

Exhibit 848-03 – Invalidity of U.S. Patent No. 10,176,848 in view of Gallagher

This chart pertains to U.S. Patent No. 10,176,848 (the “’848 patent”). This chart is subject to all reservations, objections, and disclaimers in Samsung’s Invalidity Contentions and any amendment, supplement, or modification thereof, which are incorporated herein by reference in their entirety. This chart refers to the following prior art references:

US20070098303A1 (“Gallagher”) was filed on October 31, 2005 and published May 3, 2007 and therefore qualifies as prior art to the ’848 patent under at least pre-AIA 35 U.S.C. § 102(b).

Discovery is ongoing and Samsung will update this chart pursuant to Federal Rule of Civil Procedure 26(e), the Local Rules, and the Orders of record in this matter subject to further investigation and discovery regarding the reference, the Court’s construction of the claims at issue, and discovery generally, including third-party discovery.

Gallagher anticipates the Asserted Claims of the ’848 Patent (claims 11, 12, 16, 17, 19, 20, and 84, as set forth in Maxell’s infringement contentions, served on January 11, 2024). To the extent it is found Gallagher does not expressly disclose certain limitations in the Asserted Claims, Gallagher renders obvious the Asserted Claims, either alone or in combination with other prior art identified in the cover pleading or herein, and/or in combination with the general knowledge of a person having ordinary skill in the art. In these contentions, Samsung has relied in part on Maxell’s infringement contentions. In those contentions, Maxell appears to pursue overly broad claim constructions in an effort to assert infringement where none exists and to accuse products that do not infringe the claims. Samsung’s assertion that a particular limitation is disclosed by a prior art reference and/or is disclosed in a particular manner may be based in part on Maxell’s apparent claim interpretations. Samsung does not admit that Maxell’s apparent claim interpretations are supportable or proper or that the claim limitations in question are definite or otherwise amenable to construction.

Samsung has endeavored to cite to the most relevant portions of the identified prior art, but other portions of the identified prior art may additionally disclose, either expressly or inherently, and/or render obvious one or more limitations of the asserted claims. The inclusion of specific details in some areas is not a concession that such details are required or that the omission of similar details in other areas is a defect. These citations to portions of any reference in this chart are exemplary only. Thus, Samsung reserves the right to rely on: (1) uncited portions of the identified prior art; (2) other prior art not identified herein; (3) references that show the state of the art (irrespective of whether such references themselves qualify as prior art to the asserted patents); (4) factual testimony from the inventors or authors of the prior art references, or purveyors of prior art devices; and/or (5) expert testimony, to provide context to or aid in understanding the prior art and the state of the art at the time of the alleged inventions.

’848 Patent Claim Limitation	Gallagher Exemplary Disclosure
[8pre] 8. A recording and reproducing apparatus for recording and reproducing image information, comprising:	To the extent the preamble is limiting, Gallagher discloses “[a] recording and reproducing apparatus for recording and reproducing image information.” For example:

Gallagher at Fig. 1

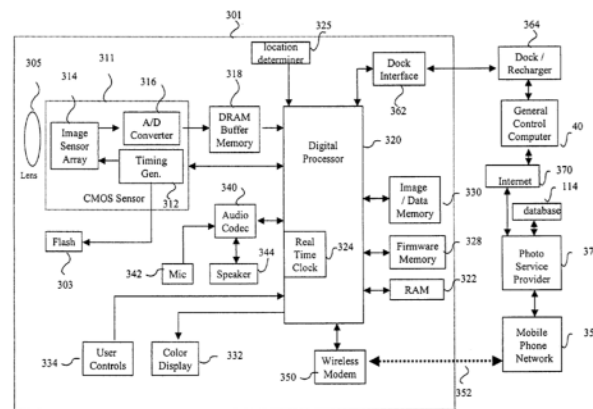


FIG. 1

Gallagher at [0003]–[0004]

With the advent of digital photography, consumers are amassing large collections of digital images and videos. The average number of images captures with digital cameras per photographer is still increasing each year. As a consequence, the organization and retrieval of images and videos is already a problem for the typical consumer. Currently, the length of time spanned by a typical consumer's digital image collection is only a few years. The organization and retrieval problem will continue to grow as the length of time spanned by the average digital image and video collection increases.

A user desires to find images and videos containing a particular person of interest. The user can perform a manual search to find images and videos containing the person of interest. However this is a slow, laborious process. Even though some commercial software (e.g. Adobe Album) allows users to tag images with labels indicating the people in the images so that searches can later be done, the initial labeling process is still very tedious and time consuming.

Gallagher at [0007]–[0011]

It is an object of the present invention to readily identify objects or persons of interests in images or videos in a digital image collection. This object is achieved by a method of identifying a particular person in a digital image collection, wherein at least one of the images in the digital image collection contains more than one person, comprising:

(a) providing at least one first label for a first image in the digital image collection containing a particular person and at least one other person; wherein the first label identifies the particular person and a second label for a second image in the digital image collection that identifies the particular person;

'848 Patent Claim Limitation	Gallagher Exemplary Disclosure
	(b) using the first and second labels to identify the particular person; (c) determining features related to the particular person from the first image or second image or both; and (d) using such particular features to identify another image in the digital image collection believed to contain the particular person. Gallagher at [0036]–[0040] FIG. 1 is a block diagram of a digital camera phone 301 based imaging system that can implement the present invention. The digital camera phone 301 is one type of digital camera. Preferably, the digital camera phone 301 is a portable battery operated device, small enough to be easily handheld by a user when capturing and reviewing images. The digital camera phone 301 produces digital images that are stored using the image data/memory 330, which can be, for example, internal Flash EPROM memory, or a removable memory card. Other types of digital image storage media, such as magnetic hard drives, magnetic tape, or optical disks, can alternatively be used to provide the image/data memory 330. The digital camera phone 301 includes a lens 305 that focuses light from a scene (not shown) onto an image sensor array 314 of a CMOS image sensor 311. The image sensor array 314 can provide color image information using the well-known Bayer color filter pattern. The image sensor array 314 is controlled by timing generator 312, which also controls a flash 303 in order to illuminate the scene when the ambient illumination is low. The image sensor array 314 can have, for example, 1280 columns×960 rows of pixels. In some embodiments, the digital camera phone 301 can also store video clips, by summing multiple pixels of the image sensor array 314 together (e.g. summing pixels of the same color within each 4 column×4 row area of the image sensor array 314) to create a lower resolution video image frame. The video image frames are read from the image sensor array 314 at regular intervals, for example using a 24 frame per second readout rate. The analog output signals from the image sensor array 314 are amplified and converted to digital data by the analog-to-digital (A/D) converter circuit 316 on the CMOS image sensor 311. The digital data is stored in a DRAM buffer memory 318 and subsequently processed by a digital processor 320 controlled by the firmware stored in firmware memory 328, which can be flash EPROM memory. The digital processor 320 includes a real-time clock 324, which keeps the date and time even when the digital camera phone 301 and digital processor 320 are in their low power state. The processed digital image files are stored in the image/data memory 330. The image/data memory 330 can also be used to store the user's personal calendar information, as will be described later in reference

'848 Patent Claim Limitation	Gallagher Exemplary Disclosure
	to FIG. 11. The image/data memory can also store other types of data, such as phone numbers, to-do lists, and the like. Gallagher at [0048]–[0049] An embodiment of the invention is illustrated in FIG. 2. A digital image collection 102 containing people is searched for a person of interest by a person finder 108. A digital image collection subset 112 is the set of images from the digital image collection 102 believed to contain the person of interest. The digital image collection 102 includes both images and videos. For convenience, the term “image” refers to both single images and videos. Videos are a collection of images with accompanying audio and sometimes text. The digital image collection subset 112 is displayed on the display 332 for review by the human user. The search for a person of interest is initiated by a user as follows: Images or videos of the digital image collection 102 are displayed on the display 332 and viewed by the user. The user establishes one or more labels for one or more of the images with a labeler 104. A feature extractor 106 extracts features from the digital image collection in association with the label(s) from the labeler 104. The features are stored in association with labels in a database 114. A person detector 110 can optionally be used to assist in the labeling and feature extraction. When the digital image collection subset 112 is displayed on the display 332, the user can review the results and further label the displayed images. To the extent Maxell contends Gallagher does not disclose this limitation, a person of ordinary skill in the art would have readily arrived at this limitation by combining or modifying it in view of their general knowledge and/or the prior art references disclosed in the corresponding section of Samsung’s Invalidity Contentions.
[8a] a processor; and	Gallagher discloses “a processor.” For example:

Gallagher at Fig. 1

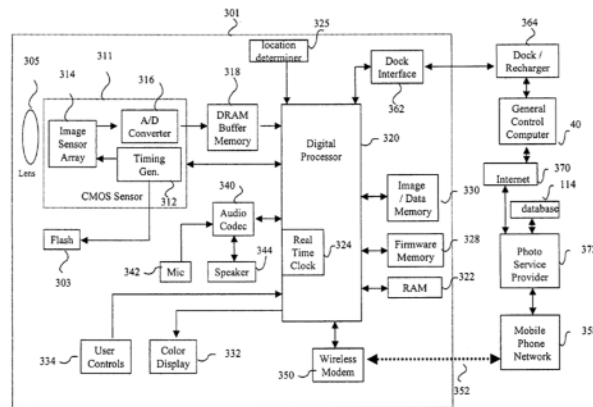


FIG. 1

Gallagher at Fig. 2

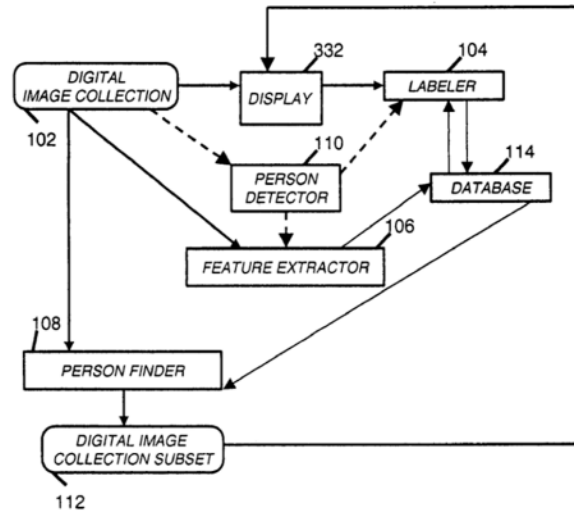


FIG. 2

Gallagher at [0036]–[0040]

'848 Patent Claim Limitation	Gallagher Exemplary Disclosure
	FIG. 1 is a block diagram of a digital camera phone 301 based imaging system that can implement the present invention. The digital camera phone 301 is one type of digital camera. Preferably, the digital camera phone 301 is a portable battery operated device, small enough to be easily handheld by a user when capturing and reviewing images. The digital camera phone 301 produces digital images that are stored using the image data/memory 330, which can be, for example, internal Flash EPROM memory, or a removable memory card. Other types of digital image storage media, such as magnetic hard drives, magnetic tape, or optical disks, can alternatively be used to provide the image/data memory 330. The digital camera phone 301 includes a lens 305 that focuses light from a scene (not shown) onto an image sensor array 314 of a CMOS image sensor 311. The image sensor array 314 can provide color image information using the well-known Bayer color filter pattern. The image sensor array 314 is controlled by timing generator 312, which also controls a flash 303 in order to illuminate the scene when the ambient illumination is low. The image sensor array 314 can have, for example, 1280 columns×960 rows of pixels. In some embodiments, the digital camera phone 301 can also store video clips, by summing multiple pixels of the image sensor array 314 together (e.g. summing pixels of the same color within each 4 column×4 row area of the image sensor array 314) to create a lower resolution video image frame. The video image frames are read from the image sensor array 314 at regular intervals, for example using a 24 frame per second readout rate. The analog output signals from the image sensor array 314 are amplified and converted to digital data by the analog-to-digital (A/D) converter circuit 316 on the CMOS image sensor 311. The digital data is stored in a DRAM buffer memory 318 and subsequently processed by a digital processor 320 controlled by the firmware stored in firmware memory 328, which can be flash EPROM memory. The digital processor 320 includes a real-time clock 324, which keeps the date and time even when the digital camera phone 301 and digital processor 320 are in their low power state. The processed digital image files are stored in the image/data memory 330. The image/data memory 330 can also be used to store the user's personal calendar information, as will be described later in reference to FIG. 11. The image/data memory can also store other types of data, such as phone numbers, to-do lists, and the like. To the extent Maxell contends Gallagher does not disclose this limitation, a person of ordinary skill in the art would have readily arrived at this limitation by combining or modifying it in view of their general knowledge and/or the prior art references disclosed in the corresponding section of Samsung's Invalidity Contentions.

