as illustrated in FIG. **6**) that might be distributed in a combination of locations (e.g. multiple databases, web, cloud, etc.). Information elements **200** may include computer files, pictures, multimedia content, applications (i.e. computer programs), menu elements, sets of icons and/or other user-selectable elements, all of which shall henceforth be indiscriminately referred to as documents **200** to lighten the text without limiting the scope of the present invention.

[0115] An axis-based graphical interface **238** is adapted to graphically structure documents **200** in arrays **288** that arrange the documents **200** in rows and/or columns in a reasonably regular fashion and to allow navigation thereof by the user further to a query **230**. The axis-based layout and ordering provide the user with information about the content of each document **200**, its meaning and its relationships to the other documents **200** disposed on the axis **292**. Navigation tools are provided with the axis-based user interface **238** to allow navigation through the documents **200** of a single axis **292** and of various axes **292** when a plurality of axes **292** is enabled. The display of documents **200** on an array **288**, or axis **292**, therefore allows contextual management of documents **200** as a flow, or an ongoing rational sequence of documents **200**. An axis-based interface **238** thus helps to intuitively display a group of documents **200** and facilitate understanding and managing large sequences of documents **200** bearing a relation.

[0116] In a simplified exemplary form, an array **288** may be embodied as an axis of documents **292** (herein below referred to as axis **292** to lighten the text), which groups documents **200** in a single row or column, as illustrated in FIG. **6**. An axis **292** can be embodied as a substantially rectilinear arrangement of documents **200** adapted to dispose each document **200** on a straight or curved line. The axis **292** can be embodied as completely straight (rectilinear), slightly curved, substantially curved, circular, angled, following a particular shape or have a consistent shape over which documents **200** are disposed in a reasonably consistent fashion. The exact shape of the axis **292** as well as its disposition can vary—horizontal, vertical or other—in relation to the device's display **150**. What matters, inter alia, is that the layout structure of an axis **292** provides a sequence of documents **200** from which a viewer can infer meaning, logical connections, contextual location, and/or relationships.

[0117] The axis **292** can be represented as a single axis **292**, a double axis **292**, or more axes **292**. Axes **292** may be independent from one another (using distinct scales, or orderings, henceforth referred to as collation functions **300**) or may form a group of axes **310** by sharing the same scale or collation function **300**. Also, a document **200**, attribute **296** or other property of an element contained in an axis **292** can be selected and used as a logical connector to create an additional axis **292** from an existing axis **292**. This subsidiary axis **294** is meant to be temporary in some embodiments, serving as a way to view a specific set of additional documents **200** or highlight certain documents **200** from the original axis **292** without having to alter the entire workspace **306**. It may originate from the logical connector document **200** or information element **200** and be disposed in non-parallel fashion thereto. The subsidiary axis's **294** position is preferably orthogonal to the original axis **292**. However, the angle may vary. Like axes **292**, logically connected axes **294** may be scrollable. More such logically connected axes **2924** can subsequently be created in the same fashion. Navigation among axes **292** and subsidiary axes **294** could be called "relational navigation".

[0118] Axes **292** may be disposed horizontally and/or vertically. Groups of axes **310** may be presented using one of the layouts or combining both. The axes **292** presented in the embodiments below are generally illustrated in the horizontal layout configuration. However, they could, all or in majority, be disposed vertically without departing from the scope of the present disclosure. Other possible graphical layouts of documents **200** might become obvious to a skilled reader in light of the present application and would be considered within the scope of this application.

[0119] When only a portion of the axis **292** is visible, a play of zoom, pan and scrolling movements along the axis **292** allows a user to navigate the axis **292** and change the series of documents **200** that are displayed in the display area **314** of the display **150**. Scrolling movements can be performed in a variety of ways including but not limited to click-and-drag, pressing on the keys of a keyboard, gesturing to a motion-sensor or on a touch-screen.

[0120] Documents **200** might overlap or decrease in size so as to fit or maximize the space available in the display area **314**. Selected documents **200** on an axis **292** can be magnified to increase the level of detail shown. Similarly, a small display area **314** could display only one document **200** out of the entire axis **292**. The remaining documents **200** would not be shown in the display area **314** but would yet remain at their respective "virtual" position on the axis **292**, ready to be displayed upon scrolling the axis **292**. In other words, if we consider a mobile platform like a mobile phone having a small display **150**, the small display **150** might only allow to efficiently exhibit one document **200** at a time. However, given that the displayed document **200** is part of an axis **292**, the other documents **200** on the axis **292** would remain displayable in accordance with their respective position on the axis **292** when the axis is scrolled, navigated, gestured.

[0121] The documents **200** are selected to be disposed on the axis **292** on the basis of one or more attributes **296**, and are ordered thereon according to a collation function **300**, namely an ordered arrangement made by comparison, (e.g. a chronological order adapted to use a time scale **318**. The attribute(s) and collation function parameters are specified in a query **230** that may be run by a user or by an automated function of the system. Indeed, each axis **292** groups documents **200** in accordance with, for example, a selected tag, category, keyword, document creator, or other attribute **296**

that expresses a characterization of one or more document(s) **200** and that are configurable to represent intrinsic or extrinsic characteristics. The term "attribute" **296** will generally be used throughout the instant specification to lighten the reading of the text and will encompass other document properties or means for establishing commonality or relationships as described above unless otherwise specified.

[0122] Attributes **296** may be user-specified or system-specified. Generally, documents **200** bear a plurality of attributes **296** assigned by one or more user(s) (e.g. keyword, subject, project, creator, category, etc.), and a plurality of attributes **296** that are assigned by the system, such as, illustratively, file type, time of creation, number of views, time of last modification, file size, etc. Given the broad range of applicability of the present invention, the attributes **296** that may be assigned by the system and user, as well as the attributes **296** that can be desirable to use in the management of axes **292** might substantially vary from one field or user to another and however remain within the scope of present specification.

[0123] The selection of one or more attributes **296** (using Boolean logic for instance) in a query **230** determines which documents **200** will be displayed on the axis **292**. If no specific attribute **296** is selected, the axis **292** will display all documents **200** in a default order, like the date of creation thereof. Thus, all documents **200** on the same axis **292** are normally associated with the selected set or combination of attributes **296** that are used as parameters for the axis **292**. Third-party data, like publicity or user-targeted information, could also be added to an axis **292**, either arbitrarily or according to user information, filtering and/or existing collation of axes **292** without departing from the scope of the present invention.

[0124] The documents **200** illustrated in FIG. **6** feature attributes **296** individually represented by a capital letter thereon, or none, in which case the documents **200** are left blank. Letter attributes **296** are used in the present application for illustrative purposes only while letter attributes are theoretically possible. More descriptive attributes **296** such as those described above are used in embodiments of the present invention. As is shown in FIG. **6**, any document **200** can simultaneously feature multiple attributes **296**, some user-specified and others system-specified. In fact, a preferred embodiment of the invention assigns a plurality of attributes **296** to every document **200**. Other documents **200** illustrated on FIG. **6** are blank, or without any associated attribute **296**, illustrating documents that could theoretically not be assigned any attribute **296**, but that could nonetheless be created and found in a query **230** (e.g. a query **230** that would select all documents **200** contained in the database **32**).

