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(71) Applicant: **LISTIUM PTY LTD** [AU/AU]; 146 Kent Street, Richmond, Victoria 3121 (AU).

(72) Inventor: **HARRISON, Marc**; 146 Kent Street, Richmond, Victoria 3121 (AU).

(74) Agent: **BOROVEC, Steven**; Churchill Attorneys, Kew Junction Towers, 89-93 High Street, Suite 302, Kew, Victoria 3101 (AU).

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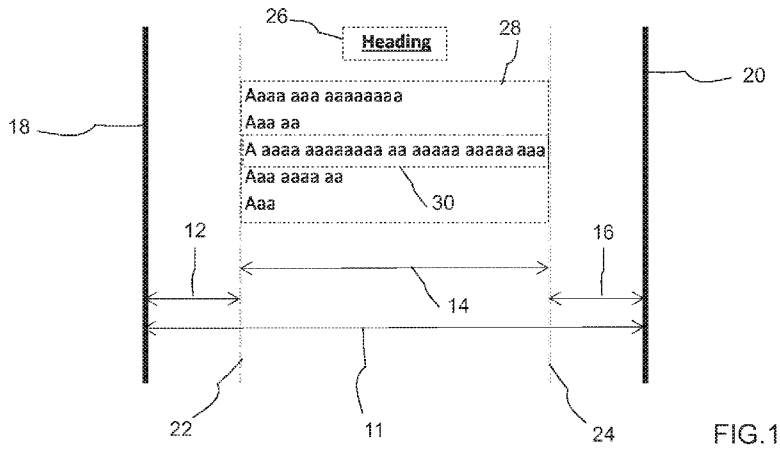

FIG.1

(57) Abstract: A computer-implemented method of displaying data elements in tabular form, the method including the step of identifying the widest data element in a table column and positioning the widest data element in relation to a left-hand table column edge and/or a right-hand column edge. In the method, the step of positioning the widest data element is performed automatically and without user assistance. The method may include the step of positioning the widest data element comprises the step of disposing a buffer area adjacent to the left- hand edge and/or right-hand edge of the widest data element. The buffer area may be disposed to the left and right of the widest data element, and may be of substantially equal width. The methods are useful in formatting of data elements for viewing on a computer-based display, and particularly in the formatting of data elements in tabular form to improve readability.

METHODS AND SYSTEMS FOR IMPROVING THE READABILITY OF TABULATED DATA

FIELD OF THE INVENTION

The present invention relates to methods and systems for the formatting of data elements for viewing on a computer-based display. More particularly, the invention relates to the formatting of data elements in tabular form to improve readability.

BACKGROUND TO THE INVENTION

The use of computer-based means for storing and presenting data elements has dramatically improved the ability to handle information. Spreadsheeting applications such as Microsoft Excel™ allow a user to store, manipulate, chart, and display data in tabular form (i.e. arranged in a matrix of columns and rows). Word processing applications such as Microsoft Word™, desktop publishing packages such as CorelDraw™ and website creators such as Joomla™, while not providing data manipulation are nevertheless used extensively for display.

It is a problem in the art that data in tabular form can be difficult to read. Readability (as distinct from legibility) is the ease with which text can be read and understood. Readability has been extensively studied with respect to prose, with various factors to measure readability having been used, such as speed of perception, perceptibility at a distance, perceptibility in peripheral vision, visibility, the reflex blink technique, rate of work (e.g., speed of reading), eye movements, and fatigue in reading all being useful tests.

Data in tabular form can be especially difficult to read on mobile devices such as tablets and smart phones given the limited screen sizes of these devices.

Considerably less study has been dedicated to the readability of tabulated data elements, and especially the output of spreadsheeting applications. The readability of spreadsheets is an important consideration given the widespread use of spreadsheets in business and education, and the dramatic impact on productivity that even minor gains in readability would bring. The readability of spreadsheets is complicated by the fact that (unlike prose) consideration must be had to the necessity for the eye to traverse the data not only horizontally, but also vertically. Moreover, mixed data is often presented comprising both numerical and alphabetical data.

To improve readability, prior art spreadsheets allow for the automatic or manual shading of alternate columns, or alternate rows. While these tools assist readability, where automatic formatting is used (which is typical) such formatting must be applied after the spreadsheet in completed. If the user updates, filters, or sorts the data later, it is generally necessary to manually re-apply the autoformat.

Other means may be used to improve readability such as the use of multiple fonts (varying type face, size, boldness, color etc), and also the use of graphical techniques such as grouping data elements in boxes. While such tools are readily available and often implemented, many users format poorly leading to output which is not improved in readability. In some cases a spreadsheet may be less readable that an unformatted document.

It is an aspect of the present invention to alleviate or overcome a problem of the prior art by providing methods and systems for improving the readability of tabulated data elements. It is a further aspect to provide a useful alternative to the prior art.

The discussion of documents, acts, materials, devices, articles and the like is included in this specification solely for the purpose of providing a context for the present invention. It is not suggested or represented that any or all of these matters formed part of the prior art base or were common general knowledge in the field relevant to the present invention as it existed before the priority date of each claim of this application.

SUMMARY OF THE INVENTION

In a first embodiment, the present invention provides a computer–implemented method of displaying data elements in tabular form, the method comprising the step of identifying the widest data element in a table column and positioning the widest data element in relation to a left-hand table column edge and/or a right-hand column edge.

In one embodiment of the method, the step of positioning the widest data element is performed automatically and without user assistance.

In one embodiment of the method, the step of positioning the widest data element comprises the step of disposing a buffer area adjacent to the left-hand edge and/or right-hand edge of the widest data element.

In one embodiment of the method, where a buffer area is disposed to the left and right of the widest data element, the buffer areas are of substantially equal width.