'848 Patent Claim Limitation

[8b] a memory coupled to the processor and storing instructions that, when executed by the processor, cause the processor to:

Gallagher Exemplary Disclosure

Gallagher discloses “a memory coupled to the processor and storing instructions” therefor. For example: Gallagher at Fig. 1

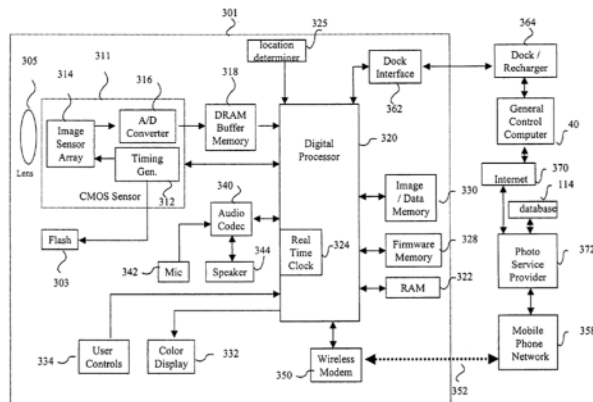


FIG. 1

Gallagher at Fig. 2

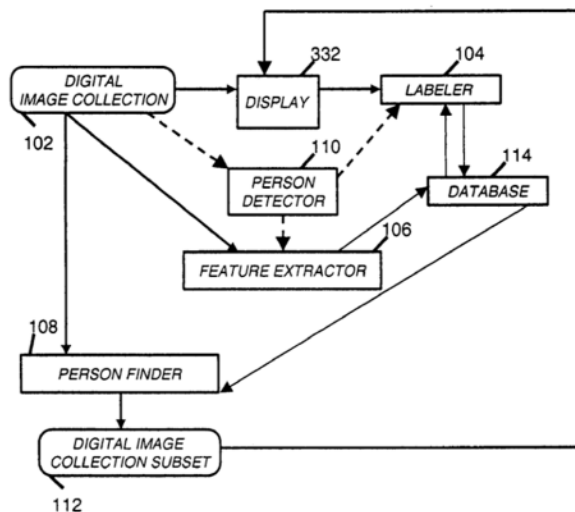


FIG. 2

'848 Patent Claim Limitation	Gallagher Exemplary Disclosure
	Gallagher at [0036]–[0040] FIG. 1 is a block diagram of a digital camera phone 301 based imaging system that can implement the present invention. The digital camera phone 301 is one type of digital camera. Preferably, the digital camera phone 301 is a portable battery operated device, small enough to be easily handheld by a user when capturing and reviewing images. The digital camera phone 301 produces digital images that are stored using the image data/memory 330, which can be, for example, internal Flash EPROM memory, or a removable memory card. Other types of digital image storage media, such as magnetic hard drives, magnetic tape, or optical disks, can alternatively be used to provide the image/data memory 330. The digital camera phone 301 includes a lens 305 that focuses light from a scene (not shown) onto an image sensor array 314 of a CMOS image sensor 311. The image sensor array 314 can provide color image information using the well-known Bayer color filter pattern. The image sensor array 314 is controlled by timing generator 312, which also controls a flash 303 in order to illuminate the scene when the ambient illumination is low. The image sensor array 314 can have, for example, 1280 columns×960 rows of pixels. In some embodiments, the digital camera phone 301 can also store video clips, by summing multiple pixels of the image sensor array 314 together (e.g. summing pixels of the same color within each 4 column×4 row area of the image sensor array 314) to create a lower resolution video image frame. The video image frames are read from the image sensor array 314 at regular intervals, for example using a 24 frame per second readout rate. The analog output signals from the image sensor array 314 are amplified and converted to digital data by the analog-to-digital (A/D) converter circuit 316 on the CMOS image sensor 311. The digital data is stored in a DRAM buffer memory 318 and subsequently processed by a digital processor 320 controlled by the firmware stored in firmware memory 328, which can be flash EPROM memory. The digital processor 320 includes a real-time clock 324, which keeps the date and time even when the digital camera phone 301 and digital processor 320 are in their low power state. The processed digital image files are stored in the image/data memory 330. The image/data memory 330 can also be used to store the user's personal calendar information, as will be described later in reference to FIG. 11. The image/data memory can also store other types of data, such as phone numbers, to-do lists, and the like. To the extent Maxell contends Gallagher does not disclose this limitation, a person of ordinary skill in the art would have readily arrived at this limitation by combining or modifying it in view of their general knowledge and/or the prior art references disclosed in the corresponding section of Samsung's Invalidity Contentions.

'848 Patent Claim Limitation

[8c] capture a photograph and generate image information of the photograph;

Gallagher Exemplary Disclosure

Gallagher discloses “capture a photograph and generate image information of the photograph.” For example: Gallagher at Fig. 1

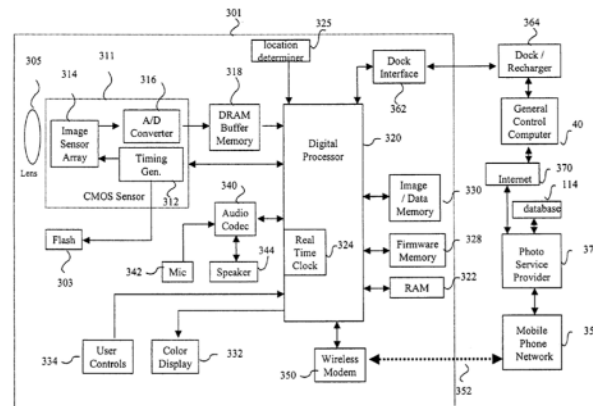


FIG. 1

Gallagher at Fig. 2

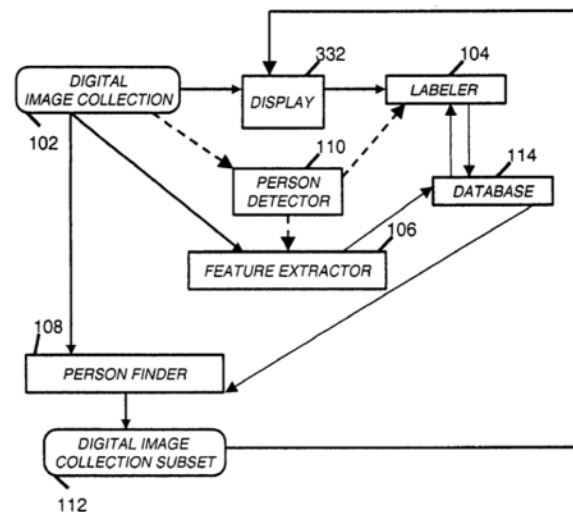


FIG. 2

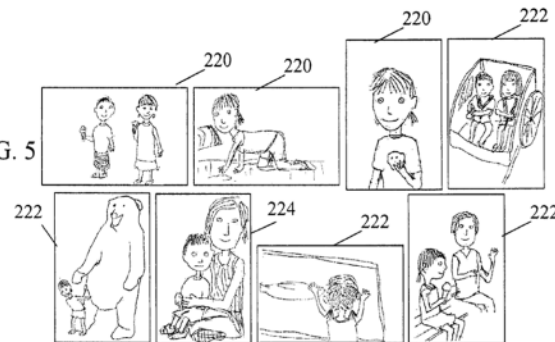
Gallagher at Fig. 4

FIG. 4



Gallagher at Fig. 5

FIG. 5



Gallagher at Fig. 6

FIG. 6



Gallagher at [0036]–[0040]

FIG. 1 is a block diagram of a digital camera phone 301 based imaging system that can implement the present invention. The digital camera phone 301 is one type of digital camera. Preferably, the digital camera phone 301 is a portable battery operated device, small enough to be easily handheld by a user when capturing and reviewing images. The digital camera phone 301 produces digital images that are stored using the image data/memory 330, which can be, for example, internal Flash EPROM memory, or

'848 Patent Claim Limitation	Gallagher Exemplary Disclosure
	a removable memory card. Other types of digital image storage media, such as magnetic hard drives, magnetic tape, or optical disks, can alternatively be used to provide the image/data memory 330. The digital camera phone 301 includes a lens 305 that focuses light from a scene (not shown) onto an image sensor array 314 of a CMOS image sensor 311. The image sensor array 314 can provide color image information using the well-known Bayer color filter pattern. The image sensor array 314 is controlled by timing generator 312, which also controls a flash 303 in order to illuminate the scene when the ambient illumination is low. The image sensor array 314 can have, for example, 1280 columns×960 rows of pixels. In some embodiments, the digital camera phone 301 can also store video clips, by summing multiple pixels of the image sensor array 314 together (e.g. summing pixels of the same color within each 4 column×4 row area of the image sensor array 314) to create a lower resolution video image frame. The video image frames are read from the image sensor array 314 at regular intervals, for example using a 24 frame per second readout rate. The analog output signals from the image sensor array 314 are amplified and converted to digital data by the analog-to-digital (A/D) converter circuit 316 on the CMOS image sensor 311. The digital data is stored in a DRAM buffer memory 318 and subsequently processed by a digital processor 320 controlled by the firmware stored in firmware memory 328, which can be flash EPROM memory. The digital processor 320 includes a real-time clock 324, which keeps the date and time even when the digital camera phone 301 and digital processor 320 are in their low power state. The processed digital image files are stored in the image/data memory 330. The image/data memory 330 can also be used to store the user's personal calendar information, as will be described later in reference to FIG. 11. The image/data memory can also store other types of data, such as phone numbers, to-do lists, and the like. To the extent Maxell contends Gallagher does not disclose this limitation, a person of ordinary skill in the art would have readily arrived at this limitation by combining or modifying it in view of their general knowledge and/or the prior art references disclosed in the corresponding section of Samsung's Invalidity Contentions.
[8d] record the image information in a recording medium;	Gallagher discloses "record the image information in a recording medium." For example:

Gallagher at Fig. 1

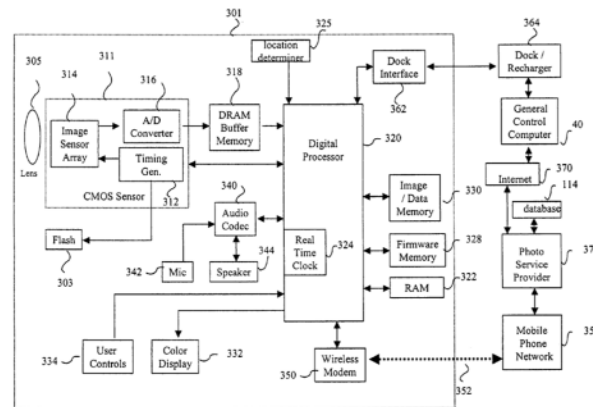


FIG. 1

Gallagher at Fig. 2

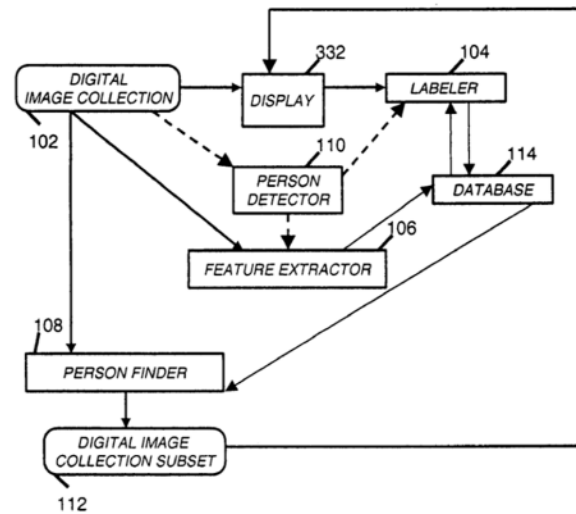
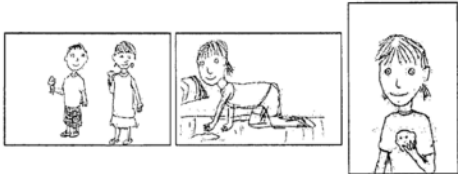
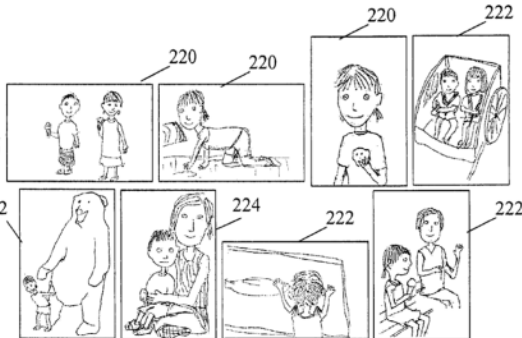


FIG. 2

Gallagher at Fig. 4

'848 Patent Claim Limitation	Gallagher Exemplary Disclosure
	FIG. 4  Gallagher at Fig. 5 FIG. 5  Gallagher at Fig. 6 FIG. 6  Gallagher at [0036]–[0040] FIG. 1 is a block diagram of a digital camera phone 301 based imaging system that can implement the present invention. The digital camera phone 301 is one type of digital camera. Preferably, the digital camera phone 301 is a portable battery operated device, small enough to be easily handheld by a user when capturing and reviewing images. The digital camera phone 301 produces digital images that are stored using the image data/memory 330, which can be, for example, internal Flash EPROM memory, or

'848 Patent Claim Limitation	Gallagher Exemplary Disclosure
	a removable memory card. Other types of digital image storage media, such as magnetic hard drives, magnetic tape, or optical disks, can alternatively be used to provide the image/data memory 330. The digital camera phone 301 includes a lens 305 that focuses light from a scene (not shown) onto an image sensor array 314 of a CMOS image sensor 311. The image sensor array 314 can provide color image information using the well-known Bayer color filter pattern. The image sensor array 314 is controlled by timing generator 312, which also controls a flash 303 in order to illuminate the scene when the ambient illumination is low. The image sensor array 314 can have, for example, 1280 columns×960 rows of pixels. In some embodiments, the digital camera phone 301 can also store video clips, by summing multiple pixels of the image sensor array 314 together (e.g. summing pixels of the same color within each 4 column×4 row area of the image sensor array 314) to create a lower resolution video image frame. The video image frames are read from the image sensor array 314 at regular intervals, for example using a 24 frame per second readout rate. The analog output signals from the image sensor array 314 are amplified and converted to digital data by the analog-to-digital (A/D) converter circuit 316 on the CMOS image sensor 311. The digital data is stored in a DRAM buffer memory 318 and subsequently processed by a digital processor 320 controlled by the firmware stored in firmware memory 328, which can be flash EPROM memory. The digital processor 320 includes a real-time clock 324, which keeps the date and time even when the digital camera phone 301 and digital processor 320 are in their low power state. The processed digital image files are stored in the image/data memory 330. The image/data memory 330 can also be used to store the user's personal calendar information, as will be described later in reference to FIG. 11. The image/data memory can also store other types of data, such as phone numbers, to-do lists, and the like. Gallagher at [0041] In the still image mode, the digital processor 320 performs color interpolation followed by color and tone correction, in order to produce rendered sRGB image data. The digital processor 320 can also provide various image sizes selected by the user. The rendered sRGB image data is then JPEG compressed and stored as a JPEG image file in the image/data memory 330. The JPEG file uses the so-called “Exif” image format described earlier. This format includes an Exif application segment that stores particular image metadata using various TIFF tags. Separate TIFF tags can be used, for example, to store the date and time the picture was captured, the lens f/number and other camera settings, and to store image captions. In particular, the ImageDescription tag can be used to store labels. The real-time clock 324 provides a capture date/time value, which is stored as date/time metadata in each Exif image file.