[0125] The query **230** in FIG. **6** here illustratively filters and selects documents **200** from the database **32** based on attribute **296** 'A' for display on the axis **292**. FIG. **6** further illustrates that the documents **200** selected from the database **32** by the query **230** are placed on the axis **292** in chronological order **318**, another parameter that could be specified in the query **230**. Indeed, an axis **292** also generally disposes the documents **200** resulting from the query **230** in accordance with a specified order or collation function **300**, (e.g. chronological order, alphabetical order, statistical order, increasing file size, etc.). A collation function **300** might include dividing the axis **292** into successive collation units **304** (e.g. time units **322** in the case of a chronological order, which can illustratively be hours, days, months, years, etc.). A collation function **300** would thus dispose each document **200** along the axis **292** according to the value of a specified attribute **296** in relation to the collation units **304** of the axis **292** and the other documents **200** of the selected document set **228**. Among collation functions **300**, a chronological distribution of documents **200** on a time scale **318** is used in most embodiments of our work because of its intuitiveness (because any action or event takes place at a specific time and usually in sequence with other events or actions). While an axis **292** disposing documents in random fashion is also contemplated within the scope of the present specification, axes **292** disposing documents **200** according to a collation function **300** are illustrated embodiments because of the usefulness of ordering documents **200**.

[0126] An axis **292** or a group of axes **310** may be embodied in a linear configuration **326** or a non-linear configuration **330**. Both configurations are illustrated in FIG. **7** in a generic example. As can be appreciated from FIG. **7**, a linear configuration **326** displays collation units **304** of the same graphical longitudinal size regardless of the number of documents **200** contained in each collation unit **304**. The size of the documents **200** located within a given collation unit **304** can optionally be adjusted in accordance with the number of documents **200** located therein. For instance, documents **200** will be larger if there are few documents **200** in the collation unit **304** and smaller if many documents **200** are found therein. Alternatively, the documents **200** can remain the same size and can overlap, or be stacked, when their quantity exceeds the available space. Another possible way of making large numbers of documents **200** fit into a fixed-size collation unit **304** is to equip the collation unit **304** with a scroll bar allowing the user to navigate the collation unit **304** to reveal hidden documents **200**. This also means that documents **200** in a linear configuration **326** may be displayed as an uneven sequence from a graphical point of view. Ultimately, a collation unit **304** in a linear configuration containing no document will appear as empty, or as a blank space on the display **150**, but will still be the same size as the other collation units **304** of the axis **292**.

[0127] Conversely, the non-linear configuration **330** displays collation units **304** of uneven longitudinal sizes because an even distribution of documents **200** along the axis **292** prevails over the linearity of the collation. In other words, document **200** size and a constant flow of documents **200** along the axis **292** are given primacy over having collation units **304** of equal graphical size. This provides a more efficient use of the space on the axes **292**, but may provide less meaning to illustrate an evolution along time.

[0128] Conversely, the non-linear configuration **330** displays collation units **304** of uneven longitudinal sizes because an even distribution of documents **200** along the axis **292** prevails over the linearity of the collation. In other words, document **200** size and a constant flow of documents **200** along the axis **292** are given primacy over having collation units **304** of equal graphical size. This provides a more efficient use of the space on the axes **292** but may provide less meaning to illustrate an evolution along time.

[0129] FIG. **7** presents a graphical user interface **234**. More specifically, it illustrates an axis-based user interface **238** with a linear axis configuration **326**. The linear axis configuration **326** shows an axis-like array **288**. This is an

exemplary illustration of how documents **200** can be presented on a linear axis **292** within and outside of the display area **314**.

[0130] Documents are not the only items one could find on an axis-like array **288**. Videos, menu options, emails and numerous other types of information elements can also be displayed on an axis-like array **288**. However, for the purpose of explaining and describing this invention, the Figures presented herein will only reserve to axes **292** with documents **200** only.

[0131] In the axis-like array **288**, documents **200** are laid out in a linear fashion, based on the framework set out by the collation units **304**. By "linear," we refer to the idea that documents **200** are arranged and extended along a straight horizontal line.

[0132] A collation unit **304** collects and combines certain elements on an axis **292**. In the case of FIG. **7**, the collation units **304** gather and combine documents **200** in a certain predetermined order.

[0133] The collation unit **304** is chronological in nature. That is, documents **200** are organized on the axis-like array **288** according to time units **322** (t**27**, t**28**, t**29**, t**30** and t**31**) that are equally spaced. The time scale **318** specifies the division of time. For example, it can be by hour, day, month, or year.

[0134] The collation function **300** makes it possible for time units **322** to align accordingly on the axis **292** based on a certain time scale **318**. Moreover, these time units **322** are moving progressively to the right. The time unit markers **334** identify the beginning and end of a time unit **322**.

[0135] The collation units **304** do not have to be chronological per se. For example, they can be alphabetical as well or based on a certain feature or identity set out by the user.

[0136] Some collation units **304** contain more documents **200** than other ones. This is because on a linear axis **292**, the collation units **304** are equally spaced from each other and, therefore, of the same length. As a result, it will often be the case that some collation units **304** will be empty and some—full or partially full of documents. FIG. **7** illustrates this very phenomenon. The time unit t**28**, for example, contains only one document **200**. Time unit t**29** is full, while time unit t**30**—empty of documents **200**. It is thus safe to assume that not all axes displaying documents or any other elements, such the axis of documents **292** depicted in FIG. **7**, are comprised of collation units **304** that are equally spaced.

[0137] Axes **292** that have non-equally spaced collation units **304** are called non-linear axes **292**. Notably, the variation in length of the collation units is the one major distinctive feature that sets non-linear axes **292** apart from the linear ones **292**.

[0138] FIG. **8** illustrates a non-linear axis of documents, with non-equally spaced collation units **304**. Just like in FIG. **7**, they follow a chronological order, set up by the collation function **300**. A certain time scale **318** defines them. Time unit t**27** contains 7 documents **200** while time unit t**28**—only 5.

[0139] Non-equally spaced collations units **304**, presented in FIG. **8**, are adapted to present documents **200** to be shown on the axis **292** in a regular, consecutive and chronological manner. There is no space between them, only separators when a time unit **322** change occurs. In this Figure, these separators are marked as time unit markers **334**.

[0140] FIG. **8** shows a document **200** with a visually distinctive feature **284**. This feature, for example, can be graphically displayed as a change in the color or the color intensity of the edges of a document, enlargement of the lines defining its frame, etc. Moreover, it seeks to visually filter and identify the documents belonging to an axis of documents **292**, sub-selected by the user as a result of a more advanced search carried out within the axis. For example, all the documents on the axis of documents **292** share one attribute in common. That attribute is depicted in the figure as attribute B, and is marked to the left of the axis of documents **292**. The user may carry out a search within the documents **200** of the axis **292** to seek for the document(s) that has/have another sub-attribute assigned to it/them. Document with a visually distinctive feature **284** would represent the result of the search. It would be consequently visually highlighted in some sort of way on the axis of documents **292** in order for the viewer to easily differentiate it from the rest of the documents **200**.