In one embodiment of the method, where a table column comprises at least 3 sub-columns disposed side-by-side, the left-hand sub-column configured to provide a buffer area disposed to the left-hand side of the widest data, the central sub-column configured to display a data element, the right-hand sub-column configured to provide a buffer area disposed to the right-hand side of the widest data element.

In one embodiment of the method, the left hand border of the left-hand sub-column is high visibility, the right-hand border of the left-hand sub-column is of low visibility or user invisible, the left-hand and right-hand borders of the central sub-column are low visibility or user invisible, the left-hand border of the right-hand sub-column is of low visibility or user invisible, and the right-hand border of the right-hand sub-column is high visibility.

In one embodiment of the method, the width of the left-hand and right-hand sub-columns provide buffer areas disposed to the left and right of the widest data element .

In one embodiment, the method comprises the step of substantially centering a table column heading with respect to the table column width.

In one embodiment, the method comprises the step of receiving a table column heading into the central sub-column, and substantially centering the table column heading with respect to the central sub-column width.

In one embodiment, the method comprises the step of identifying the data type of the data element, and formatting the data element according to the data type.

In one embodiment of the method, the step of identifying the data element type discerns between non-numerical data and numerical data.

In one embodiment of the method, where the data element is identified as non-numerical data the data element is formatted as left aligned, and where the data element is identified as numerical data the data element is formatted as right aligned.

In one embodiment, the method comprises the steps of:

providing a table column, the table column generated by, or selected by a user, the table column having a high visibility left-hand border and a high visibility right hand border,

identifying the widest data element of each of the one of more rows of the table column,

setting the position of the high visibility left-hand border to provide a buffer area between the high visibility left-hand border and the left-hand edge of the widest data record, and/or

setting the position of the high visibility right-hand border to provide a buffer area between the high visibility right-hand border and the right-hand edge of the widest data element .

In one embodiment of the method, the buffer area(s) is/are space(s)

In one embodiment, the method is configured to be operable within a spreadsheeting application.

In a second aspect, the present invention provides a computer-readable storage medium containing a program which, when executed alone or in combination another program, performs an operation for the display of data in tabular form, the operation comprising displaying data elements in tabular form, identifying the widest data element in a table column and positioning the widest data element in relation to a left hand table column edge and/or a right-hand column edge.

In one embodiment, the computer-readable storage medium contains a program which, when executed alone or in combination another program, performs an operation for the display of data in tabular form, the operation comprising the method as described herein.

In a third aspect, the present invention provides a system comprising:

a processor, and

a memory containing a program, which when executed alone or in combination with another program by the processor, is configured to perform an operation for the display of data in tabular form, the operation comprising displaying data elements in tabular form, identifying the widest data element in a table column and positioning the widest data element in relation to a left hand table column edge and/or a right-hand column edge.

In a fourth aspect, the present invention provides a system comprising:

a processor, and

a memory containing a program, which when executed alone or in combination with another program by the processor, is configured to perform an operation for the display of data in tabular form, the operation comprising the method as described herein.

In a fifth aspect, the present invention provides a computer executable program which when executed alone or in combination with another program by the processor, is configured to perform an operation for the display of data in tabular form, the operation comprising displaying data elements in tabular form, identifying the widest data element in a table column and positioning the widest data element in relation to a left hand table column edge and/or a right-hand column edge.

In a sixth aspect, the present invention provides a computer executable program, which when executed alone or in combination with another program by the processor, is configured to perform an operation for the display of data in tabular form, the operation comprising the method as described herein.

In a seventh aspect, the present invention provides a display of data in tabulated form, the data produced by the method as described herein.

It will be understood that any feature described with reference to the first aspect of the invention may be applicable to any one or more of the second, third, fourth, fifth, six or seventh aspects of the invention. For the sake of clarity and succinctness, features of the first aspect are not explicitly recited in combination with the second, third, fourth, fifth, six and seventh aspects in this Summary section. Each of the features of the first aspect of the invention are nevertheless incorporated herein as independent combinations with the second, third, fourth, fifth, six and seventh aspects of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 shows a display output of tabular data by a preferred method of the present invention.

Fig. 2 shows a sequence of display outputs demonstrating dynamic formatting of the tabular data of Fig. 1 after (i) alteration to the widest data element by the user, and (ii) alteration to the overall column width by the user.

DETAILED DESCRIPTION OF THE INVENTION

After considering this description it is apparent to one skilled in the art how the invention is implemented in various alternative embodiments and alternative applications. However, although various embodiments of the present invention is described herein, it is understood that these embodiments are presented by way of example only, and not limitation. As such, this description of various alternative embodiments should not be construed to limit the scope or breadth of the present invention. Furthermore, statements of advantages or other aspects apply to specific exemplary embodiments, and not necessarily to all embodiments covered by the claims.

Throughout the description and the claims of this specification the word “comprise” and variations of the word, such as “comprising” and “comprises” is not intended to exclude other additives, components, integers or steps.

Reference throughout this specification to “one embodiment” or “an embodiment” means that a particular feature, structure or characteristic described in connection with the embodiment is included in at least one embodiment of the present invention. Thus, appearances of the phrases

"in one embodiment" or "in an embodiment" in various places throughout this specification are not necessarily all referring to the same embodiment, but may.

The present invention is predicated at least in part on the Applicant's finding that a consideration of the widest data element in a table column, and the disposition of that record is of importance in improving the readability of data in spreadsheets and other computer-implemented means of data display. While spreadsheet applications allow for the formatting of table column width, this does little to improve the overall readability of the table and instead only prevents a data element from running over two lines. It is the positioning of the widest data element with reference to the in relation to a left hand table column edge and/or a right-hand column edge which improves readability.

Any of all method steps may be performed automatically by a software embodiment of the present methods, or separate software which controls a software embodiment of the present methods. Thus, the user's attention and time in creating the spreadsheet is freed to concentrate on the substantive content of the document, rather than issues of formatting and readability.