'848 Patent Claim Limitation	Gallagher Exemplary Disclosure
	Gallagher at [0069]–[0073] Image/video capture time. Image capture time can be a precise minute in time, e.g. Mar. 27, 2004 at 10:17 AM. Or the image capture time can be less precise, e.g. 2004 or March 2004. The image capture time can be in the form of a probability distribution function e.g. Mar. 27, 2004 $\pm$ 2 days with 95% confidence. Often times the capture time is embedded in the file header of the digital image or video. For example, the EXIF image format (described at www.exif.org) allows the image or video capture device to store information associated with the image or video in the file header. The “Date\Time” entry is associated with the date and time the image was captured. In some cases, the digital image or video results from scanning film and the image capture time is determined by detection of the date printed into the image (as is often done at capture time) area, usually in the lower left corner of the image. The date a photograph is printed is often printed on the back of the print. Alternatively, some film systems contain a magnetic layer in the film for storing information such as the capture date. Capture condition metadata (e.g. flash fire information, shutter speed, aperture, ISO, scene brightness, etc.) Geographic location. The location is preferably stored in units of latitude and longitude. Scene environment information. Scene environment information is information derived from the pixel values of an image or video in regions not containing a person. For example, the mean value of the non-people regions in an image or video is an example of scene environment information. Another example of scene environment information is texture samples (e.g. a sampling of pixel values from a region of wallpaper in an image). Geographic location and scene environment information are important clues to the identity of persons in the associated images. For example, a photographer's visit to grandmother's house could be the only location where grandmother is photographed. When two images are captured with similar geographic locations and environments, it is more likely that detected persons in the two images are the same as well. Scene environment information can be used by the person detector 110 to register two images. This is useful when the people being photographed are mostly stationary, but the camera moves slightly between consecutive photographs. The scene environment information is used to register the two images, thereby aligning the positions of the people in the two frames. This alignment is used by the person finder 108 because when two persons have the same position in two images captured closely in time and registered, then the likelihood that the two people are the same individual is high. To the extent Maxell contends Gallagher does not disclose this limitation, a person of ordinary skill in the art would have readily arrived at this limitation by combining or modifying it in view of their general knowledge and/or the prior art references disclosed in the corresponding section of Samsung's Invalidity Contentions.

'848 Patent Claim Limitation

[8e] execute a face-recognizing process on the image information to recognize a face;

Gallagher Exemplary Disclosure

Gallagher discloses “execute a face-recognizing process on the image information to recognize a face.” For example:

Gallagher at Fig. 2

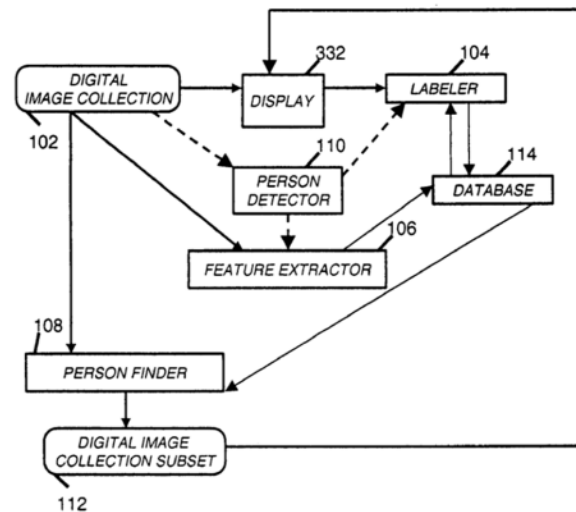
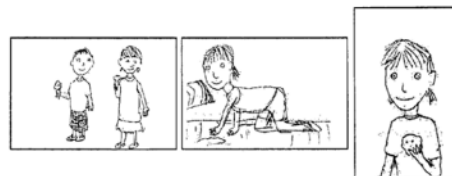


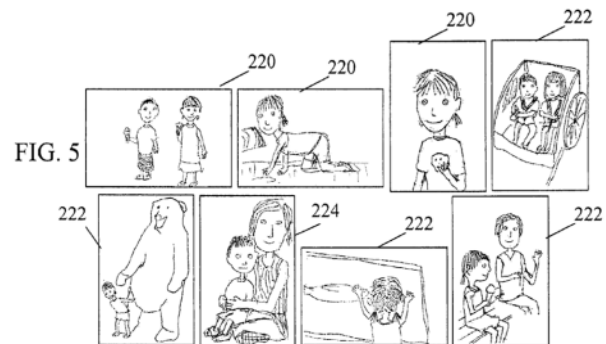
FIG. 2

Gallagher at Fig. 4

FIG. 4



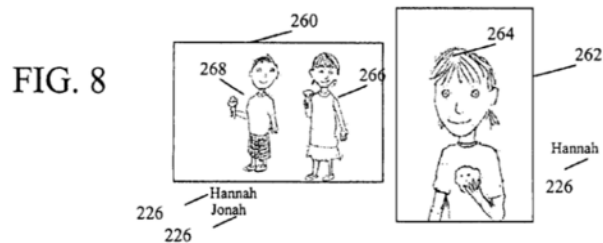
Gallagher at Fig. 5



Gallagher at Fig. 6



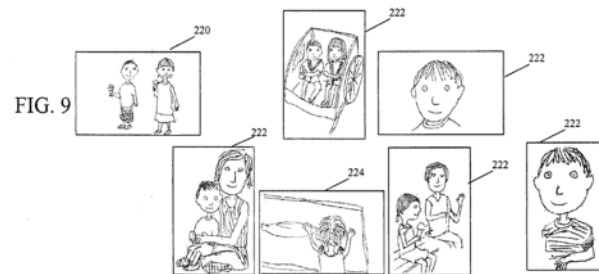
Gallagher at Fig. 8



Gallagher at Fig. 9

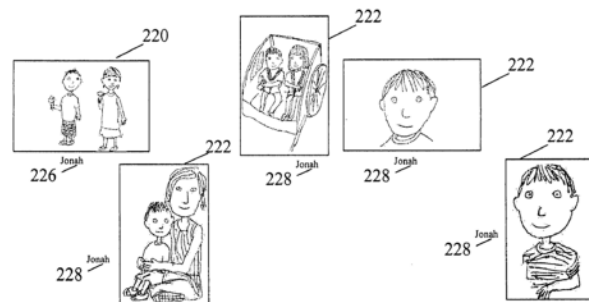
'848 Patent Claim Limitation

Gallagher Exemplary Disclosure



Gallagher at Fig. 10

FIG. 10



Gallagher at Fig. 11

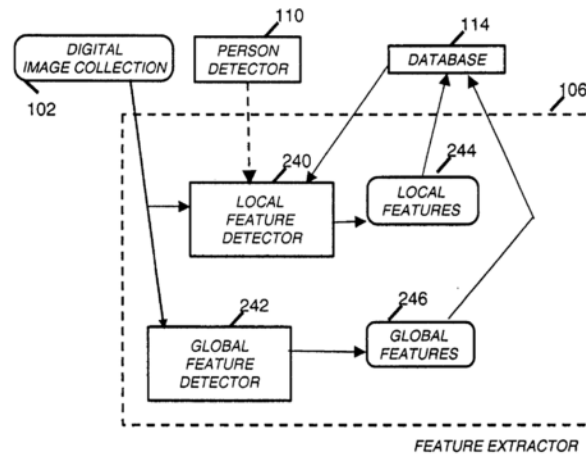


FIG. 11

Gallagher at Fig. 12A

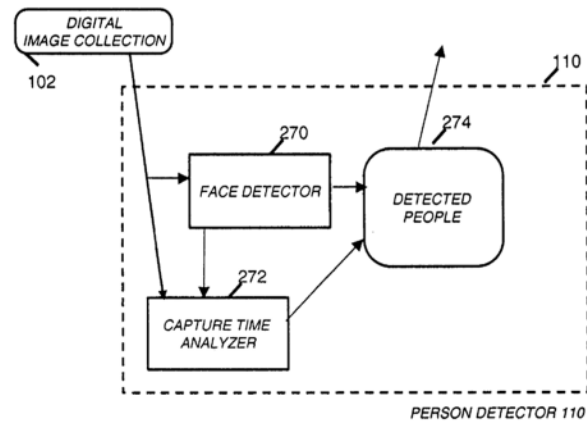


FIG. 12A

Gallagher at Fig. 13

'848 Patent Claim Limitation

Gallagher Exemplary Disclosure

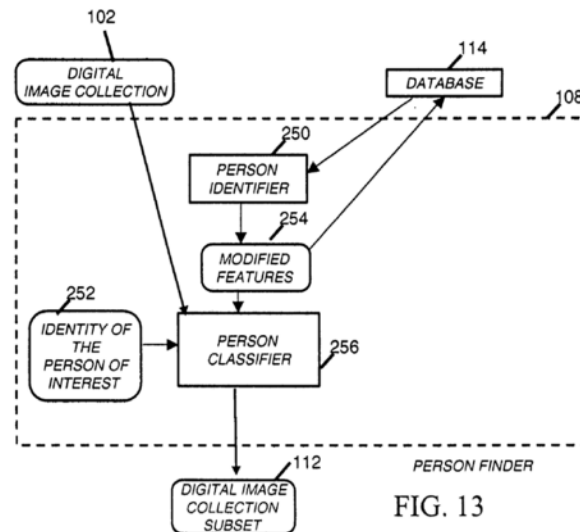


FIG. 13

Gallagher at Fig. 15

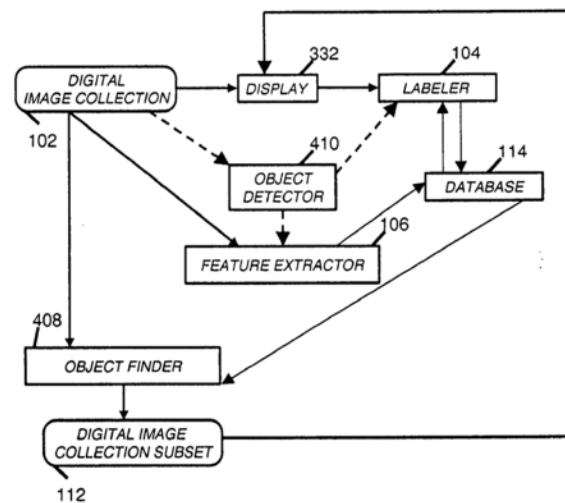


FIG. 15

Gallagher at [0007]–[0011]

It is an object of the present invention to readily identify objects or persons of interests in images or videos in a digital image collection. This object is achieved by a method of identifying a particular person in a digital image collection, wherein at least one of the images in the digital image collection contains more than one person, comprising:

- (a) providing at least one first label for a first image in the digital image collection containing a particular person and at least one other person; wherein the first label identifies the particular person and a second label for a second image in the digital image collection that identifies the particular person;
- (b) using the first and second labels to identify the particular person;
- (c) determining features related to the particular person from the first image or second image or both;
- and
- (d) using such particular features to identify another image in the digital image collection believed to contain the particular person.

Gallagher at [0036]–[0040]

FIG. 1 is a block diagram of a digital camera phone 301 based imaging system that can implement the present invention. The digital camera phone 301 is one type of digital camera. Preferably, the digital camera phone 301 is a portable battery operated device, small enough to be easily handheld by a user when capturing and reviewing images. The digital camera phone 301 produces digital images that are stored using the image data/memory 330, which can be, for example, internal Flash EPROM memory, or a removable memory card. Other types of digital image storage media, such as magnetic hard drives, magnetic tape, or optical disks, can alternatively be used to provide the image/data memory 330.