[0141] FIG. **9** presents a graphical user interface **234**. More specifically, it illustrates an axis-based user interface **238** with a linear axis configuration **326** as it can be visible on three distinct display areas **314**. The simultaneous presentation of three different display areas **314** on the same axis **292** is provided for illustrative purposes only despite the fact that only one display area **314** would suffice and normally be utilized to show a portion of the axis **292**. The purpose of displaying three instead of one display area seeks to schematically demonstrate the variety of layouts and placements of documents **200** on an axis **292** and the different ways in which they can be viewed via display areas **314**. By this, one can see that some display areas may have no documents **200** displayed, some—a few and some might present a portion of an axis **292** filled completely by documents **200**.

[0142] The linear axis configuration **326** presented in FIG. **9** is also illustrated in FIG. **7**. The difference lies in the fact that FIG. **9** shows how the documents **200** exhibited on the linear axis **292** can be viewed on display areas **314**. A computer or telephone screen can serve as a display area **314**. These, however, are mere examples. Possibilities of devices and apparatuses upon which axes of documents or any kind of elements can be displayed are numerous.

[0143] When examining FIG. **9** from left to right, one notices that the display area **314** closest to the left side of the FIG. **9** visually fully displays two documents **200** belonging to the time unit **27** and one document belonging to the time unit t**28**. The display area **314** shown in the center of FIG. **9** shows two documents belonging to the time unit t**29**, while the display area **314** to the right side of FIG. **9** fails to bring to light any documents, as the time unit t**30**, which is shown on this display area **314**, contains no documents **200**. To summarize, FIG. **9** schematically points out that the portion of a linear axis **292** (or the whole axis **292**), when visible on a display area **314**, may display some or no documents; moreover, it may potentially present on the display area **314** empty space as well.

[0144] FIG. **10** illustrates a non-linear axis of documents **292**, with non-equally spaced collation units **304**, as it can be visible on three distinct display areas **314**. If examined carefully, one notices that the non-linear axis **292** presented in FIG. **10** is also illustrated in FIG. **8**. The difference lies in

the fact that FIG. **10** schematically illustrates how the documents **200** exhibited on the axis **292** can be viewed on the display areas **314**.

[0145] Non-linear axes **292**, in general, when visible on a display area **314**, show documents **200** or any other elements, while failing to reveal any empty, and therefore, non-occupied by or any other document and/or element, space. The following examples from FIG. **10** further illustrate this:

[0146] The display area **314** to the utmost left side of FIG. **10** presents the document with a visually distinctive feature **284**. This display area **314** shows fully three documents **200** belonging to the time unit t**27**. Moreover, it partially reveals two other documents **200** belonging to the same time unit t**27**.

[0147] The display area **314** in the center of FIG. **10** shows fully two documents **200**, one belonging to the time unit t**27** and another—to the time unit t**28**. Furthermore, this display area **314** shows partially two other documents **200**, one belonging to the time unit t**27** and the other—to time unit t**28**.

[0148] Similarly, the display area **314** to the right side of FIG. **10** shows three documents **200** belonging to time unit t**29**. Another partially displayed documents **200** belongs to the time unit t**28**. FIG. **10** seeks to illustrate that a non-linear axis **292** with documents **200**, when visible on a display area **314**, shows documents without revealing any empty space.

[0149] FIG. **11** illustrates the insertion of a document **342** on a non-linear axis of documents **200**. The insertion takes place outside of the display area **314**. The display area **314** shows ten documents **200**. The eleventh one, located at the utmost right side of the display area **314**, is only partially shown.

[0150] The documents **200** within the display area **314** belong to three different time units, one of which is shown fully on the display area **314**. The beginning and end of this time unit are marked by two time unit markers **334**. Document **201.1** is the last fully-displayed document **200** shown on the left side of the display area **314**.

[0151] Within the time unit fully shown on the display area **314**, there are two documents with a visually distinctive feature **284**, described in greater length in the discussion about FIG. **10**. The actual visual feature assigned to these documents is different on each of them. This is so that the viewer can discriminate between the two with little or no difficulty. FIG. **11**, also, shows two more documents with a visually distinctive feature **284**. Both are located to the outmost left side of FIG. **11**. One of which is the first document **200** displayed on the axis **292**, as it is located next to the beginning of the axis **336**.

[0152] Not all the documents **200** present on the axis **292** shown in FIG. **11** are displayed in the display area **314**. Some of them are outside of the viewing space. One document **200** with a visually displayed feature **284** is shown outside of the display area, on the left side of FIG. **11**. Two documents **200**, along with a portion of a document **200**, are displayed outside the display area **314**, on the right side of FIG. **11**. FIG. **11** shows only the beginning of the axis **292**, implying that there are documents **200** on the axis **292** beyond the ones displayed in the Figure.

[0153] FIG. **11** also illustrates how an inserted document **342** is added to the axis **292**. The insertion arrow **362** points out the exact location where this document is inserted—outside the display area **314**, and on the beginning of the axis **292**. This insertion location may have been chosen by the collation function **300**.

[0154] There are two ways documents **342** can be inserted on a document: when it is already existent and is given an attribute based on which the axis **292** is defined, by the user; and when is created or imported by a user. Both these actions result in the same effect, namely, in the addition of a document **200** on an axis **292**. In a network collaborative work context, multiple users can simultaneously insert or change attributes of elements **200** distributed on one or more axes **292**.

[0155] FIG. **12** illustrates the insertion of a document **342** on a non-linear axis **292**, outside the display area **314** and a way in which this insertion affects the way documents **200** within the display area **314** are graphically laid out. This is likely to be one of default implantation in an axis-based interface **238** since the beginning of the axis **292** was not moved.

[0156] FIG. **12** depicts the same non-linear axis **292** as the one illustrated in FIG. **11**. FIG. **12**, moreover, shows how the insertion of the document **342** on the axis **292** shifts the location of all the documents **200** of the axis **292** to the right. The arrow **366** indicates the direction towards which the documents **200** are moved as a result of this insertion.

[0157] Due to the insertion of document **342**, all the documents **200** within and outside of the display area **314** shifted to the right in order to make room for the newly added document **342**. Moreover, the document **200.1** is now partially located outside the display area **314** in FIG. **12**.

[0158] FIGS. **13** and **14** illustrate two other possible embodiments of the way a document **342** can be inserted on a non-linear axis **292**, outside the display area **314**. In FIG. **13**, a document **342**, as shown by the insertion arrow **362**, is being inserted on the utmost left side of the axis **292**, outside of the display area **314**. The insertion causes the beginning of the axis **336** to move further to the left to make room for the newly added document **342**, without affecting the display of documents **200** within the display area **314**.