Where a data element is disposed across a single line, the width of a data element may be taken as the distance from the most left-hand point of the most left-hand character of record to the most right-hand point of the most right-hand character of record. While a data element is typically an alphabetical or numerical string running across a single line, it is contemplated that the record may be disposed over several lines of the spreadsheet, the several lines forming a single table row. In that circumstance, the width of the data element may be determined by reference to the widest single line within a data element.

The data element may not be an alphabetical or numerical string, and in some embodiments may be a graphic or a photograph. In that circumstance, the width may be the distance between the left-hand edge and the right-hand edge of the record. Where that distance varies vertically within the record, the greatest distance may be taken as the width. For example, where the data element is a square photograph, the width is the distance between the left-hand and right-hand edges of the photograph. Where the data element is a triangular graphic, the width is taken as the length of the triangle base.

Readability is improved wherein a buffer area is disposed to the left and/or right of the widest data element. Preferably, a space is disposed to the left and right of the widest data element. In this context, the term "buffer area" is intended to mean a part of the table which is devoid of a data element, and/or is visually distinguishable from the widest data element. While an buffer area perceived by a user as empty space (i.e. visually similar or identical to the background of the adjacent data element) is generally most effective, it will be understood than a buffer area may nevertheless have content, so long as that content is distinguishable from the adjacent widest data element. For example, the buffer area content may comprise unobtrusive characters such as periods, dashes, commas, apostrophes, character spaces, or may be shaded or have a graphical component included. The function of the buffer area is to assist in readability, and so need only really be distinguishing from the data element.

The buffer area may have a width which is proportional of the width of the data element. For example, where the widest data element is very wide, the buffer area may be more effective where it is also very wide. Similarly, a more narrow widest data element may not require a very wide buffer area to achieve an increase in readability.

The buffer area may have a width of at least about 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 25, 30, 35, 40, 45, or 50% the width of the widest data element. Alternatively, the buffer area width may have an absolute value, typically expressed as picas, points, or millimeters for example. The buffer may at least about 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 25, 30, 35, 40, 45, or 50 picas.

For increased readability, it is preferred for the width of a left-hand and right-hand buffer region be substantially equal. However, it is contemplated that in some embodiments the two buffer regions are not equal, with one buffer region being at least about 10, 20, 30, 40, 50, 60, 70, 80 or 90% the width of the other.

Where the widest data element is as wide, or wider, than the column in which it is disposed (for example, where a maximum column width is user-set or automatically set) then any buffer area may have zero width.

Where the widest data element is wider that the column in which it is disposed, the data element may be truncated, or may wrap onto the next column row, or altered in any other way such that the method remains operable.

Readability may be improved to a larger extent where buffer areas of substantially equal width are disposed to the left and to the right of the widest data element. In this embodiment, the widest data element may appear substantially centered by reference to the left-hand edge and right hand edge of the column. As will be appreciated, where a data element is left-aligned or right-aligned with respect to the edge of a buffer area, the data element will not be precisely centered. Further disclosure with regards to justification is presented *infra*.

Means for disposing a buffer area include the use of indentations, character spacings, graphics blocks, and other means known to the skilled artisan

An advantageous means for disposing a buffer area relies on a table column being comprised of two or more sub-columns, the first sub-column configured to contain the data element, and the second sub-column configured to provide the buffer area. Where two buffer areas are required (one the left of the data element, and another to the right of the data element), then three sub-columns may be utilized. This embodiment exploits the pre-existence of multiple columns within a spreadsheet. Typically, readability is improved where a visible boarder is absent between the data element sub-column and the buffer area sub-column. This provides the user with a visual perception of the data element column being centered (or even simply disposed away from adjacent column(s)), this in turn improving readability.

While in some embodiments the method sets the width of the buffer area, in other embodiments the width of the buffer area is fixed by the user such that the column width alters when any alteration to the widest data element is made (i.e. when the existing widest data element is made wider or narrower), or when a new data element becomes the widest data element. In that circumstance, the method alters the column width so as to keep the widest element centered, and also the user buffer area at the user fixed width.

Thus, the widest item in the column is identified, and where the user sets the column width, the width of the buffer area is calculated by the method so that the widest data element is centered and all other data elements are left or right aligned with that element. Where the user sets the

width of the buffer area then the column width is calculated by the method so that the widest element is substantially centered and all other elements are left or right aligned with that element.

Typically, the table column will have a heading to identify the data category, and in that circumstance the heading is automatically substantially centered with respect to the table column width, the table column width being set in turn by the widest data element within the table column. According to a preference by the user, the heading may not be substantially centered as described above, but may be offset to the left or the right of centre. The degree of offset may be weighted by reference to the center of all or most data elements in the column. Thus, where a single data element in a column is very wide, but the remainder are very narrow, and all data elements are left-justified, the heading is offset a high degree to the left such that the heading appears centered more so with respect to the narrow data elements.

In one embodiment of the present methods, the type of data in the data element is considered with a view to improving readability. Accordingly, the method may comprise the step of identifying the data type of the data element. Typically, a distinction is drawn between non-numerical data (such as alphabetical strings), and numerical data. Where data is mixed, the predominant data type may be used to draw the distinction.

The step of indentifying the data type may be automatically performed by the method by analysis of the data element. Alternatively, the method may configured to infer the data type by reference to the column table heading. For example, where the heading includes the characters “USD”, “$”, “Income”, “Price”, “Pounds”, “Kilograms”, “Inches” or “Centimeters” the data elements within that column are identified by the method as numerical. Table columns having any other heading may be identified as non-numerical. Alternatively, non-numerical data may be identified by reference to column headings such as “Name”, “Address”, “Retailer”, or “Product Description”. The skilled person is enabled by the present specification to generate a more complete dictionary of words and terms that are potentially usable as data categories, and to associate the correct data type with each potential category.