The digital camera phone 301 includes a lens 305 that focuses light from a scene (not shown) onto an image sensor array 314 of a CMOS image sensor 311. The image sensor array 314 can provide color image information using the well-known Bayer color filter pattern. The image sensor array 314 is controlled by timing generator 312, which also controls a flash 303 in order to illuminate the scene when the ambient illumination is low. The image sensor array 314 can have, for example, 1280 columns×960 rows of pixels.

In some embodiments, the digital camera phone 301 can also store video clips, by summing multiple pixels of the image sensor array 314 together (e.g. summing pixels of the same color within each 4 column×4 row area of the image sensor array 314) to create a lower resolution video image frame. The video image frames are read from the image sensor array 314 at regular intervals, for example using a 24 frame per second readout rate.

The analog output signals from the image sensor array 314 are amplified and converted to digital data by the analog-to-digital (A/D) converter circuit 316 on the CMOS image sensor 311. The digital data is

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	stored in a DRAM buffer memory 318 and subsequently processed by a digital processor 320 controlled by the firmware stored in firmware memory 328, which can be flash EPROM memory. The digital processor 320 includes a real-time clock 324, which keeps the date and time even when the digital camera phone 301 and digital processor 320 are in their low power state. The processed digital image files are stored in the image/data memory 330. The image/data memory 330 can also be used to store the user's personal calendar information, as will be described later in reference to FIG. 11. The image/data memory can also store other types of data, such as phone numbers, to-do lists, and the like. Gallagher at [0048]–[0049] An embodiment of the invention is illustrated in FIG. 2. A digital image collection 102 containing people is searched for a person of interest by a person finder 108. A digital image collection subset 112 is the set of images from the digital image collection 102 believed to contain the person of interest. The digital image collection 102 includes both images and videos. For convenience, the term “image” refers to both single images and videos. Videos are a collection of images with accompanying audio and sometimes text. The digital image collection subset 112 is displayed on the display 332 for review by the human user. The search for a person of interest is initiated by a user as follows: Images or videos of the digital image collection 102 are displayed on the display 332 and viewed by the user. The user establishes one or more labels for one or more of the images with a labeler 104. A feature extractor 106 extracts features from the digital image collection in association with the label(s) from the labeler 104. The features are stored in association with labels in a database 114. A person detector 110 can optionally be used to assist in the labeling and feature extraction. When the digital image collection subset 112 is displayed on the display 332, the user can review the results and further label the displayed images. Gallagher at [0050]–[0057] A label from the labeler 104 indicates that a particular image or video contains a person of interest and includes at least one of the following: (1) the name of a person of interest in an image or video. A person's name can be a given name or a nickname. (2) an identifier associated with the person of interest such as a text string or identifier such as “Person A” or “Person B”. (3) the location of the person of interest within the image or video. Preferably, the location of the person of interest is specified by the coordinates (e.g. the pixel address of row and column) of the eyes of the

'848 Patent Claim Limitation	Gallagher Exemplary Disclosure
	person of interest (and the associated frame number in the case of video). Alternatively, the location of the person of interest can be specified by coordinates of a box that surrounds the body or the face of the person of interest. As a further alternative, the location of the person of interest can be specified by coordinates indicating a position contained within the person of interest. The user can indicate the location of the person of interest by using a mouse to click on the positions of the eyes for example. When the person detector 110 detects a person, the position of the person can be highlighted to the user by, for example, circling the face on the display 332. Then the user can provide the name or identifier for the highlighted person, thereby associating the position of the person with the user provided label. When more than one person is detected in an image, the positions of the persons can be highlighted in turn and labels can be provided by the user for any of the people. (4) an indication to search for images or videos from the image collection believed to contain the person of interest. (5) the name or identifier of a person of interest who is not in the image. The digital image collection 102 contains at least one image having more than one person. A label is provided by the user via the labeler 104, indicating that the image contains a person of interest. Features related to the person of interest are determined by the feature extractor 106, and these features are used by the person finder 108 to identify other images in the collection that are believed to contain the person of interest. Note that the terms “tag”, “caption”, and “annotation” are used synonymously with the term “label.” Gallagher at [0063]–[0064] FIG. 7 is a flow diagram showing an alternative method for identifying images believed to contain a person of interest. In this embodiment, a user labels the people in one or more images or videos, initiates a search for a person of interest, and the system determines and displays images or videos from a subset of the digital image collection 102 believed to contain the person of interest. The displayed images can be reviewed by the user, and the user can indicate whether the displayed images do contain the person of interest. In addition, the user can verify or provide the name of the person of interest. Finally, based on the input from the user, the system can again determine a set of images believed to contain the person of interest. In block 202, images are displayed on the display 332. In block 204, the user selects images, where each image contains the person of interest. At least one of the selected images contains more than one person. In block 206, the user provides labels via the labeler 104 to identify the people in the selected images. Preferably, the label does not indicate the location of persons within the image or video. Preferably, the label indicates the name of the person or people in the selected images or videos. FIG. 8 shows two

'848 Patent Claim Limitation	Gallagher Exemplary Disclosure
	selected images and the associated labels 226 indicating the names of people in each of the two selected images. In block 207, the user initiates a search for a person of interest. The person of interest is the name of a person that has been used as a label when labeling people in selected images. For example, the user initiates a search for images of “Jonah.” In block 208, the person identifier accesses the features from the features extractor 106 and associated labels stored in the database 114 and determines the digital image collection subset 112 of images and videos believed to contain the person of interest. In block 210, the digital image collection subset 112 is displayed on the display 332. FIG. 9 shows that the digital image collection subset 112 contains labeled images 220, images correctly believed to contain the person of interest 222, and images incorrectly believed to contain the person of interest 224. This is a consequence of the imperfect nature of current face detection and recognition technology. In block 212, the user reviews the digital image collection subset 112 and can indicate the correctness of each image in the digital image collection subset 112. This user indication of correctness is used to provide additional labels via the labeler 104 in block 204. For example, the user indicates via the user interface that all of the images and videos correctly believes to contain the person of interest 222 of the digital image collection subset 112 do contain the person of interest. The user can also indicate, via the user interface, those images of the images and videos of the digital image collection subset 112 do not contain the person of interest. The indicated images are then removed from the digital image collection subset 112, and the remaining images can be labeled as previously described. Each image and video of the digital image collection subset 112 is then labeled with the name of the person of interest. The user can review the name of the person of interest determined by the labeler 104 via the display. After the user indicates that the images and videos of the digital image collection subset 112 contain the person of interest, the message “Label as Jonah?” appears, and the user can confirm the determined name of the person of interest by pressing “yes”, or enter a different name for the person of interest by pressing “no.” FIG. 10 shows the digital image collection subset 112 after the user has removed images incorrectly believed to contain the person of interest, and an automatically generated label 228 used to label the images that have been reviewed by the user. Gallagher at [0065] Note that the person of interest and images or videos can be selected by any user interface known in the art. For example, if the display 332 is a touch sensitive display, then the approximate location of the person of interest can be found by determining the location that the user touches the display 332.

'848 Patent Claim Limitation	Gallagher Exemplary Disclosure
	Gallagher at [0075] An effective, person detector 110 is based on the image capture time associated with digital images and videos is described with regard to FIG. 12A. The images and videos of the digital image collection 102 are analyzed by a face detector 270, such as the aforementioned face detector by Jones and Viola. The face detector is tuned to provide detected people 274 while minimizing false detections. As a consequence, many people in images are not detected. This can be a consequence of, for example, having their back to the camera, or a hand over the face. The detected faces from the face detector 270 and the digital image collection 102 are passed to a capture time analyzer 272 to find images containing people that were missed by the face detector 270. The capture time analyzer 272 operates on the idea that, when two images are captured very close in time, it is likely that if an individual appears in one image, then he or she also appears in the other image as well. In fact, this relationship can be determined with fairly good accuracy by analyzing large collections of images when the identities of persons in the images are known. For processing videos, face tracking technology is used to find the position of a person across frames of the video. One method of face tracking is video is described in U.S. Pat. No. 6,700,999, where motion analysis is used to track faces in video. To the extent Maxell contends Gallagher does not disclose this limitation, a person of ordinary skill in the art would have readily arrived at this limitation by combining or modifying it in view of their general knowledge and/or the prior art references disclosed in the corresponding section of Samsung's Invalidity Contentions.
[8f] reproduce the recorded image from the recording medium;	Gallagher discloses "reproduce the recorded image from the recording medium." For example:

Gallagher at Fig. 2

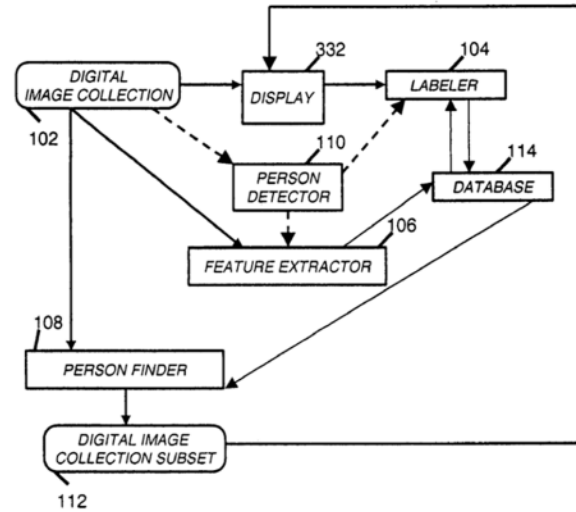
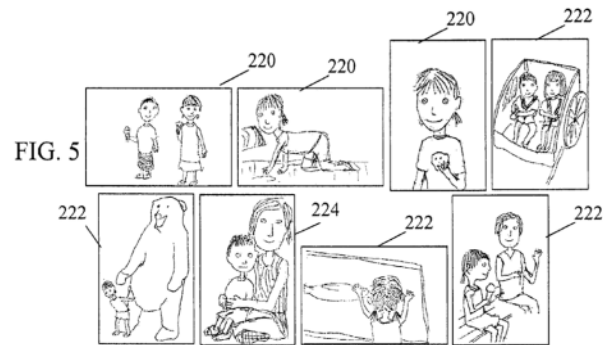


FIG. 2

Gallagher at Fig. 3

'848 Patent Claim Limitation	Gallagher Exemplary Disclosure
	<pre> graph TD 202[images or videos are displayed] --> 204[User selects image(s)] 204 --> 206[user provides a label] 206 --> 208[determine digital image collection subset] 208 --> 210[images and videos of subset are displayed] 210 --> 212[user reviews subset] 212 --> 214[user provides additional label] 214 --> 208 </pre> FIG. 3 Gallagher at Fig. 4 FIG. 4

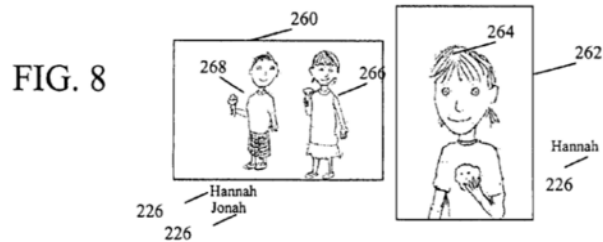
Gallagher at Fig. 5



Gallagher at Fig. 6



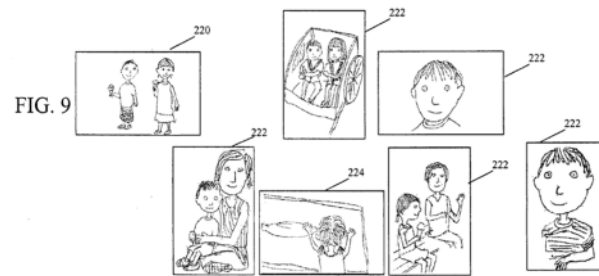
Gallagher at Fig. 8



Gallagher at Fig. 9

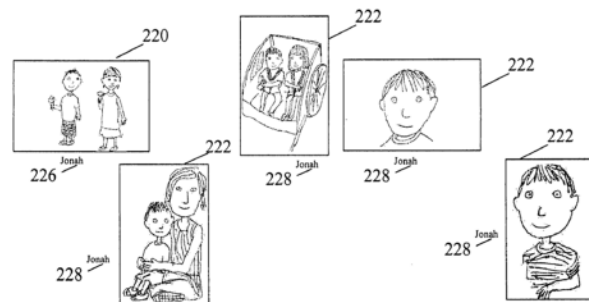
'848 Patent Claim Limitation

Gallagher Exemplary Disclosure



Gallagher at Fig. 10

FIG. 10



Gallagher at Fig. 13

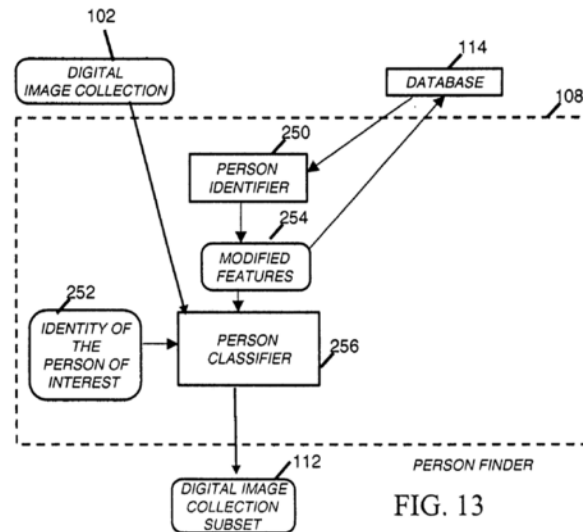


FIG. 13

Gallagher at Fig. 15

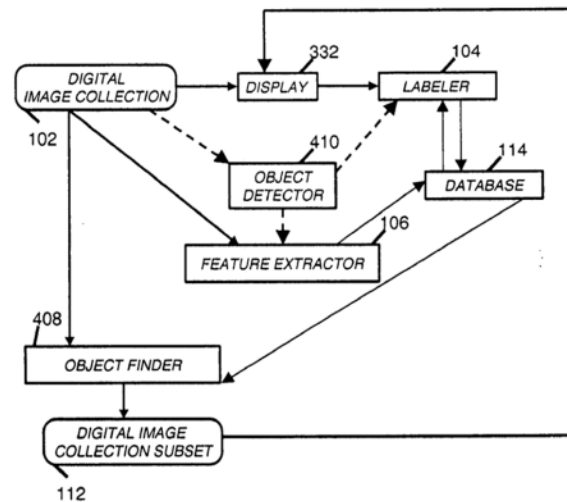


FIG. 15

Gallagher at [0043]

The digital processor 320 also creates a low-resolution “thumbnail” size image, which can be created as described in commonly-assigned U.S. Pat. No. 5,164,831 to Kuchta, et al., the disclosure of which is herein incorporated by reference. The thumbnail image can be stored in RAM memory 322 and supplied to a color display 332, which can be, for example, an active matrix LCD or organic light emitting diode (OLED). After images are captured, they can be quickly reviewed on the color LCD image display 332 by using the thumbnail image data.