[0159] In FIG. **14**, the same document **342** is inserted on the right side of the axis **292**, outside of the display area **314**. This insertion causes the document **200.2** to move to the right, as arrow **370** indicates it, outside of the display area **314**. FIGS. **13** and **14** demonstrate how the insertion of a document **342** on a non-linear axis **292**, outside the display area **314**, does not necessarily affect the visual display of documents **200** within the display area **314**.

[0160] FIGS. **15** and **16** illustrate two other possible embodiments of the way a document **346** can be removed from a non-linear axis **292**, outside the display area **314**.

[0161] FIG. **15** illustrates a possible way in which documents **346** may be removed from the axis **292**, outside of the display area **314**. The removal arrows **374** point to the possible directions towards which these documents **200** may go as a result of their removal. One must be reminded that the removal of a document **200** from an axis **292**, in general, may be caused by the removal of the attribute that once linked it to an axis **292** and/or by the actual deletion of the document **200** by a user. As the FIG. **15** seeks to illustrate, the removal of documents **200** from an axis **292**, from within space outside of the display area **314**, will not affect the distribution and layout of these documents **200** on the display area **314**.

[0162] FIG. **16** illustrates another aspect of the present invention offering another option of the way in which documents **346**, when removed from the display area **314**, may not affect the display and layout of the documents within the display area **314**. Similarly to FIG. **15**, FIG. **16** illustrates how a document **346** may be removed from the axis **292**, from the outside the display area **314**, without disturbing the layout of the documents **200** within the display area **314**.

[0163] Moreover, FIG. **16** illustrates a possible solution to the problem that might arise as a result of the removal of documents **346** from the display area **314**. The cross signs **378** mark the two documents **346** that have been removed from the display area **314**. In order to avoid the possible movement of the rest of the documents **200** within the display area **314** as a result of their removal, the space that these two documents **346** once occupied on the display area **314** remains static and unchanged. The two documents **346** that were removed remain listed on the axis **292**, within the display area **314**, and are being marked by the cross sign **378**.

[0164] The cross sign **378** presented in FIG. **16** is for illustrative purposes only, and may be substituted by other means seeking to identify the documents **346** that were removed from the display area **314**, from those that were not. FIG. **16**, therefore, represents one aspect of the embodiment in which the removal of documents **346** from the display area **314** of an axis **292** may not affect the viewer of the display area **314**.

[0165] FIGS. **17** and **18** illustrate another possible way in which the insertion of a document **342** on an axis **292** may affect the viewer of the display area **314** and how this undesirable effect may be alleviated. In this case, the undesirable consequence relates more to the viewer's potential loss of track of a certain document **200** on the display area **314**. The loss might cause frustration and confusion to the viewer. To understand it, one must examine FIGS. **17** and **18** together in order to trace the succession of events illustrated herein.

[0166] FIG. **17** illustrates an axis **292** with documents **200**, placed within the display area **314**. A document **342** is being inserted on the axis **292**, inside the display area **314**, between a document **200.3** and the document with a visually distinctive feature **284**. The insertion arrow **362** pinpoints the exact location where the document **342** is being introduced.

[0167] The display area **314**, also, exhibits four other noteworthy documents **200**, three of which are documents with a visually distinctive feature **284**. The other one, document **200.2**, is located to the left of the document **200.3**.

[0168] A pointing device **348**, embodied in FIG. **17** as a cursor **350**, points towards the document **200.2**. The cursor **350** may indicate the viewer's intention to deal with the document **200.2** and, therefore, serves as a reference (aka reference point) indicator based upon which the addition and/or removal of documents **200** may take place within and outside of the display area **314**.

[0169] The reference based upon which the addition and/or removal of documents **342**, **346** may take place within and outside of the display area **314** may be embodied, for example, as the position of the cursor **350**, as shown in FIG. **17**. It may also be embodied as a line defined in relation to the viewer's activity(ies) in relation to the elements of the axis(es) displayed within the display area **314**, or as a collation position. Moreover, the reference based upon which the addition and/or removal of documents **200** may take place within and outside of the display area **314** may be also identified, for example, via a multi-point sensing device.

[0170] The reference may be static or dynamic. The static reference is not subject to dislocation as a result of the viewer's activity on the display area **314**. The static reference may be embodied as a line, displaying vertically the center of the display area **314**. For example, it is presented in FIG. **18** as the center of the display area **358**. The line indicating the center of the display area **358** (FIG. **18**) is not shown to the user. It may also be embodied as a vertical line located on the display area **314**, as shown in FIG. **19** as the vertical line **354**. This line as well is not revealed to the user.

[0171] The dynamic reference aligns itself to the movement of the pointing device **348**, which may be embodied, for example, as a cursor **350** or the position and alignment of the viewer's eyes in relation to the display area **314**.

[0172] The possibilities of the actions one might want to undertake in respect to the document **200.2** are numerous. It may be the case, for example, that the viewer might want to open it, observe its content, read it, and/or send it to someone else as an attachment in an email. However, due to the possible sudden dislocation of the document **200.2**, the viewer might unintentionally target another document **200.3** instead of the one the viewer initially intended to target. In this case, the viewer might click, for example, or touch with one's finger(s) a document **200** other than the one initially intended to be targeted. This might cause frustration to the viewer, especially when accuracy in one's work and deadlines to accomplish a certain task may be of great importance to the user. Undesirable consequences to the viewer as a result of the insertion of the document **342** are most likely to occur especially when the insertion is subject to no order or, in other words, randomly carried out.

[0173] FIG. **18** presents a possible way in which the insertion of documents **342** may be carried so that it would alleviate the effect the random insertion of document **342** might have on the viewer of the display area **314**. In this Figure, the insertion of document **342** is carried out in relation to the center line of the display area **358**. The center line of the display area **358** is the reference based upon which the insertion of the document **342** is handled.

[0174] More specifically, FIG. **18** illustrates how the insertion of the document **342** may be carried out in on half of the display area **314**, namely, on the side where the cursor **350** was initially pointing at document **202.2**. This side is determined in reference to the center of the display area **358**.

[0175] As a result of the insertion of the document **342**, the cursor **350** is now pointing towards the document **200.3**. This is because the document **342**, when inserted on the axis **292**, pushed to the left, as indicated by the arrow **366**, the documents **200** located on the left side of the space occupied by the document **342**. The movement to the left occurred as a result of the insertion of the document **342** on the axis **292**.

[0176] FIG. **19** illustrates the preferred embodiment of the present invention in which the movement of documents **200** on the axis **292**, when a document **342** is being inserted on the axis **292**, is carried out in reference to the location of the viewer's pointing device **348**, embodied in this Figure as a cursor **350**.

[0177] The vertical line **354** indicates the location of the display area **314** aimed by the viewer, based on the position of the cursor **350**. The insertion of the document **342** on the

axis **292** is carried out so that the documents **200** move in the opposite direction from the vertical line **354**; in other words, in the opposite direction from where the aimed document **382** is located. The arrow **366** indicates that the documents **200** move towards the right side of the display area **314** as the aimed document **382** is located on the left side of the display area **314**.