The step of identifying the data type may be by way of direct entry by the user of the data type (by drop down menu on a user interface, for example). In some circumstances, the data type may be identifiable by the method by reference to a data type tagged to a cell. For example, in Excel a user is enabled to specify a data format for a series of cells which together comprise a

column. The present method (where configured to be operable in combination with Excel) may be configured read the data type tag and thereby identify the data type in a cell.

Identification of the data type is facilitated where the method allows for the user to select a data element category from a set of fixed, predetermined categories. In that circumstance, the predetermined categories have an expected data type and so the method is configured to utilize the expected data type for the identification of the data type.

Readability may be improved where numerical data is right aligned, and non-numerical data is left-aligned.

The present methods rely on the use of one or more borders to define a left-hand and/or right-hand edge of a column or a sub-column. As used herein, the term "border" includes borders which are highly visible to a user, and also those which are low visibility to user. A high-visibility border may be used, for example, to provide a prominent visual delineation between the edge of a data element and the edge of a table column. A high visibility border may further provide a visual delineation between two adjacent table columns. A high visibility border is typically comprised of a bold vertical line, which may be continuous or discontinuous.

Invisible borders are preferably used in the present methods to define buffer areas. However, a low visibility border which may be very fine, feint or incomplete may be useful in certain circumstances.

In any implementation the present methods may be executed continuously (or at least upon each entry of data) such that the column is dynamically modified. Alternatively, the method may be executed at irregular intervals (for example when the data is saved), or rarely (for example, when all data has been entered).

Given the benefit of the present disclosure, the skilled person is enabled to implement the present invention in one or more contexts.

As one example, the present methods may be implemented in the context of a prior art application, such as a spreadsheet application, a word processing application, a desktop publishing application, a webpage creation application, or a database application. Such

applications may allow for the programming of a macro which when run may execute a method of the present invention. For example, as is well known to the skilled artisan Microsoft Excel™ allows macros to be written in Visual Basic.

As an alternative, an existing application may be patched or otherwise modified to allow for the present methods to be executed while the application is operating.

The methods and systems described herein may be deployed in part or in whole through a computer that executes computer software, program codes, and/or instructions on a processor. The processor may be part of a server, client, network infrastructure, mobile computing platform, stationary computing platform, or other computing platform. A processor may be any kind of computational or processing device capable of executing program instructions, codes, binary instructions and the like. The processor may be or may include a signal processor, digital processor, embedded processor, microprocessor or any variant such as a coprocessor (math co-processor, graphic co-processor, communication co-processor and the like) and the like that may directly or indirectly facilitate execution of program code or program instructions stored thereon. In addition, the processor may enable execution of multiple programs, threads, and codes.

The threads may be executed simultaneously to enhance the performance of the processor and to facilitate simultaneous operations of the application. By way of implementation, methods, program codes, program instructions and the like described herein may be implemented in one or more thread. The thread may spawn other threads that may have assigned priorities associated with them; the processor may execute these threads based on priority or any other order based on instructions provided in the program code. The processor may include memory that stores methods, codes, instructions and programs as described herein and elsewhere.

The processor may access a storage medium through an interface that may store methods, codes, and instructions as described herein and elsewhere. The storage medium associated with the processor for storing methods, programs, codes, program instructions or other type of instructions capable of being executed by the computing or processing device may include but may not be limited to one or more of a CD-ROM, DVD, memory, hard disk, flash drive, RAM, ROM, cache and the like.

A processor may include one or more cores that may enhance speed and performance of a multiprocessor. In embodiments, the process may be a dual core processor, quad core processors, other chip-level multiprocessor and the like that combine two or more independent cores (called a die).

The methods and systems described herein may be deployed in part or in whole through a computer that executes computer software on a server, client, firewall, gateway, hub, router, or other such computer and/or networking hardware. The software program may be associated with a server that may include a file server, print server, domain server, internet server, intranet server and other variants such as secondary server, host server, distributed server and the like. The server may include one or more of memories, processors, computer readable media, storage media, ports (physical and virtual), communication devices, and interfaces capable of accessing other servers, clients, computers, and devices through a wired or a wireless medium, and the like. The methods, programs or codes as described herein and elsewhere may be executed by the server. In addition, other devices required for execution of methods as described in this application may be considered as a part of the infrastructure associated with the server.

The server may provide an interface to other devices including, without limitation, clients, other servers, printers, database servers, print servers, file servers, communication servers, distributed servers and the like. Additionally, this coupling and/or connection may facilitate remote execution of program across the network. The networking of some or all of these devices may facilitate parallel processing of a program or method at one or more location without deviating from the scope of the invention. In addition, any of the devices attached to the server through an interface may include at least one storage medium capable of storing methods, programs, code and/or instructions. A central repository may provide program instructions to be executed on different devices. In this implementation, the remote repository may act as a storage medium for program code, instructions, and programs.

The software program may be associated with a client that may include a file client, print client, domain client, internet client, intranet client and other variants such as secondary client, host client, distributed client and the like. The client may include one or more of memories, processors, computer readable media, storage media, ports (physical and virtual), communication devices, and interfaces capable of accessing other clients, servers, computers, and devices through a wired or a wireless medium, and the like. The methods, programs or codes as described herein

and elsewhere may be executed by the client. In addition, other devices required for execution of methods as described in this application may be considered as a part of the infrastructure associated with the client.

The client may provide an interface to other devices including, without limitation, servers, other clients, printers, database servers, print servers, file servers, communication servers, distributed servers and the like. Additionally, this coupling and/or connection may facilitate remote execution of program across the network. The networking of some or all of these devices may facilitate parallel processing of a program or method at one or more location without deviating from the scope of the invention. In addition, any of the devices attached to the client through an interface may include at least one storage medium capable of storing methods, programs, applications, code and/or instructions. A central repository may provide program instructions to be executed on different devices. In this implementation, the remote repository may act as a storage medium for program code, instructions, and programs.