Gallagher at [0048]–[0049]

An embodiment of the invention is illustrated in FIG. 2. A digital image collection 102 containing people is searched for a person of interest by a person finder 108. A digital image collection subset 112 is the set of images from the digital image collection 102 believed to contain the person of interest. The digital image collection 102 includes both images and videos. For convenience, the term “image” refers to both single images and videos. Videos are a collection of images with accompanying audio and sometimes text. The digital image collection subset 112 is displayed on the display 332 for review by the human user.

The search for a person of interest is initiated by a user as follows: Images or videos of the digital image collection 102 are displayed on the display 332 and viewed by the user. The user establishes one or more labels for one or more of the images with a labeler 104. A feature extractor 106 extracts features from the digital image collection in association with the label(s) from the labeler 104. The features are stored in association with labels in a database 114. A person detector 110 can optionally be used to assist in the labeling and feature extraction. When the digital image collection subset 112 is displayed on the display 332, the user can review the results and further label the displayed images.

Gallagher at [0063]–[0064]

FIG. 7 is a flow diagram showing an alternative method for identifying images believed to contain a person of interest. In this embodiment, a user labels the people in one or more images or videos, initiates a search for a person of interest, and the system determines and displays images or videos from a subset of the digital image collection 102 believed to contain the person of interest. The displayed images can be reviewed by the user, and the user can indicate whether the displayed images do contain the person of interest. In addition, the user can verify or provide the name of the person of interest. Finally, based on the input from the user, the system can again determine a set of images believed to contain the person of interest.

In block 202, images are displayed on the display 332. In block 204, the user selects images, where each image contains the person of interest. At least one of the selected images contains more than one person.

'848 Patent Claim Limitation	Gallagher Exemplary Disclosure
	In block 206, the user provides labels via the labeler 104 to identify the people in the selected images. Preferably, the label does not indicate the location of persons within the image or video. Preferably, the label indicates the name of the person or people in the selected images or videos. FIG. 8 shows two selected images and the associated labels 226 indicating the names of people in each of the two selected images. In block 207, the user initiates a search for a person of interest. The person of interest is the name of a person that has been used as a label when labeling people in selected images. For example, the user initiates a search for images of “Jonah.” In block 208, the person identifier accesses the features from the features extractor 106 and associated labels stored in the database 114 and determines the digital image collection subset 112 of images and videos believed to contain the person of interest. In block 210, the digital image collection subset 112 is displayed on the display 332. FIG. 9 shows that the digital image collection subset 112 contains labeled images 220, images correctly believed to contain the person of interest 222, and images incorrectly believed to contain the person of interest 224. This is a consequence of the imperfect nature of current face detection and recognition technology. In block 212, the user reviews the digital image collection subset 112 and can indicate the correctness of each image in the digital image collection subset 112. This user indication of correctness is used to provide additional labels via the labeler 104 in block 204. For example, the user indicates via the user interface that all of the images and videos correctly believes to contain the person of interest 222 of the digital image collection subset 112 do contain the person of interest. The user can also indicate, via the user interface, those images of the images and videos of the digital image collection subset 112 do not contain the person of interest. The indicated images are then removed from the digital image collection subset 112, and the remaining images can be labeled as previously described. Each image and video of the digital image collection subset 112 is then labeled with the name of the person of interest. The user can review the name of the person of interest determined by the labeler 104 via the display. After the user indicates that the images and videos of the digital image collection subset 112 contain the person of interest, the message “Label as Jonah?” appears, and the user can confirm the determined name of the person of interest by pressing “yes”, or enter a different name for the person of interest by pressing “no.” FIG. 10 shows the digital image collection subset 112 after the user has removed images incorrectly believed to contain the person of interest, and an automatically generated label 228 used to label the images that have been reviewed by the user. Gallagher at [0065] Note that the person of interest and images or videos can be selected by any user interface known in the art. For example, if the display 332 is a touch sensitive display, then the approximate location of the person of interest can be found by determining the location that the user touches the display 332.

Gallagher at [0137]–[0139]

In some cases, the modified features 254 form the person identifier 250 are straightforward to generate from the database 114. For example, when the database contains only global features and no local features, then the features associated with each label (whether or not the label contains position information) will be identical. For example, if the only feature is image capture time, then each label associated with the image is associated with the image capture time. Also, if the labels contain position information, then associating features with the labels is easy because either the features do not include local features and therefore the same features are associated with each label, or the features contain local features and the position of the image region over which the local features are computed is used to associate the features with the labels (based on proximity).

A person classifier 256 uses the modified features 254 and a identity of the person of interest 252 to determine a digital image collection subset 112 of images and videos believed to contain the person of interest. The modified features 254 includes some features having associated labels (known as labeled features). Other features (known as unlabeled features) do not have associated labels (e.g. all of the image and videos in the digital image collection 102 that were not labeled by the labeler 104). The person classifier 256 uses labeled features to classify the unlabeled features. This problem, although in practice quite difficult, is studied in the field of pattern recognition. Any classifier may be used to classify the unlabeled features. Preferably, the person classifier determines a proposed label for each of the unlabeled features and a confidence, belief, or probability associated with the proposed label. In general, classifiers assign labels to unlabeled features by considering the similarity between a particular set of unlabeled features and labeled sets of features. With some classifiers (e.g. Gaussian Maximum Likelihood), labeled sets of features associated with a single individual person are aggregated to form a model of appearance for the individual. The digital image collection subset 112 is the collection of images and videos having an associated proposed label with a probability that exceeds a threshold T_0 , where T_0 ranges from $0 \leq T_0 \leq 1.0$. Preferably, the digital image collection subset 112 also contains the image and videos associated with features having labels matching the identity of the person of interest 252. The images and videos of the digital image collection subset are sorted so that images and videos determined to have the highest belief of containing the person of interest appear at the top of the subset, following only the images and videos with features having labels matching the identity of the person of interest 252.

The person classifier 256 can measure the similarity between sets of features associated with two or more persons to determine the similarity of the persons, and thereby the likelihood that the persons are the same. Measuring the similarity of sets of features is accomplished by measuring the similarity of subsets of the features. For example, when the local features describe clothing, the following method is used to compare two sets of features. If the difference in image capture time is small (i.e. less than a few hours) and if the quantitative description of the clothing is similar in each of the two sets of features is

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	similar, then the likelihood of the two sets of local features belonging to the same person is increased. If, additionally, the clothes have a very unique or distinctive pattern (e.g. a shirt of large green, red, and blue patches) for both sets of local features, then the likelihood is even greater that the associated people are the same individual. Gallagher at [0146] Preferably, the user can adjust the value of T_0 through the user interface. As the value increases, the digital image collection subset 112 contains fewer images or videos, but the likelihood that the images and videos in the digital image collection subset 112 actually do contain the person of interest increases. In this manner, the user can determine the number and accuracy of the search results. To the extent Maxell contends Gallagher does not disclose this limitation, a person of ordinary skill in the art would have readily arrived at this limitation by combining or modifying it in view of their general knowledge and/or the prior art references disclosed in the corresponding section of Samsung's Invalidity Contentions.
[8g] register a person in the image information as a specific person in a mode selected from a first setting mode and a second setting mode, wherein, when the first setting mode is selected, a person with a face is obtained by newly photographing the person in a photographing mode and thereafter registered as the specific person, and,	Gallagher discloses "register a person in the image information as a specific person in a mode selected from a first setting mode and a second setting mode, wherein, when the first setting mode is selected, a person with a face is obtained by newly photographing the person in a photographing mode and thereafter registered as the specific person." For example:

Gallagher at Fig. 2

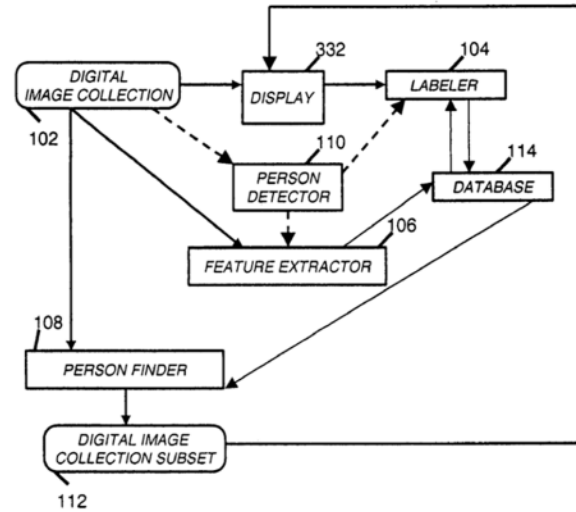
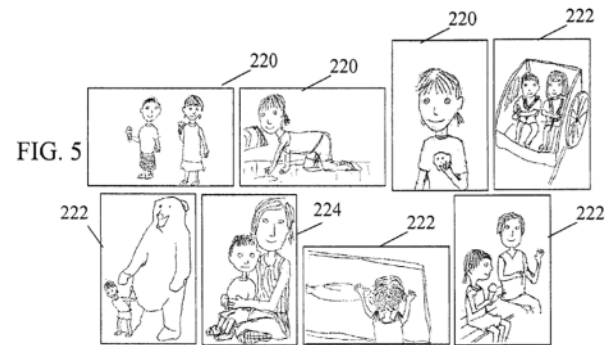


FIG. 2

Gallagher at Fig. 3

'848 Patent Claim Limitation	Gallagher Exemplary Disclosure
	<pre> graph TD 202[images or videos are displayed] --> 204[User selects image(s)] 204 --> 206[user provides a label] 206 --> 208[determine digital image collection subset] 208 --> 210[images and videos of subset are displayed] 210 --> 212[user reviews subset] 212 --> 214[user provides additional label] 214 --> 208 </pre> FIG. 3 Gallagher at Fig. 4 FIG. 4