[0178] In FIG. **19**, the vertical line **354** is vertical because it is perpendicular to the axis **292**. If the axis **292** were to be vertical, the line **354** would be embodied as a horizontal axis defined by the position of the cursor **350**.

[0179] Similar to FIG. **19**, FIG. **20** illustrates another embodiment of the present invention in which the movement of documents **200** on the axis **292**, as a result of the insertion of the document **342**, is based on the location of the aimed document **382**. The document **382** is the document targeted or aimed by the viewer. The insertion of the document **342** is carried on the basis of the region of the display area **314** towards which the viewer is looking. In this Figure, this region is marked by eye view indicator **386**.

[0180] The actual position and aim of the viewer's eyes in relation to the display area **314** can be detected, for example, via a web camera connected to the display area **314**. The web camera could be used in order to track the viewer's eye movements and/or hand gestures. Even if the pointing device **348** in FIG. **20**, embodied as the cursor **350**, is located on the right side of the display area **314**, the movement of documents **200** on the axis **292** is carried out, as the arrow **366** indicates it, towards the left side of the display area **314**, away from the aimed document **386**. This is so that the viewer may not be affected by the insertion of the document **342**, as the viewer's attention is focused on the utmost left side of the display area **314**.

[0181] FIGS. **21**, **22** and **23** illustrate another aspect of the invention in which the insertion of a document **342** on an axis **292** may affect the viewer of the display area **314** and how this problem may be alleviated. In this case, the undesirable consequence relates more to the viewer's potential loss of track of a certain document. To understand it, one must examine FIGS. **21**, **22** and **23** together in order to trace the succession of events presented herein.

[0182] FIG. **21** illustrates the viewer's intent to aim and target the document **200.4** presented on the display area **314** by using a pointing device **348** embodied in as a cursor **350**. The successive cursors **350** shown in FIG. **21** represent a cursor being moved by the user. Simultaneously to the viewer's attempt to target the document **200.4**, a document **342** is being added to the axis **292**, in near proximity to the aimed document **200.4**.

[0183] FIG. **22** illustrates a possible outcome of the insertion of the document **342** on the axis **292** on the aimed document **200.4**. In the case of FIG. **22**, this outcome is illustrated as an immediate movement of the aimed document **200.4** from within the display area **314** towards left, as indicated by the arrow **366**, and into the area of the axis **292** that is not displayed to the viewer. In this case, using a logical approach similar to the one shown in FIG. **19**, the left movement of documents **200** is chosen because it is in the opposed direction from the location where the cursor **350** was initially located. Therefore, it is in the opposite direction from the center of the display area **358**. With the movement of the aimed document **200.4** leftwards, the viewer would have now had to attempt to reach the document **200.4** by scrolling for example, activity that might prove to be dissatisfactory and causing some degree of inconvenience to the viewer.

[0184] FIG. **23** illustrates the preferred embodiment of the present invention, presenting another solution to the problem the viewer might face as a result of the insertion of documents **342** within the display area **314**. In this case, the solution provided consists of identifying the side of the display area **314** upon which the viewer focuses most of the attention based on the direction and movement of the cursor **350**. The solution provided in FIG. **23**, also, offers to insert documents **200** within the idle side of the display area **314**, towards which the viewer does not aim via its pointing device **348** and/or glance. In FIG. **23**, the insertion of the document **342** is carried in the idle region **394** of the display area **314**. This is the region in which the document **200.4** towards which the viewer aims is not located.

[0185] The display area **314** is equally divided into two sub-regions: the idle region **394** and the active region **398**. The active region **398** is the space of the display area **314** towards which the viewer is aiming in order to reach a certain aimed document **200.4**. It is therefore the region of the display area **314** in which most of the movement of the pointing device **348** and/or of the aim of the viewer's eyes is/are taking place. Similarly, the idle region **394** is the space of the display area **314** towards which the viewer does not aim via its pointing device **348** and/or glance.

[0186] Once these two regions are identified and marked through the usage of the vertical axis **354** (not shown to the user), the insertion of documents **342** takes place within the idle region **394** and outside the display area **314**, where the addition of an extra document **342** would not cause the displacement of any documents **200** within the active region **398**.

[0187] The non-insertion arrow **402** indicates that the insertion of document **342** within the active region **398** does not occur. That is because the viewer, by moving the pointing device **348** embodied in this Figure by the cursor **350**, would cause the system to pause and assess the direction of the movement of the cursor **350**. Once it would stop at a specific aimed document **200.4**, the system would identify the region of the display area **314** upon which the trajectory of the movement of the cursor **250** was traced. This region is the active region **398** of the display area **314**. FIG. **23**, therefore, embodies another solution to the unintended and/or undesirable consequences of the insertion of a document **342** on an axis **292** within the display area **314**.

[0188] FIG. **24** yet embodies another solution to the unintended and/or undesirable consequences of the insertion and/or removal of a document **342**, **346** within the display area **314**. The solution consists in notifying the viewer of the display area **314** of any changes that might occur to the documents **200** on the axis **292** without adding or removing any of them until a later time, following the instructions set up by the viewer.

[0189] FIG. **24** presents the same axis **292** illustrated in the previous FIG. **23**, upon which the same display area **314** is superimposed to bring to the viewer's attention to a series of documents **200** which were described above at a greater length. Above the axis **292**, one notices the display area notifications feature **406**. These notifications concern the changes taken place while the axis **292** is displayed on the display area **314**. These changes, however, do not lead to the

visual displacement of documents **200** within and outside of the display area **314** until a later time, chosen by the viewer.

[0190] The actual presentation of the display area notifications feature **406** may vary. The wording and content of the notifications may differ as well. One example would be that it could provide the following information to the viewer: three documents **200** have been added to the axis; one of the documents **342** is to be inserted within the display area **314**; one document **200** from the display area **314** has been removed. These notifications may, also, indicate the identity of the user(s) who added and/or removed documents **342**, **346**. Moreover, these notifications may offer the time when these documents **342**, **346** may be added and/or removed from the axis **292** in light of the preferences and selection of the viewer. Documents **342** outside of the display area **314** may be added or removed at in real and/or at a later time, in dependence of the viewer's preferences and choices.

[0191] The user may also have the choice to decide when the addition and/or removal of the document **342**, **346** may occur. The display area notification feature **406** may offer the addition and/or removal of the documents **342**, **346** to be carried out automatically on a specific and/or periodical time. It may also offer to add and/or remove the documents **342**, **346** when the user removes and reopens the axis **292**.

[0192] Similar to FIG. **24**, FIG. **25** embodies another solution to the unintended and/or undesirable consequences of the insertion of a document **342** within the display area **314**, on the viewer of the display area **314**. The solution consists in offering the viewer the option to pause for a certain time the removal and/or addition of any documents **342**, **346** on an axis **292** of documents **200** and allow the viewer to activate the actual update of the axis **292** at a time determined by the viewer, when any modifications to the axis **292**, within and outside of the display area **314**, are deemed to have less or no impact on the viewer.