The methods and systems described herein may be deployed in part or in whole through network infrastructures. The network infrastructure may include elements such as computing devices, servers, routers, hubs, firewalls, clients, personal computers, communication devices, routing devices and other active and passive devices, modules and/or components as known in the art. The computing and/or non-computing device(s) associated with the network infrastructure may include, apart from other components, a storage medium such as flash memory, buffer, stack, RAM, ROM and the like. The processes, methods, program codes, instructions described herein and elsewhere may be executed by one or more of the network infrastructural elements.

The methods, program codes, and instructions described herein and elsewhere may be implemented on a cellular network having multiple cells. The cellular network may either be frequency division multiple access (FDMA) network or code division multiple access (CDMA) network. The cellular network may include mobile devices, cell sites, base stations, repeaters, antennas, towers, and the like. The cell network may be a GSM, GPRS, 3G, EVDO, mesh, or other networks types.

The methods, programs codes, and instructions described herein and elsewhere may be implemented on or through mobile devices. The mobile devices may include navigation devices, cell phones, mobile phones, mobile personal digital assistants, laptops, palmtops, netbooks,

pagers, electronic books readers, music players and the like. These devices may include, apart from other components, a storage medium such as a flash memory, buffer, RAM, ROM and one or more computing devices. The computing devices associated with mobile devices may be enabled to execute program codes, methods, and instructions stored thereon.

Alternatively, the mobile devices may be configured to execute instructions in collaboration with other devices. The mobile devices may communicate with base stations interfaced with servers and configured to execute program codes. The mobile devices may communicate on a peer to peer network, mesh network, or other communications network. The program code may be stored on the storage medium associated with the server and executed by a computing device embedded within the server. The base station may include a computing device and a storage medium. The storage device may store program codes and instructions executed by the computing devices associated with the base station.

The computer software, program codes, and/or instructions may be stored and/or accessed on computer readable media that may include: computer components, devices, and recording media that retain digital data used for computing for some interval of time; semiconductor storage known as random access memory (RAM); mass storage typically for more permanent storage, such as optical discs, forms of magnetic storage like hard disks, tapes, drums, cards and other types; processor registers, cache memory, volatile memory, non-volatile memory; optical storage such as CD, DVD; removable media such as flash memory (e.g. USB sticks or keys), floppy disks, magnetic tape, paper tape, punch cards, standalone RAM disks. Zip drives, removable mass storage, off-line, and the like; other computer memory such as dynamic memory, static memory, read/write storage, mutable storage, read only, random access, sequential access, location addressable, file addressable, content addressable, network attached storage, storage area network, bar codes, magnetic ink, and the like.

The software may reside on a remote server, with data elements being entered by a user via a network such as a WAN, LAN or the Internet. In that circumstances the data elements may also reside on that remote server, thereby allowing a user to view and modify a data set in tabular from a local device.

The methods and systems described herein may transform physical and/or or intangible items from one state to another. The methods and systems described herein may also transform data representing physical and/or intangible items from one state to another.

The elements described and depicted herein, including in flow charts and block diagrams throughout the figures, imply logical boundaries between the elements. However, according to software or hardware engineering practices, the depicted elements and the functions thereof may be implemented on computers through computer executable media having a processor capable of executing program instructions stored thereon as a monolithic software structure, as standalone software modules, or as modules that employ external routines, code, services, and so forth, or any combination of these, and all such implementations may be within the scope of the present disclosure. Examples of such computers may include, but may not be limited to, personal digital assistants, laptops, personal computers, mobile phones, other handheld computing devices, wired or wireless communication devices, transducers, chips, calculators, satellites, tablet PCs, electronic books, gadgets, electronic devices, devices having artificial intelligence, computing devices, networking equipment, servers, routers and the like.

Furthermore, the elements depicted in the flow chart and block diagrams or any other logical component may be implemented on a machine capable of executing program instructions. Thus, while the foregoing drawings and descriptions set forth functional aspects of the disclosed systems, no particular arrangement of software for implementing these functional aspects should be inferred from these descriptions unless explicitly stated or otherwise clear from the context. Similarly, it will be appreciated that the various steps identified and described above may be varied, and that the order of steps may be adapted to particular applications of the techniques disclosed herein. All such variations and modifications are intended to fall within the scope of this disclosure. As such, the depiction and/or description of an order for various steps should not be understood to require a particular order of execution for those steps, unless required by a particular application, or explicitly stated or otherwise clear from the context.

The methods and/or processes described above, and steps thereof, may be realized in hardware, software or any combination of hardware and software suitable for a particular application. The hardware may include a general purpose computer and/or dedicated computing device or specific computing device or particular aspect or component of a specific computing device. The processes may be realized in one or more microprocessors, microcontrollers, embedded

microcontrollers, programmable digital signal processors or other programmable device, along with internal and/or external memory. The processes may also, or instead, be embodied in an application specific integrated circuit, a programmable gate array, programmable array logic, or any other device or combination of devices that may be configured to process electronic signals. It will further be appreciated that one or more of the processes may be realized as a computer executable code capable of being executed on a computer readable medium.

The computer executable code may be created using a structured programming language such as C, an object oriented programming language such as C++, or any other high-level or low-level programming language (including assembly languages, hardware description languages, and database programming languages and technologies) that may be stored, compiled or interpreted to run on one of the above devices, as well as heterogeneous combinations of processors, processor architectures, or combinations of different hardware and software, or any other machine capable of executing program instructions.

Thus, in one aspect, each method described above and combinations thereof may be embodied in computer executable code that, when executing on one or more computing devices, performs the steps thereof. In another aspect, the methods may be embodied in systems that perform the steps thereof, and may be distributed across devices in a number of ways, or all of the functionality may be integrated into a dedicated, standalone device or other hardware. In another aspect, the means for performing the steps associated with the processes described above may include any of the hardware and/or software described above. All such permutations and combinations are intended to fall within the scope of the present disclosure.