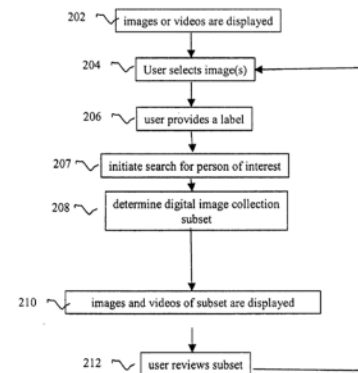
Gallagher at Fig. 5



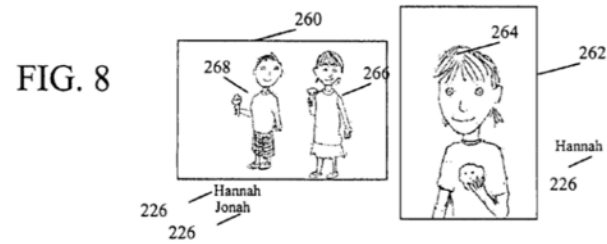
Gallagher at Fig. 6



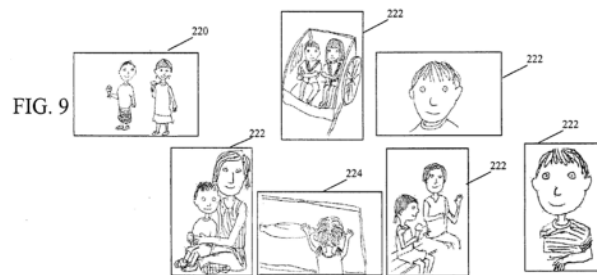
Gallagher at Fig. 7



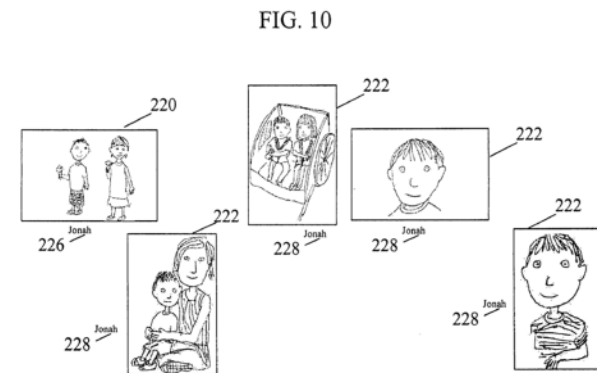
Gallagher at Fig. 8



Gallagher at Fig. 9



Gallagher at Fig. 10



Gallagher at Fig. 11

'848 Patent Claim Limitation

Gallagher Exemplary Disclosure

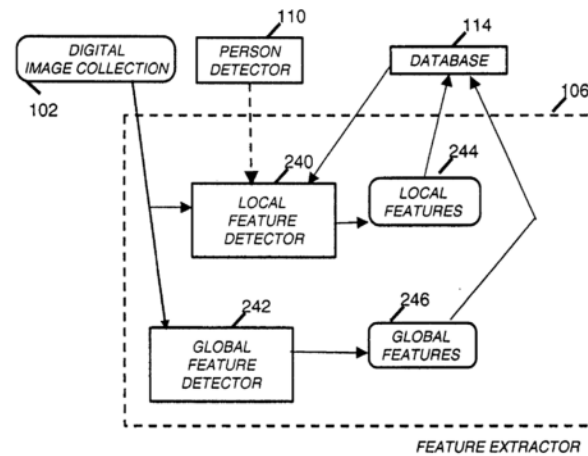


FIG. 11

Gallagher at Fig. 12A

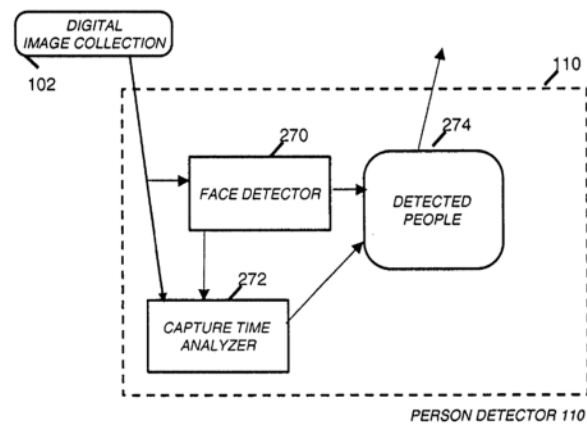


FIG. 12A

Gallagher at Fig. 13

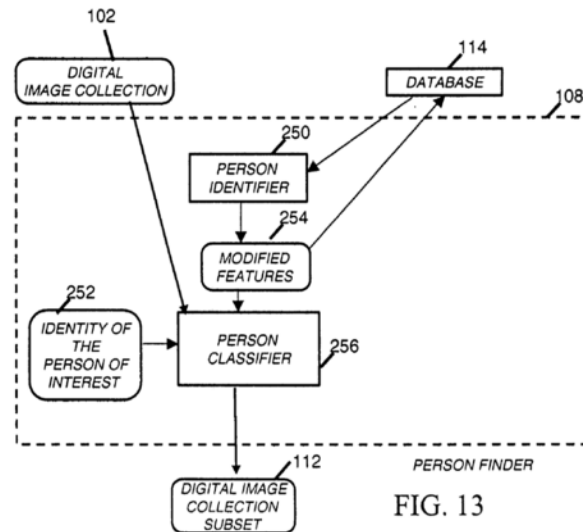


FIG. 13

Gallagher at Fig. 15

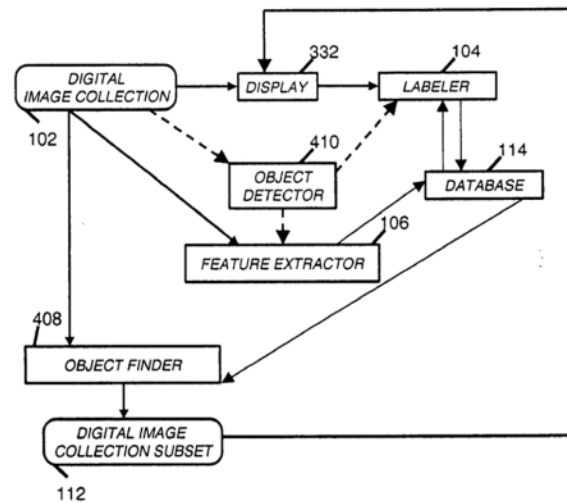


FIG. 15

Gallagher at [0007]–[0011]

It is an object of the present invention to readily identify objects or persons of interests in images or videos in a digital image collection. This object is achieved by a method of identifying a particular person in a digital image collection, wherein at least one of the images in the digital image collection contains more than one person, comprising:

- (a) providing at least one first label for a first image in the digital image collection containing a particular person and at least one other person; wherein the first label identifies the particular person and a second label for a second image in the digital image collection that identifies the particular person;
- (b) using the first and second labels to identify the particular person;
- (c) determining features related to the particular person from the first image or second image or both;
- and
- (d) using such particular features to identify another image in the digital image collection believed to contain the particular person.

Gallagher at [0048]–[0049]

An embodiment of the invention is illustrated in FIG. 2. A digital image collection 102 containing people is searched for a person of interest by a person finder 108. A digital image collection subset 112 is the set of images from the digital image collection 102 believed to contain the person of interest. The digital image collection 102 includes both images and videos. For convenience, the term “image” refers to both single images and videos. Videos are a collection of images with accompanying audio and sometimes text. The digital image collection subset 112 is displayed on the display 332 for review by the human user.

The search for a person of interest is initiated by a user as follows: Images or videos of the digital image collection 102 are displayed on the display 332 and viewed by the user. The user establishes one or more labels for one or more of the images with a labeler 104. A feature extractor 106 extracts features from the digital image collection in association with the label(s) from the labeler 104. The features are stored in association with labels in a database 114. A person detector 110 can optionally be used to assist in the labeling and feature extraction. When the digital image collection subset 112 is displayed on the display 332, the user can review the results and further label the displayed images.

Gallagher at [0050]–[0057]

A label from the labeler 104 indicates that a particular image or video contains a person of interest and includes at least one of the following:

- (1) the name of a person of interest in an image or video. A person's name can be a given name or a nickname.

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	(2) an identifier associated with the person of interest such as a text string or identifier such as “Person A” or “Person B”. (3) the location of the person of interest within the image or video. Preferably, the location of the person of interest is specified by the coordinates (e.g. the pixel address of row and column) of the eyes of the person of interest (and the associated frame number in the case of video). Alternatively, the location of the person of interest can be specified by coordinates of a box that surrounds the body or the face of the person of interest. As a further alternative, the location of the person of interest can be specified by coordinates indicating a position contained within the person of interest. The user can indicate the location of the person of interest by using a mouse to click on the positions of the eyes for example. When the person detector 110 detects a person, the position of the person can be highlighted to the user by, for example, circling the face on the display 332. Then the user can provide the name or identifier for the highlighted person, thereby associating the position of the person with the user provided label. When more than one person is detected in an image, the positions of the persons can be highlighted in turn and labels can be provided by the user for any of the people. (4) an indication to search for images or videos from the image collection believed to contain the person of interest. (5) the name or identifier of a person of interest who is not in the image. The digital image collection 102 contains at least one image having more than one person. A label is provided by the user via the labeler 104, indicating that the image contains a person of interest. Features related to the person of interest are determined by the feature extractor 106, and these features are used by the person finder 108 to identify other images in the collection that are believed to contain the person of interest. Note that the terms “tag”, “caption”, and “annotation” are used synonymously with the term “label.” Gallagher at [0061] Alternatively, if the labeler 104 cannot determine the name of the person of interest, the user can be asked to enter the name of the person of interest by displaying the message “Who is this?” on the display 332 and allowing the user to enter the name of the person of interest, which can then be used by the labeler 104 to label the images and videos of the digital image collection subset 112. Gallagher at [0063]–[0064] FIG. 7 is a flow diagram showing an alternative method for identifying images believed to contain a person of interest. In this embodiment, a user labels the people in one or more images or videos, initiates a search for a person of interest, and the system determines and displays images or videos from a subset

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	of the digital image collection 102 believed to contain the person of interest. The displayed images can be reviewed by the user, and the user can indicate whether the displayed images do contain the person of interest. In addition, the user can verify or provide the name of the person of interest. Finally, based on the input from the user, the system can again determine a set of images believed to contain the person of interest. In block 202, images are displayed on the display 332. In block 204, the user selects images, where each image contains the person of interest. At least one of the selected images contains more than one person. In block 206, the user provides labels via the labeler 104 to identify the people in the selected images. Preferably, the label does not indicate the location of persons within the image or video. Preferably, the label indicates the name of the person or people in the selected images or videos. FIG. 8 shows two selected images and the associated labels 226 indicating the names of people in each of the two selected images. In block 207, the user initiates a search for a person of interest. The person of interest is the name of a person that has been used as a label when labeling people in selected images. For example, the user initiates a search for images of “Jonah.” In block 208, the person identifier accesses the features from the features extractor 106 and associated labels stored in the database 114 and determines the digital image collection subset 112 of images and videos believed to contain the person of interest. In block 210, the digital image collection subset 112 is displayed on the display 332. FIG. 9 shows that the digital image collection subset 112 contains labeled images 220, images correctly believed to contain the person of interest 222, and images incorrectly believed to contain the person of interest 224. This is a consequence of the imperfect nature of current face detection and recognition technology. In block 212, the user reviews the digital image collection subset 112 and can indicate the correctness of each image in the digital image collection subset 112. This user indication of correctness is used to provide additional labels via the labeler 104 in block 204. For example, the user indicates via the user interface that all of the images and videos correctly believes to contain the person of interest 222 of the digital image collection subset 112 do contain the person of interest. The user can also indicate, via the user interface, those images of the images and videos of the digital image collection subset 112 do not contain the person of interest. The indicated images are then removed from the digital image collection subset 112, and the remaining images can be labeled as previously described. Each image and video of the digital image collection subset 112 is then labeled with the name of the person of interest. The user can review the name of the person of interest determined by the labeler 104 via the display. After the user indicates that the images and videos of the digital image collection subset 112 contain the person of interest, the message “Label as Jonah?” appears, and the user can confirm the determined name of the person of interest by pressing “yes”, or enter a different name for the person of interest by pressing “no.” FIG. 10 shows the digital image collection subset 112 after the user has removed images incorrectly believed to

'848 Patent Claim Limitation	Gallagher Exemplary Disclosure
	contain the person of interest, and an automatically generated label 228 used to label the images that have been reviewed by the user. Gallagher at [0065] Note that the person of interest and images or videos can be selected by any user interface known in the art. For example, if the display 332 is a touch sensitive display, then the approximate location of the person of interest can be found by determining the location that the user touches the display 332. Gallagher at [0069]–[0073] Image/video capture time. Image capture time can be a precise minute in time, e.g. Mar. 27, 2004 at 10:17 AM. Or the image capture time can be less precise, e.g. 2004 or March 2004. The image capture time can be in the form of a probability distribution function e.g. Mar. 27, 2004 $\pm$ 2 days with 95% confidence. Often times the capture time is embedded in the file header of the digital image or video. For example, the EXIF image format (described at www.exif.org) allows the image or video capture device to store information associated with the image or video in the file header. The “Date\Time” entry is associated with the date and time the image was captured. In some cases, the digital image or video results from scanning film and the image capture time is determined by detection of the date printed into the image (as is often done at capture time) area, usually in the lower left corner of the image. The date a photograph is printed is often printed on the back of the print. Alternatively, some film systems contain a magnetic layer in the film for storing information such as the capture date. Capture condition metadata (e.g. flash fire information, shutter speed, aperture, ISO, scene brightness, etc.) Geographic location. The location is preferably stored in units of latitude and longitude. Scene environment information. Scene environment information is information derived from the pixel values of an image or video in regions not containing a person. For example, the mean value of the non-people regions in an image or video is an example of scene environment information. Another example of scene environment information is texture samples (e.g. a sampling of pixel values from a region of wallpaper in an image). Geographic location and scene environment information are important clues to the identity of persons in the associated images. For example, a photographer's visit to grandmother's house could be the only location where grandmother is photographed. When two images are captured with similar geographic locations and environments, it is more likely that detected persons in the two images are the same as well. Scene environment information can be used by the person detector 110 to register two images. This is useful when the people being photographed are mostly stationary, but the camera moves slightly between consecutive photographs. The scene environment information is used to register the two images, thereby

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	aligning the positions of the people in the two frames. This alignment is used by the person finder 108 because when two persons have the same position in two images captured closely in time and registered, then the likelihood that the two people are the same individual is high. Gallagher at [0074] The local feature detector 240 computes local features 244. Local features are features directly relating to the appearance of a person in an image or video. Computation of these features for a person in an image or video requires knowledge of the position of the person. The local feature detector 240 is passed information related to the position of a person in an image of video from either the person detector 110, or the database 114, or both. The person detector 110 can be a manual operation where a user inputs the position of people in images and videos by outlining the people, indicating eye position, or the like. Preferable, the person detector 110 implements a face detection algorithm. Methods for detecting human faces are well known in the art of digital image processing. For example, a face detection method for finding human faces in images is described in the following article: Jones, M. J.; Viola, P., "Fast Multi-view Face Detection", IEEE Conference on Computer Vision and Pattern Recognition (CVPR), June 2003. Gallagher at [0137]–[0139] In some cases, the modified features 254 form the person identifier 250 are straightforward to generate from the database 114. For example, when the database contains only global features and no local features, then the features associated with each label (whether or not the label contains position information) will be identical. For example, if the only feature is image capture time, then each label associated with the image is associated with the image capture time. Also, if the labels contain position information, then associating features with the labels is easy because either the features do not include local features and therefore the same features are associated with each label, or the features contain local features and the position of the image region over which the local features are computed is used to associate the features with the labels (based on proximity). A person classifier 256 uses the modified features 254 and a identity of the person of interest 252 to determine a digital image collection subset 112 of images and videos believed to contain the person of interest. The modified features 254 includes some features having associated labels (known as labeled features). Other features (known as unlabeled features) do not have associated labels (e.g. all of the image and videos in the digital image collection 102 that were not labeled by the labeler 104). The person classifier 256 uses labeled features to classify the unlabeled features. This problem, although in practice quite difficult, is studied in the field of pattern recognition. Any classifier may be used to classify the