[0193] FIG. **25** seeks to illustrate, through the non-insertion arrows **402**, that none of the insertions of the documents **342** are allowed to take place within and outside of the axis **292**. This is because these modifications are not permitted to take place until the viewer activates the pause/activate feature **410**. This feature inhibits any modifications of the documents **200** on the axis **292** to take place until the viewer allows them to happen.

[0194] In FIG. **25**, this permission is expressed by the viewer's activation of the pause/activate feature **410**. The activation may be visually presented by a change of color, for example, from the paused state. The viewer may, later, pause any further addition and/or removal of documents **342**, **346** on the axis **292** by pausing the pause/activate feature **410**. The pausing may be visually presented, for example, by a change of color from the one depicting activated state of the pause/activate feature **410**.

[0195] FIGS. **26**, **27** and **28** illustrate three respective possible embodiments of a linear axis **292** as it may be partially viewed via a display area **314**. These Figures illustrate possible distributions of documents **200** on a linear axis **292**, on which some collation units **304**, in this case, time units **322**, may be partially, semi and/or completely filled with documents **200**. Moreover, they illustrate how the addition and/or removal of documents **342**, **346** from within these time units **322** may take place in light of the fact that some of these time units **322** are only partially or fully empty of documents **200**.

[0196] FIG. **26** illustrates how an axis **292** may be partially viewed on a display area **314**. The portion of the axis **292** displayed via the display area **314** is, however, filled to the maximum with documents **200**. The insertion and/or removal of documents **342**, **346**, however, may take place nonetheless. In this Figure, the insertion arrows **362** identify potential spaces on the axis **292**, outside of the display area **314**, where documents **342** may be added. Moreover, FIG. **26** illustrates that document **346** may be also removed. In this case, the document **346** is being removed from time unit t**31**. The removal arrow **374** indicates the removal of the document **346**. With this scenario, the viewer of the display area **314** will not be subject to undesirable modifications of the layout of the documents **200** displayed within the display area **314**. The removal and insertion of documents **200** take place without modifying the display of documents **200** within the display area **314**.

[0197] FIG. **27** illustrates how an axis **292** may be partially viewed on a display area **314**. Roughly half of the area of the axis **292** displayed via the display area **314** is filled with documents **200**. The insertion arrow **362** indicates that documents **200** may be added in the empty space visible via the display area **314**. With this scenario, as well, the viewer of the display area **314** will not be subject to undesirable modifications of the layout of the documents **200** displayed within the display area **314**. Even if two more documents **200** were to be inserted inside the display area **314**, within the time unit t**28**, as FIG. **28** illustrates it, this would not cause the documents **200** within the time unit t**29** to dislocate.

[0198] FIGS. **29** and **30** illustrate another embodiment of the present invention in which the insertion of the document **342** within the display area **314** leads to the movement of another document **200.5** from within the display area **314** outwards into the non-displayed area. This phenomenon occurs in the case where the collation unit **314** partially revealed within the display area has some empty space which makes possible the insertion of other documents **200**.

[0199] In FIG. **28**, document **342** is being inserted between two documents **200** revealed within the display area **314**. These two documents are document **200** and **200.5**. Moreover, document **342** is being inserted in the time unit t**28** and before the document **200.5**. In the case illustrated in FIG. **28**, the location where the document **342** is inserted is identified based on the fact that the time and/or date the document **342** was produced was prior to the time and/or date when the document **200.5** was created. Given that the time units t**27**, t**28**, t**29**, t**30** and t**31** present documents **200** in a chronological order, progressively and consistently moving from left to right, the documents **342** inserted within the axis **292**, within and outside the display area **314**, would follow this chronological order as well. FIG. **29** illustrates the displacement of the document **200.5** towards the right side of the axis **292**, from within towards the outside of the display area **314**.

[0200] FIGS. **31** and **32** illustrate another embodiment of the present invention in which the insertion of the document **342** on the linear axis **292**, within the time unit t**27**, leads to the rest of the documents **200** within the time unit t**27** to be compressed in order to make room for the newly added document **342**.

[0201] Despite the insertion of an additional document **342** within the time unit t**27**, the time unit t**27** itself does not change in length. This is because the rest of the documents

200 within the time unit t**27** reduced in size to accommodate the addition of the document **342**.

[0202] In FIG. **31**, the document **342** is being inserted at the utmost left side of the time unit t**27**. The insertion, as the arrow **366** indicates it, leads to the displacement of the rest of the documents **200** to the left of the time unit t**27**. FIG. **32** illustrates how the documents **200** initially present within the time unit t**27** reduce in size so that despite the addition of a new document **342**, the respective time unit t**27** is subject to no modification in terms of its length and width.

[0203] FIGS. **33**, **34** and **35** illustrate yet another embodiment of the present invention. More specifically, they present the insertion of the document **342** within an axis **292** A, presented within the display area **314**, when the axis **292** is part of a group of axes **310**. The insertion of the document **342** leads to the enlargement of the time unit t**27** to fit the new document addition.

[0204] FIG. **33** depicts a group of axes **310** and a display area **314** which exhibits portions of the following three axes **292**: A, B and C. A, B and C refer to the respective attributes given to the documents **200** that belong to these three axes **292**. There are in total 8 axes **292** presented in this group of axes **310**. Some of them, namely axes **292** D, E, F, G and H, are not displayed at all on the display area **314**.

[0205] In our preferred embodiment, no two axes **292** can be displayed on the same vertical line. Stated differently, any two axes **292**, presented in a group of axes **310** will never be vertically placed in a tangential fashion. The end of an axis **338** may not lie next to the beginning or start of another axis **292**. Given that, it is often the case that there might be non-occupied (by any document **200**) space between two axes **292**. In the case of the FIG. **33**, this space is caused by the fact that there are no documents **200** with the attributes E and F that would be fitted for the time units t**27** and t**28** respectively.

[0206] Empty space, non-occupied by documents **200** within an axis **292** is different from the empty space between two axes **292**. Axes **292** B, C, D, G and F, for example, all have empty spaces where documents **200** may be potentially added in the future. Whereas there might a possibility for an addition of a or several other document(s) **342** to be added on axis **292** B, C and D for example, within the space presently non-occupied by documents **200**, there is no possibility for this to materialize in case of the empty space highlighted as grey shaded area next to the left and respective right the end of the axes **338** presented in the FIG. **33**.

[0207] FIG. **33**, furthermore, illustrates the insertion of the document **342** within the axis **292** A to the right of the document **200.1** present on the axis **292** A. Furthermore, FIG. **34** illustrates the outcome of this insertion, embodied in the movement outward of the display area **314** of the document **200.1**, to the left of the axis **292**.

[0208] The displacement of the document **200.1** from within towards outside of the display area **314** may cause undesirable consequences on the viewer of the display area **314**, especially when the document **200.1** is the document the viewer aims to reach. Moreover, the insertion of the document **342** on the axis **292** A causes the time unit t**27** to become larger than it was initially, so that it would accommodate the new document **342** insertion.