The software program may be coded for use in an application under development, such as an application for the making of lists or keeping track of information in a business or a domestic environment. Alternatively, the software program is configured to be operable in combination with another software program.

The present invention will now be more fully described by reference to the following non-limiting embodiments.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Fig. 1 shows a column table of width **11** displayed by a preferred method of the present invention, and the dynamic adjustments automatically made by the method. The method of this embodiment comprises a left-hand sub-column **12** (configured to provide a left-hand buffer area), a central sub-column **14** (configured to contain data elements), and a right hand sub-column **16** (configured to provide a right-hand buffer area). The table column has a width **11**, defined by a left-hand edge **18** and a right-hand edge **20**, both edges **18** and **20** having high visibility borders.

The central sub-column **14** is defined by a left-hand edge **22** and a right hand edge **24**, both edges **22** and **24** having low visibility borders. The central sub-column **14** contains a heading **26** which is precisely centered within the central sub-column **14**, and also a plurality of data elements **28**.

The left-hand sub-column is defined by the left-hand edge **18** and right-hand edge **22**. The right-hand sub-column is defined by the left-hand edge **24** and right-hand edge **20**. It will be noted that the edges marked **18**, **20**, **22** and **24** may be differentially named depending on which column or sub-column is involved.

It will be noted that the data elements **28** are non-numerical and therefore left-aligned a gainst the left-hand edge of central sub-column **22**.

The width of the column **11** is set by the user according to personal preference. The width of the central sub-column **14** is set automatically by the method, and is dependent on the width of the widest record of all data elements **28**. The width of the left-hand **12** and right hand **16** columns are equal and set automatically by the method, with reference to the user-selected width of column **11** and also the width of central sub-column **14** (the width of central sub-column **14** in turn dependent on the width of the widest data element).

Because the widths of the left-hand **14** and right-hand **16** sub-columns are set as equal by the method, it will be noted that the heading **26** is precisely centered with respect to both the column **10** and also the central sub-column **14**. At the same time, the data elements **28** are not precisely

centered given the left-justification of the data elements **28**. Similarly (although not shown in the drawings) data elements that are right-aligned would also not be precisely centered.

Fig. 2A shows a first circumstance whereby the third data element **30** is the widest data-element.

Fig. 2B shows a second circumstance where a user (for any reason) deletes characters from the third data element **30**, such that the first data element **32** becomes the widest. It will be noted that the width of the central sub-column **14** reduces in accordance with the width of the new widest data element **32**. The method automatically increases the widths of the left-hand **12** and right-hand **16** sub-columns given that the total column width **10** remains static. The widths of sub-columns **12** and **16** are increased by an equal amount to ensure the central sub-column **14** remains centered.

According to personal preference, the user may manually reduce the overall width of the column **10**, this circumstance being shown in Fig. 2C. The width of the central sub-column **14** remains static, with the method automatically reducing widths of sub-columns **12** and **16** by an equal amount to ensure the central sub-column **14** remains centered.

Figs 2D, 2E, and 2F show the sequence of Figs. 2A, 2B and 2C, except that the low-visibility borders **22** and **24** have been rendered invisible to the user. Figs. 2D, 2E and 2F show a more readable display of data elements, compared with Figs 2A, 2B and 2C.

It may be noted that in this preferred embodiment a mathematical relationship exists between the widths of column **11**, sub-column **12**, sub-column **14** and sub-column **16**.

Firstly, the width of sub-columns **12** and **16** are equal. Secondly, the width of column 11 is equal to the sum of sum of the widths of sub columns **12**, **14** and **16**.

It should be appreciated that in the above description of exemplary embodiments of the invention, various features of the invention are sometimes grouped together in a single embodiment, figure, or description thereof, for the purpose of streamlining the disclosure and aiding in the understanding of one or more of the various inventive aspects. This method of disclosure, however, is not to be interpreted as reflecting an intention that the claimed invention requires more features than are expressly recited in each claim. Rather, as the following claims reflect,

inventive aspects lie in less than all features of a single foregoing disclosed embodiment. Thus, the claims following the Detailed Description are hereby expressly incorporated into this Detailed Description, with each claim standing on its own as a separate embodiment of this invention.

Furthermore, while some embodiments described herein include some but not other features included in other embodiments, combinations of features of different embodiments are meant to be within the scope of the invention, and form different embodiments, as would be understood by those skilled in the art. For example, in the following claims, any of the claimed embodiments can be used in any combination.

In the description provided herein, numerous specific details are set forth. However, it is understood that embodiments of the invention may be practiced without these specific details. In other instances, well-known methods, structures and techniques have not been shown in detail in order not to obscure an understanding of this description.

Thus, while there has been described what are believed to be the preferred embodiments of the invention, those skilled in the art will recognize that other and further modifications may be made thereto without departing from the spirit of the invention, and it is intended to claim all such changes and modifications as falling within the scope of the invention. For example, components and functionality may be added or deleted from diagrams and operations may be interchanged among functional blocks. Steps may be added or deleted to methods described within the scope of the present invention.

CLAIMS:

1. A computer–implemented method of displaying data elements in tabular form, the method comprising the step of identifying the widest data element in a table column and positioning the widest data element in relation to a left-hand table column edge and/or a right-hand column edge.

2. The method of claim 1 wherein the step of positioning the widest data element is performed automatically and without user assistance.

3. The method of claim 1 or claim 2 wherein the step of positioning the widest data element comprises the step of disposing a buffer area adjacent to the left-hand edge and/or right-hand edge of the widest data element.

4. The method of claim 3 wherein where a buffer area is disposed to the left and right of the widest data element, the buffer areas are of substantially equal width.