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	unlabeled features. Preferably, the person classifier determines a proposed label for each of the unlabeled features and a confidence, belief, or probability associated with the proposed label. In general, classifiers assign labels to unlabeled featured by considering the similarity between a particular set of unlabeled features and labeled sets of features. With some classifiers (e.g. Gaussian Maximum Likelihood), labeled sets of features associated with a single individual person are aggregated to form a model of appearance for the individual. The digital image collection subset 112 is the collection of images and videos having an associated proposed label with a probability that exceeds a threshold T_0, where T_0 ranges from $0 \leq T_0 \leq 1.0$. Preferably, the digital image collection subset 112 also contains the image and videos associated with features having labels matching the identity of the person of interest 252. The images and videos of the digital image collection subset are sorted so that images and videos determined to have the highest belief of containing the person of interest appear at the top of the subset, following only the images and videos with features having labels matching the identity of the person of interest 252. The person classifier 256 can measure the similarity between sets of features associated with two or more persons to determine the similarity of the persons, and thereby the likelihood that the persons are the same. Measuring the similarity of sets of features is accomplished by measuring the similarity of subsets of the features. For example, when the local features describe clothing, the following method is used to compare two sets of features. If the difference in image capture time is small (i.e. less than a few hours) and if the quantitative description of the clothing is similar in each of the two sets of features is similar, then the likelihood of the two sets of local features belonging to the same person is increased. If, additionally, the clothes have a very unique or distinctive pattern (e.g. a shirt of large green, red, and blue patches) for both sets of local features, then the likelihood is even greater that the associated people are the same individual. To the extent Maxell contends Gallagher does not disclose this limitation, a person of ordinary skill in the art would have readily arrived at this limitation by combining or modifying it in view of their general knowledge and/or the prior art references disclosed in the corresponding section of Samsung's Invalidity Contentions.
[8h] when the second setting mode is selected, a person with a face in the image information is selected from a plurality of faces in the image information recorded in the recording medium and thereafter	Gallagher discloses "when the second setting mode is selected, a person with a face in the image information is selected from a plurality of faces in the image information recorded in the recording medium and thereafter registered as the specific person." For example:

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registered as the specific person;
and

Gallagher Exemplary Disclosure

Gallagher at Fig. 2

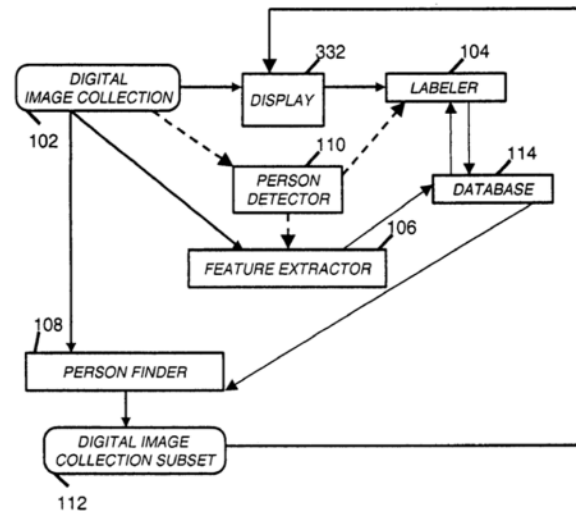
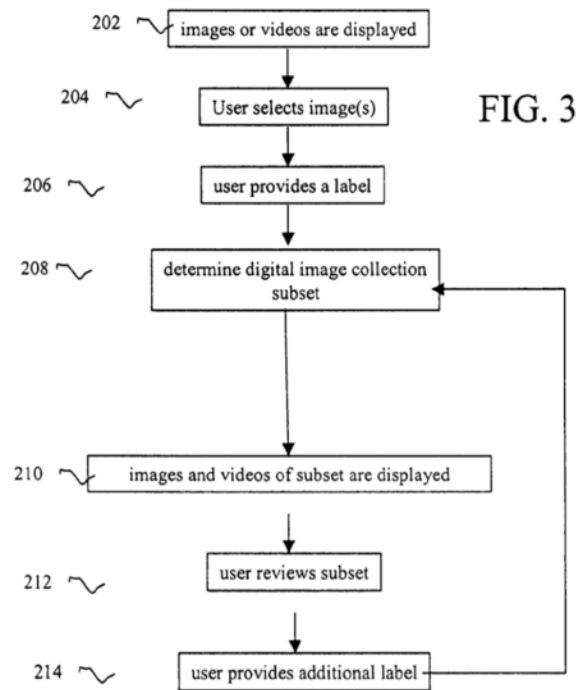


FIG. 2

Gallagher at Fig. 3



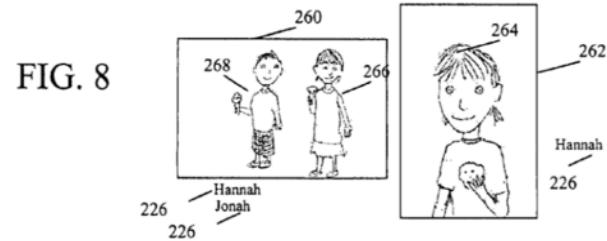
Gallagher at Fig. 6



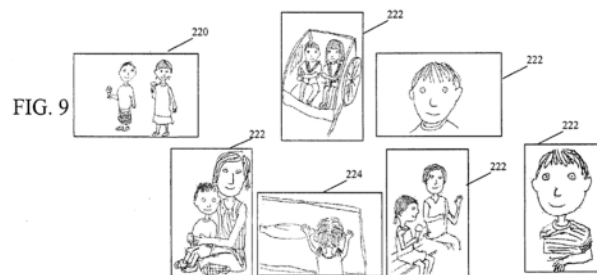
Gallagher at Fig. 8

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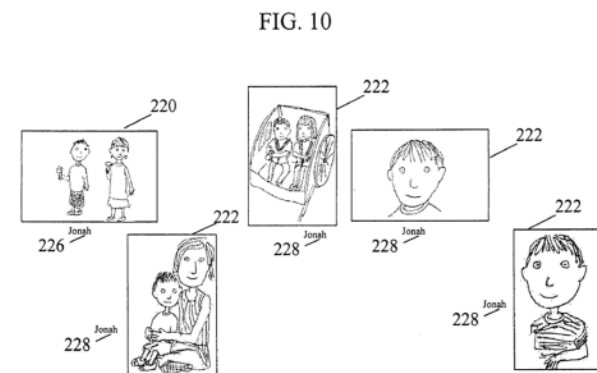
Gallagher Exemplary Disclosure



Gallagher at Fig. 9



Gallagher at Fig. 10



Gallagher at Fig. 11

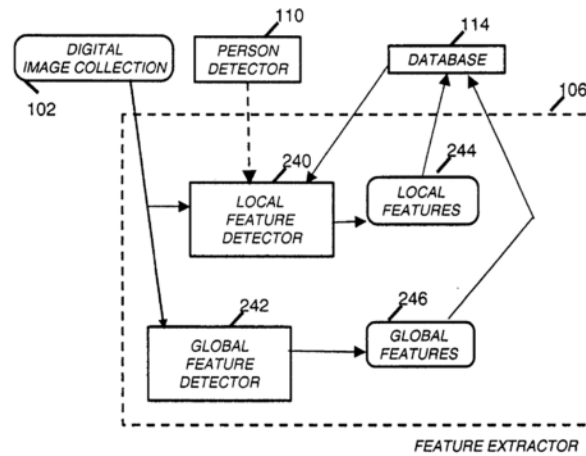


FIG. 11

Gallagher at Fig. 12A

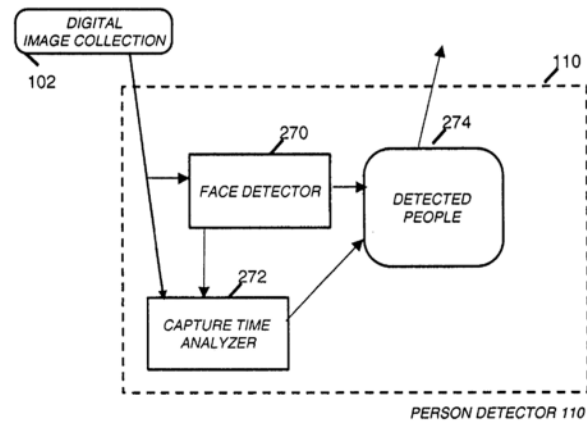


FIG. 12A

Gallagher at Fig. 13

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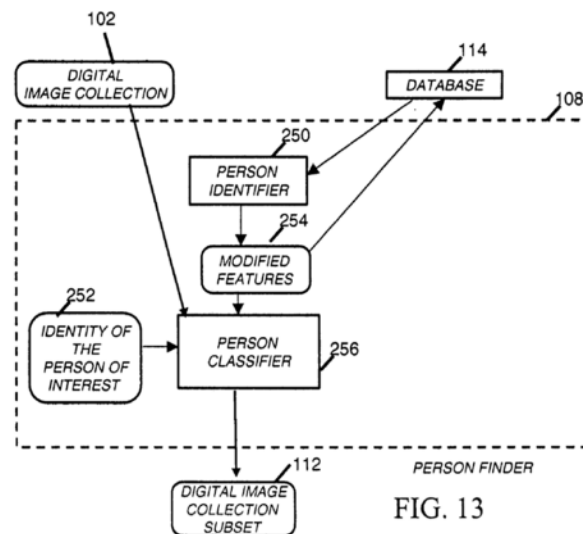


FIG. 13

Gallagher at Fig. 15

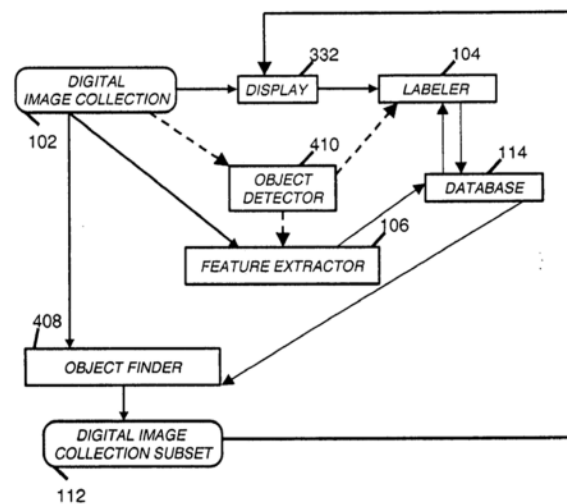


FIG. 15

Gallagher at [0048]–[0049]

An embodiment of the invention is illustrated in FIG. 2. A digital image collection 102 containing people is searched for a person of interest by a person finder 108. A digital image collection subset 112 is the set of images from the digital image collection 102 believed to contain the person of interest. The digital image collection 102 includes both images and videos. For convenience, the term “image” refers to both single images and videos. Videos are a collection of images with accompanying audio and sometimes text. The digital image collection subset 112 is displayed on the display 332 for review by the human user.

The search for a person of interest is initiated by a user as follows: Images or videos of the digital image collection 102 are displayed on the display 332 and viewed by the user. The user establishes one or more labels for one or more of the images with a labeler 104. A feature extractor 106 extracts features from the digital image collection in association with the label(s) from the labeler 104. The features are stored in association with labels in a database 114. A person detector 110 can optionally be used to assist in the labeling and feature extraction. When the digital image collection subset 112 is displayed on the display 332, the user can review the results and further label the displayed images.

Gallagher at [0050]–[0057]

A label from the labeler 104 indicates that a particular image or video contains a person of interest and includes at least one of the following:

- (1) the name of a person of interest in an image or video. A person's name can be a given name or a nickname.
- (2) an identifier associated with the person of interest such as a text string or identifier such as “Person A” or “Person B”.
- (3) the location of the person of interest within the image or video. Preferably, the location of the person of interest is specified by the coordinates (e.g. the pixel address of row and column) of the eyes of the person of interest (and the associated frame number in the case of video). Alternatively, the location of the person of interest can be specified by coordinates of a box that surrounds the body or the face of the person of interest. As a further alternative, the location of the person of interest can be specified by coordinates indicating a position contained within the person of interest. The user can indicate the location of the person of interest by using a mouse to click on the positions of the eyes for example. When the person detector 110 detects a person, the position of the person can be highlighted to the user by, for example, circling the face on the display 332. Then the user can provide the name or identifier for the highlighted person, thereby associating the position of the person with the user provided label. When more than one person is detected in an image, the positions of the persons can be highlighted in turn and labels can be provided by the user for any of the people.