[0209] In FIG. **34**, as a result of the insertion of the document **342**, document **200.1** moved to the left of the axis **292** A, outside of the display area **314**. Furthermore, one less document **200** is displayed on the axis **292** C. Whereas there were three documents **200** initially displayed on the axis **292** C within the display area **314** (see FIG. **33**), due to the enlargement of the time unit t**27** one of the documents **200** from the axis **292** C has moved leftwards, from within towards outside of the display area **314**. This change of document display within the display area **314** may cause undesirable consequences on the viewer.

[0210] FIG. **35** illustrates a possible solution to prevent these potential undesirable consequences on the viewer by bringing an additional space **450** on the axis **292** C within the display area **314**. The additional **450** would therefore bring the initial display of documents **200** on the axis **292** C, as presented in FIG. **33**, despite the enlargement of the time unit t**27**. This additional space **450** may be temporarily placed in the respective place on the axis **292** C. It may also correct itself automatically when the user carries out additional actions intended to move the display area **314** elsewhere. In this manner, the viewer would be less likely to experience any undesirable consequences due to the insertion of the document **342** on the axis **292** A, within the display area **314**.

[0211] FIG. **36** is another embodiment of the present invention, in which the insertion of the document **342** within the display area **314** may not cause the enlargement of the time unit t**27** in which the document **342** is inserted.

[0212] In FIG. **36**, the insertion of the document **342** takes place on the axis **292** B, which portion that is displayed on the display area **314** reveals relatively more empty space (i.e. more room for documents **200** to be added into) than the axes **292** A and C do. In light of this circumstance, the insertion of the document **342** within the display area **314** leads not to the enlargement of the time unit t**27** to which the newly inserted document **342** belongs. As a result of the insertion, the respective document moves leftwards on the axis **292** B, and outside of the display area **314**.

[0213] As illustrated in FIG. **36**, the insertion of a document **342** could take advantage of the empty space on the axis **292** B to show itself in the display area **314** before heading towards document-sized empty space. This movement may be animated. This may happen after a certain amount of time or after the user takes action to move the display area **314** to display other regions of the same axes **292** or other ones.

[0214] FIG. **37** illustrates another embodiment of the present invention, in which a group of axes **310** is partially shown on the display area **314**. More specifically, it provides another possible solution for handling the addition of numerous documents **342** within the display area **314**.

[0215] A series of documents **342**, which have been added simultaneously or at a certain time distance from each other an axis **292**, are partially displayed on the display area **314**. They are located within the receiving space **434**.

[0216] The addition of the documents **342** may cause the sudden enlargement of the time unit t**27** to which they belong, and which is partially presented on the display area **314**. In the case of the FIG. **37**, the solution given in order to avoid the enlargement of the respective time unit t**27** is to incorporate the respective documents **342** within a receiving space **434** which has a scrolling device **418** confined on both of its sides by scrolling arrows **414**. In this manner, the viewer of the display area **314** may explore the added documents **342** within the scrolling device **418** a later time without changing the size of the time unit t**27** and of the layout of documents **342** within the display area **314**.

[0217] FIG. **38** illustrates another embodiment of the present invention in which a group of axes **310** are partially shown on the display area **314**. More specifically, FIG. **38** provides another possible solution for handling the addition of numerous documents **342** within the display area **314**.

[0218] A series of documents **342** are being added simultaneously or at a certain time distance from each other, on axis **292** D, which is partially displayed on the display area **314**. The addition of the documents **342** may cause the sudden enlargement of the time unit t**27** partially presented on the display area **314**. In the case of the FIG. **38**, the solution given in order to avoid the enlargement of the respective time unit t**27** is to incorporate the respective documents **342** within an elements management device **422**. In FIG. **38**, this elements management device **422** has scrolling properties **442**.

[0219] The elements management device **422**, as FIG. **38** illustrates it, may indicate the maximum number of documents **342** to be displayed on the display area **314** from all the documents **342** that were added to the axis **292** D. The display potential **438** indicates that the elements management device **422** may display up to 5 of such documents **342**. Moreover, the elements management device **422** may have an on and off button **426** which the viewer may use to indicate if the newly added documents **200** may be displayed or not on the axis **292** D, within the display area **314**. This embodiment, as well, illustrates another potential solution to the undesirable consequences that might arise as a result of the insertion of documents **342** within the display area **314**, on the viewer of the display area **314**.

[0220] FIG. **39** illustrates another embodiment of the present invention in which a group of axes **310** are partially shown on the display area **314**. More specifically, FIG. **39** provides another possible solution for handling the addition and/or removal of numerous documents **200** within the display area **314**

[0221] In FIG. **39**, a series of documents **342** are being added simultaneously at a certain time distance from each other, on axis **292** D. Axis **292** D is partially shown on the display area **314**. In order to avoid the sudden enlargement of the time unit t**27** partially presented on the display area **314** as a result of the abrupt and rapid addition of documents **342** on the axis **292** D, the documents **342** that were inserted and/removed on the axis **292** D are compressed into a group of documents **430**.

[0222] The group of documents **430** may indicate the number of documents **342** added to the axis **292** D. In the case of the FIG. **39**, this number is 9, as indicated by the counting element **446**. The group of documents **430** intends to avoid the enlargement of the time unit t**27** as a result of the addition of the extra documents **200** on the axis **292** D, change that may cause unwanted consequences on the viewer of the display area **314**.

[0223] The viewer of the display area **314** may explore the added documents **342** within the group of documents **430** a later time with or without changing the size of the time unit t**27** and of the layout of the documents **200** within the display area **314**.

[0224] FIG. **40** presents a flowchart illustrating in an exemplary manner the method upon which one or more aspects of the present invention are based, namely—the addition of an information element **342** on an axis **292** of information elements **200**. The method consists of the following steps: displaying the information elements **200** with a commonality on an axis **292** of information elements **200**; adding of at least one additional information element **342** to the respective axis **292**; identifying the insertion location; and moving the information elements **200** on the axis **292** in function of the insertion parameter to display the additional information element **342** on the axis **292**.

[0225] Similar to FIG. **40**, FIG. **41** presents another flowchart illustrating in an exemplary manner the method upon which one or more aspects of the present invention are based, namely—the addition of an information element **342** on a group of axes **310** of information elements **200**. The method consists of the following steps: displaying information elements **200** sharing a first commonality on an axis **292** of information elements **200**; displaying information elements **200** sharing a second commonality on a second axis **292** of information elements **200**; grouping the first and the second axis **292** of information elements **200**; adding at least an additional information element **342** to be presented on one of the axes **292** of information elements **200**; and moving information elements **200** on the axis and adjusting a time unit **322** of the group of axes **310** to display **314** the additional information element **200** on the axis **292**.