5. The method of any one of claims 1 to 4 where a table column comprises at least 3 sub-columns disposed side-by-side, the left-hand sub-column configured to provide a buffer area disposed to the left-hand side of the widest data, the central sub-column configured to display a data element, the right-hand sub-column configured to provide a buffer area disposed to the right-hand side of the widest data element.

6. The method of claim 5 wherein the left hand border of the left-hand sub-column is high visibility, the right-hand border of the left-hand sub-column is of low visibility or user invisible, the left-hand and right-hand borders of the central sub-column are low visibility or user invisible, the left-hand border of the right-hand sub-column is of low visibility or user invisible, and the right-hand border of the right-hand sub-column is high visibility.

7. The method of claim 5 or claim 6 wherein the width of the left-hand and right-hand sub-columns provide buffer areas disposed to the left and right of the widest data element .

8. The method of any one of claims 1 to 4 comprising the step of substantially centering a table column heading with respect to the table column width.

9. The method of any one of claims 5 to 7 comprising the step of receiving a table column heading into the central sub-column, and substantially centering the table column heading with respect to the central sub-column width.

10. The method of any one of claims 1 to 9 comprising the step of identifying the data type of the data element, and formatting the data element according to the data type.

11. The method of claim 10 wherein the step of identifying the data element type discerns between non-numerical data and numerical data.

12. The method of claim 11 wherein where the data element is identified as non-numerical data the data element is formatted as left aligned, and where the data element is identified as numerical data the data element is formatted as right aligned.

13. The method of any one of claims 1 to 12 comprising the steps of:

providing a table column, the table column generated by, or selected by a user, the table column having a high visibility left-hand border and a high visibility right hand border,

identifying the widest data element of each of the one of more rows of the table column,

setting the position of the high visibility left-hand border to provide a buffer area between the high visibility left-hand border and the left-hand edge of the widest data record, and/or

setting the position of the high visibility right-hand border to provide a buffer area between the high visibility right-hand border and the right-hand edge of the widest data element.

14. The method of any one of claims 3 to 13 wherein the buffer area(s) is/are space(s)

15. The method of any one of claims 1 to 14 configured to be operable within a spreadsheeting application.

16. A computer-readable storage medium containing a program which, when executed alone or in combination another program, performs an operation for the display of data in tabular form, the operation comprising displaying data elements in tabular form, identifying the widest data element in a table column and positioning the widest data element in relation to a left hand table column edge and/or a right-hand column edge.

17. A computer-readable storage medium containing a program which, when executed alone or in combination another program, performs an operation for the display of data in tabular form, the operation comprising the method of any one of claims 1 to 15.

18. A system comprising:

a processor, and

a memory containing a program, which when executed alone or in combination with another program by the processor, is configured to perform an operation for the display of data in tabular form, the operation comprising displaying data elements in tabular form, identifying the widest data element in a table column and positioning the widest data element in relation to a left hand table column edge and/or a right-hand column edge.

19. A system comprising:

a processor, and

a memory containing a program, which when executed alone or in combination with another program by the processor, is configured to perform an operation for the display of data in tabular form, the operation comprising the method of any one of claims 1 to 15.

20. A computer executable program which when executed alone or in combination with another program by the processor, is configured to perform an operation for the display of data in tabular form, the operation comprising displaying data elements in tabular form, identifying the widest data element in a table column and positioning the widest data element in relation to a left hand table column edge and/or a right-hand column edge.

21. A computer executable program, which when executed alone or in combination with another program by the processor, is configured to perform an operation for the display of data in tabular form, the operation comprising the method of any one of claims 1 to 15.

22. A display of data in tabulated form, the data produced by the method of any one of claims 1 to 15.

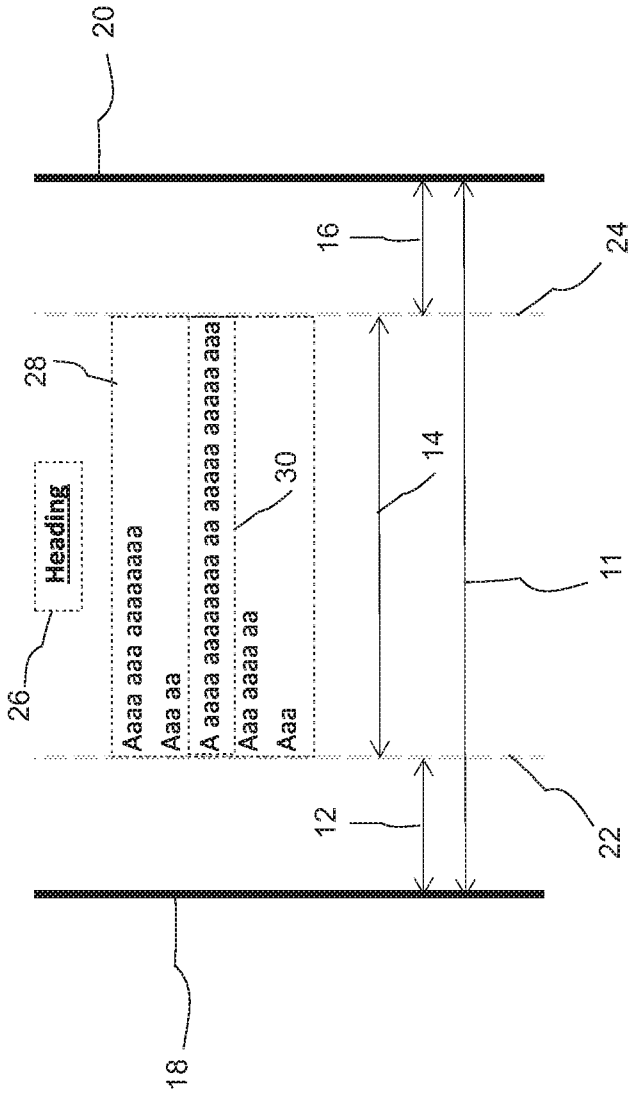
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FIG.1