[0226] FIG. **42** presents another flowchart illustrating in an exemplary manner the method upon which one or more aspects of the present invention are based, namely—the addition and display of a plurality of information elements **292** on the display area **314** in a predetermined manner. The flowchart consists of the following steps: displaying information elements **200** sharing a commonality on an axis **292** of information elements; adding a plurality of additional information elements **200** to be presented on the axis **292**; identifying a display parameter; and moving information elements **200** on the axis **292** in function of the display parameter to display a predetermined number of the plurality of additional information elements **342** on the axis **292**.

[0227] FIG. **43** presents another flowchart illustration in an exemplary fashion the method upon which one or more aspects of the present invention are based, namely—the viewer's receipt of notification and option to act based on the addition of at least one information element **342** on the axis **292** displayed on the display area **314**. The flowchart consists of the following: displaying information elements **200** sharing a first commonality on a first axis **292** of information elements **200** for a first user; sharing an access right of the first commonality with a second user; adding at least one additional information element **342** with the shared first commonality by the second user; warning the first user that the at least one additional information element **342** is going to be displayed on the displayed first axis **292** of information elements; and selecting a display option to define how the at least one additional information element **342** may be displayed by the first user on the axis **292** of information elements that was displayed first.

[0228] FIGS. **44-45** represent the flowchart method presenting several of the embodiments of the present invention. The flowchart starts at FIG. **44** and consists of three steps.

[0229] Steps **1**, which starts at block **458**, consists of searching for events in respect to the adding and/or removal of documents **342**, **346** taking place on the axis **292**. If such events do occur, the system shows the display area notification feature **406**, listing the information pertaining to the newly added and/or removed documents **342**, **346**.

[0230] The second step, which starts at block **462**, consists of identifying if there are any insertions of documents **342**

taking place on the axis **292**. If the cursor **350** is moving, the system identifies the active region **348**, towards which the cursor **350** is moving. Then, if the inserted document **342** is in the active region **398**, the insertion does not take place. However, if the respective document **342** is at the left of the active region **398**, the system pushes the documents **200** before the inserted document **342**, to the left. After pushing the documents **200** to the left or to the right of the axis **292**, the document **342** is inserted on the axis **292**.

[0231] If the cursor **350** is not moving, if the inserted document **342** is at the left of the cursor **350**, the system pushes the documents **200** before the inserted document **342**, to the left of the axis **292**. If the inserted document **342** is at the right of the cursor **350**, the system pushes the documents **200** after the inserted document **342**, to the right of the axis **292**. The document **342** is consequently inserted on the axis **292**.

[0232] Once the document **342** is inserted on the axis **292**, the system identifies if the inserted documents **342** was placed on a linear or non-linear axis **292**. If it is a linear axis **292**, the system verifies if there is sufficient space to accommodate the insertion of the document **342**. If this is not the case, the system compacts the inserted documents **342** within a time unit **322**.

[0233] If the inserted document **342** was not placed on a linear axis **292**, and was placed within a group of axes **310**, the system checks if the time unit **322** has become larger as a result of the insertion of the document **342**. If this were the case, the system checks if there are documents **200** visible on the other axes **292** of the group **310**. If all these conditions hold true, the system adds temporary additional space **450** outside the display area **314** in order to keep the documents **200** within the display area **314**.

[0234] Step **3** identifies if there are any documents **346** to be removed from an axis **292**. If this were to be the case, the system identifies if the respective documents **346** are shown on the display area **314**. If the document **346** is displayed on the display **314**, the system adds a cross sign **378** to identify the removed document **346** from the rest of the documents **200** displayed on the display area **314**. The document **346** is removed from the number of documents **200** displayed on the display area **314** the user may have selected. The system also disables the selection features on the document **346**.

[0235] If the document **346** is not within the display area **314**, it is removed from the axis **292**. If the removed document **346** is at the left of the display area **314**, the system pushes the documents **200** before the removed document **346**, to the right. If this is not the case, the system pushes the documents **200** before the removed document **346**, to the left.

[0236] The description and the drawings that are presented above are meant to be illustrative of the present invention. They are not meant to be limiting of the scope of the present invention. Modifications to the embodiments described may be made without departing from the present invention, the scope of which is defined by the following claims:

1.-**20**. (canceled)

21. A computer-implemented method of displaying a plurality of elements on an axis of elements on a display area of a user's device, the method comprising:

assigning a collation function to the axis of elements, the collation function including a time-based order;

receiving a plurality of elements from another user, the plurality of elements being transmitted through a network, the elements including a timestamp respectively associated thereto;

associating the plurality of elements with respective collation positions on the axis of elements;

displaying the plurality of elements in a substantially rectilinear and vertical orientation on the display in a stacked configuration of elements on the axis of elements; and

displaying a notification in association with the plurality of elements including an identity of the another user providing the plurality of elements, wherein the plurality of stacked elements is unstacked and elements are distinctly displayed on the axis on a basis of an action performed by the user on the display area.

22. The computer-implemented method of claim **21**, wherein the axis is scrollable with a gesture over a touch screen interface.

23. The computer-implemented method of claim **21**, wherein the display of stacked elements on the axis is made without substantially modifying the display of elements within the display area.

24. The computer-implemented method of claim **21**, wherein the collation function is a chronological order.

25. The computer-implemented method of claim **21**, further comprising simultaneously displaying each unstacked element from the plurality of elements following the action performed by the user on the display area.

26. The computer-implemented method of claim **21**, wherein displaying each unstacked element from the plurality of element is enlarging a time unit associated with the collation function of the axis of elements.

27. The computer-implemented method of claim **21**, wherein the elements are user-selectable.

28. The computer-implemented method of claim **21**, wherein the plurality of elements is inserted to the axis of elements compressed into a stacked group of elements to prevent an abrupt and rapid addition of elements on the axis changing a layout of elements displayed thereon.

29. The computer-implemented method of claim **21**, wherein the plurality of elements includes text files.

30. The computer-implemented method of claim **21**, wherein the axis includes elements having a common attribute.

31. The computer-implemented method of claim **21**, wherein the collation function includes collation units of a size adapted to be adjusted in accordance with a number of elements located therein.

32. The computer-implemented method of claim **21**, further comprising identifying elements added to the axis as a result of an action of the another user.

33. The computer-implemented method of claim **21**, wherein the device includes a phone.

34. The computer-implemented method of claim **21**, wherein the device includes a computer device.

35. The computer-implemented method of claim **21**, wherein the collation function includes non-equally spaced collation units along the axis of elements.

36. The computer-implemented method of claim **21**, wherein the display area includes an idle region of the axis of elements and an active region of the axis of elements.

37. The computer-implemented method of claim **21**, wherein the collation function comprises a plurality of

collation units and wherein an addition of an element in a collation unit on the axis of elements is compressing a graphical representation of an element present in the collation unit on the axis.

38. The computer-implemented method of claim **21**, wherein the collation function includes a chronological order including a non-linear timeline where units of time are not evenly represented in an axial distance along the axis of elements.

39. The computer-implemented method of claim **38**, wherein a unit of time is becoming axially longer to accommodate additional elements displayed therein.

40. The computer-implemented method of claim **21**, wherein the elements are displayed with a quadrilateral shape.

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