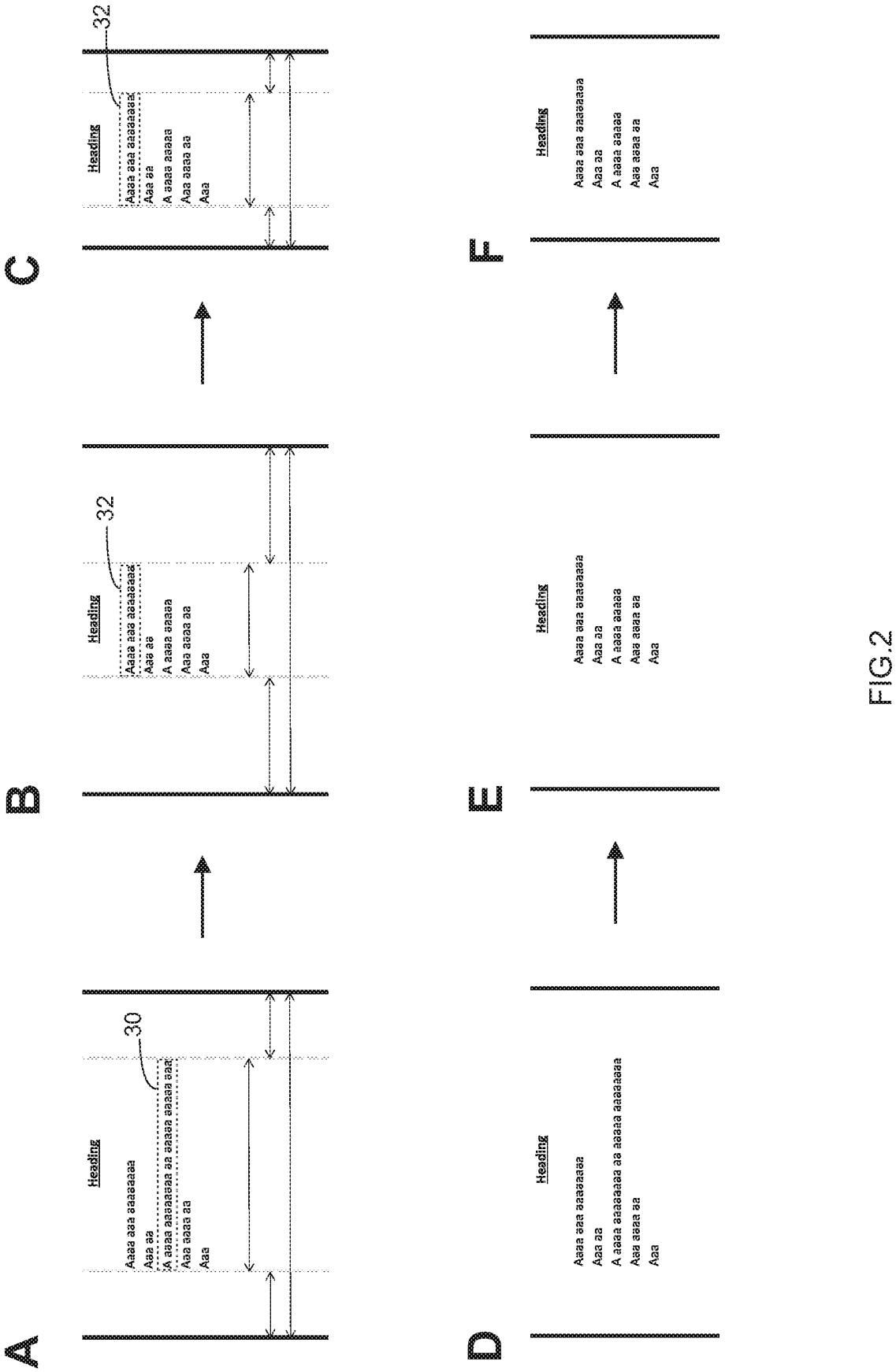
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FIG.2

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2015/050463

A. CLASSIFICATION OF SUBJECT MATTER

G06F 3/00 (2006.01) G06F 7/00 (2006.01)

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

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

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

EPODOC, WPIAP: IPC G06F & Keywords (data, tabular, column, row, adjust, position, align, space, edge, gap, margin) and like terms.

Google Patents, Google: Keywords (dynamic column spacing data display, adjustable column space word processing software, auto center excel sheet, adjust column spacing data display) and like terms.

Espace, Google Scholar, Google, AUSPAT : Applicant/Inventor name search.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	Documents are listed in the continuation of Box C	

[X] Further documents are listed in the continuation of Box C [X] See patent family annex

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
17 September 2015	17 September 2015
Name and mailing address of the ISA/AU	**Authorised officer**
AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA Email address: pct@ipaustralia.gov.au	MD Reza-E Rabbi AUSTRALIAN PATENT OFFICE (ISO 9001 Quality Certified Service) Telephone No. 0262833141

INTERNATIONAL SEARCH REPORT C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		International application No. **PCT/AU2015/050463**
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	US 4457638 A (HORN et al.) 03 July 1984 Abstract, line 20 column 2, lines 30 to 35 column 2, lines 55 to 59 column 7, fig 3, 5. Fig 5.	1, 2, 8, 10, 16-22 3-7, 9, 11-15
Y	US 4484826 A (HORN et al.) 27 November 1984 lines 35 to 50 column 5, fig 4.	3-7, 9, 11-15
A	US 7725815 B2 (PETERS) 25 May 2010	
A	US 2009/0089662 A1 (WULKAN et al.) 02 April 2009	
A	US 5930812 A (MASAKI) 27 July 1999	

INTERNATIONAL SEARCH REPORT Information on patent family members	International application No. **PCT/AU2015/050463**

This Annex lists known patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

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		US 5162993 A	10 Nov 1992

End of Annex

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.