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	(4) an indication to search for images or videos from the image collection believed to contain the person of interest. (5) the name or identifier of a person of interest who is not in the image. The digital image collection 102 contains at least one image having more than one person. A label is provided by the user via the labeler 104, indicating that the image contains a person of interest. Features related to the person of interest are determined by the feature extractor 106, and these features are used by the person finder 108 to identify other images in the collection that are believed to contain the person of interest. Note that the terms “tag”, “caption”, and “annotation” are used synonymously with the term “label.” Gallagher at [0061] Alternatively, if the labeler 104 cannot determine the name of the person of interest, the user can be asked to enter the name of the person of interest by displaying the message “Who is this?” on the display 332 and allowing the user to enter the name of the person of interest, which can then be used by the labeler 104 to label the images and videos of the digital image collection subset 112. Gallagher at [0063]–[0064] FIG. 7 is a flow diagram showing an alternative method for identifying images believed to contain a person of interest. In this embodiment, a user labels the people in one or more images or videos, initiates a search for a person of interest, and the system determines and displays images or videos from a subset of the digital image collection 102 believed to contain the person of interest. The displayed images can be reviewed by the user, and the user can indicate whether the displayed images do contain the person of interest. In addition, the user can verify or provide the name of the person of interest. Finally, based on the input from the user, the system can again determine a set of images believed to contain the person of interest. In block 202, images are displayed on the display 332. In block 204, the user selects images, where each image contains the person of interest. At least one of the selected images contains more than one person. In block 206, the user provides labels via the labeler 104 to identify the people in the selected images. Preferably, the label does not indicate the location of persons within the image or video. Preferably, the label indicates the name of the person or people in the selected images or videos. FIG. 8 shows two selected images and the associated labels 226 indicating the names of people in each of the two selected images. In block 207, the user initiates a search for a person of interest. The person of interest is the name of a person that has been used as a label when labeling people in selected images. For example, the user initiates a search for images of “Jonah.” In block 208, the person identifier accesses the features from the

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	features extractor 106 and associated labels stored in the database 114 and determines the digital image collection subset 112 of images and videos believed to contain the person of interest. In block 210, the digital image collection subset 112 is displayed on the display 332. FIG. 9 shows that the digital image collection subset 112 contains labeled images 220, images correctly believed to contain the person of interest 222, and images incorrectly believed to contain the person of interest 224. This is a consequence of the imperfect nature of current face detection and recognition technology. In block 212, the user reviews the digital image collection subset 112 and can indicate the correctness of each image in the digital image collection subset 112. This user indication of correctness is used to provide additional labels via the labeler 104 in block 204. For example, the user indicates via the user interface that all of the images and videos correctly believes to contain the person of interest 222 of the digital image collection subset 112 do contain the person of interest. The user can also indicate, via the user interface, those images of the images and videos of the digital image collection subset 112 do not contain the person of interest. The indicated images are then removed from the digital image collection subset 112, and the remaining images can be labeled as previously described. Each image and video of the digital image collection subset 112 is then labeled with the name of the person of interest. The user can review the name of the person of interest determined by the labeler 104 via the display. After the user indicates that the images and videos of the digital image collection subset 112 contain the person of interest, the message “Label as Jonah?” appears, and the user can confirm the determined name of the person of interest by pressing “yes”, or enter a different name for the person of interest by pressing “no.” FIG. 10 shows the digital image collection subset 112 after the user has removed images incorrectly believed to contain the person of interest, and an automatically generated label 228 used to label the images that have been reviewed by the user. Gallagher at [0065] Note that the person of interest and images or videos can be selected by any user interface known in the art. For example, if the display 332 is a touch sensitive display, then the approximate location of the person of interest can be found by determining the location that the user touches the display 332. Gallagher at [0074] The local feature detector 240 computes local features 244. Local features are features directly relating to the appearance of a person in an image or video. Computation of these features for a person in an image or video requires knowledge of the position of the person. The local feature detector 240 is passed information related to the position of a person in an image of video from either the person detector 110, or the database 114, or both. The person detector 110 can be a manual operation where a user inputs the

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	position of people in images and videos by outlining the people, indicating eye position, or the like. Preferable, the person detector 110 implements a face detection algorithm. Methods for detecting human faces are well known in the art of digital image processing. For example, a face detection method for finding human faces in images is described in the following article: Jones, M. J.; Viola, P., "Fast Multi-view Face Detection", IEEE Conference on Computer Vision and Pattern Recognition (CVPR), June 2003. Gallagher at [0137]–[0139] In some cases, the modified features 254 form the person identifier 250 are straightforward to generate from the database 114. For example, when the database contains only global features and no local features, then the features associated with each label (whether or not the label contains position information) will be identical. For example, if the only feature is image capture time, then each label associated with the image is associated with the image capture time. Also, if the labels contain position information, then associating features with the labels is easy because either the features do not include local features and therefore the same features are associated with each label, or the features contain local features and the position of the image region over which the local features are computed is used to associate the features with the labels (based on proximity). A person classifier 256 uses the modified features 254 and a identity of the person of interest 252 to determine a digital image collection subset 112 of images and videos believed to contain the person of interest. The modified features 254 includes some features having associated labels (known as labeled features). Other features (known as unlabeled features) do not have associated labels (e.g. all of the image and videos in the digital image collection 102 that were not labeled by the labeler 104). The person classifier 256 uses labeled features to classify the unlabeled features. This problem, although in practice quite difficult, is studied in the field of pattern recognition. Any classifier may be used to classify the unlabeled features. Preferably, the person classifier determines a proposed label for each of the unlabeled features and a confidence, belief, or probability associated with the proposed label. In general, classifiers assign labels to unlabeled features by considering the similarity between a particular set of unlabeled features and labeled sets of features. With some classifiers (e.g. Gaussian Maximum Likelihood), labeled sets of features associated with a single individual person are aggregated to form a model of appearance for the individual. The digital image collection subset 112 is the collection of images and videos having an associated proposed label with a probability that exceeds a threshold T_0, where T_0 ranges from $0 \leq T_0 \leq 1.0$. Preferably, the digital image collection subset 112 also contains the image and videos associated with features having labels matching the identity of the person of interest 252. The images and videos of the digital image collection subset are sorted so that images and videos determined to have the

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	highest belief of containing the person of interest appear at the top of the subset, following only the images and videos with features having labels matching the identity of the person of interest 252. The person classifier 256 can measure the similarity between sets of features associated with two or more persons to determine the similarity of the persons, and thereby the likelihood that the persons are the same. Measuring the similarity of sets of features is accomplished by measuring the similarity of subsets of the features. For example, when the local features describe clothing, the following method is used to compare two sets of features. If the difference in image capture time is small (i.e. less than a few hours) and if the quantitative description of the clothing is similar in each of the two sets of features is similar, then the likelihood of the two sets of local features belonging to the same person is increased. If, additionally, the clothes have a very unique or distinctive pattern (e.g. a shirt of large green, red, and blue patches) for both sets of local features, then the likelihood is even greater that the associated people are the same individual. To the extent Maxell contends Gallagher does not disclose this limitation, a person of ordinary skill in the art would have readily arrived at this limitation by combining or modifying it in view of their general knowledge and/or the prior art references disclosed in the corresponding section of Samsung's Invalidity Contentions.
[8i] selectively reproduce the recorded image information which includes the registered specific person.	Gallagher discloses "selectively reproduce the recorded image information which includes the registered specific person." For example:

Gallagher at Fig. 2

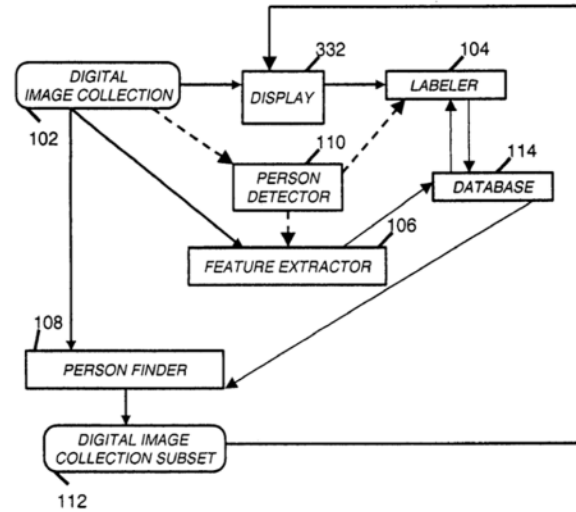
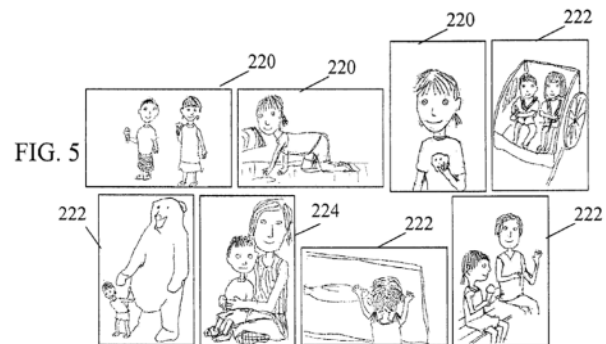


FIG. 2

Gallagher at Fig. 3

'848 Patent Claim Limitation	Gallagher Exemplary Disclosure
	<pre> graph TD 202[images or videos are displayed] --> 204[User selects image(s)] 204 --> 206[user provides a label] 206 --> 208[determine digital image collection subset] 208 --> 210[images and videos of subset are displayed] 210 --> 212[user reviews subset] 212 --> 214[user provides additional label] 214 --> 208 </pre> FIG. 3 Gallagher at Fig. 4 FIG. 4

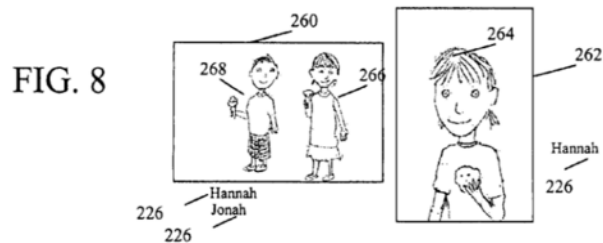
Gallagher at Fig. 5



Gallagher at Fig. 6



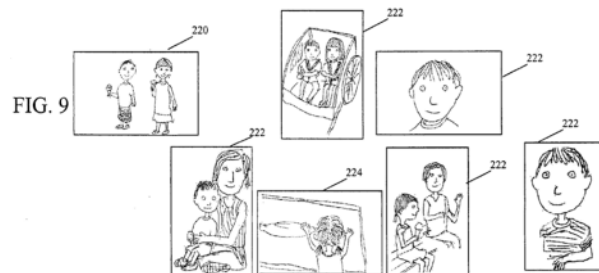
Gallagher at Fig. 8



Gallagher at Fig. 9

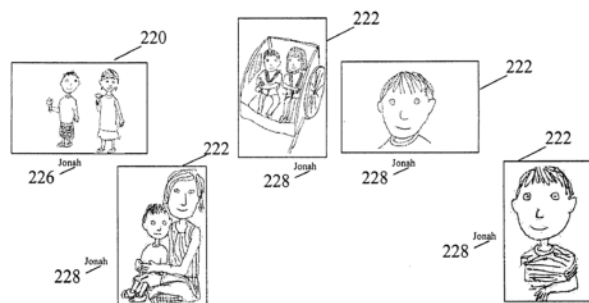
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Gallagher at Fig. 10

FIG. 10



Gallagher at Fig. 12A

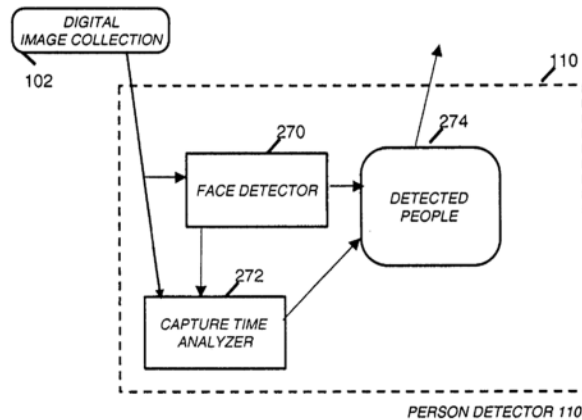


FIG. 12A

Gallagher at Fig. 13

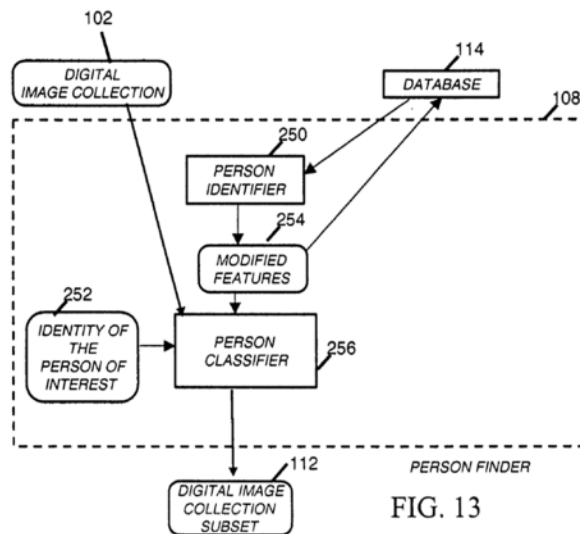


FIG. 13

Gallagher at Fig. 15

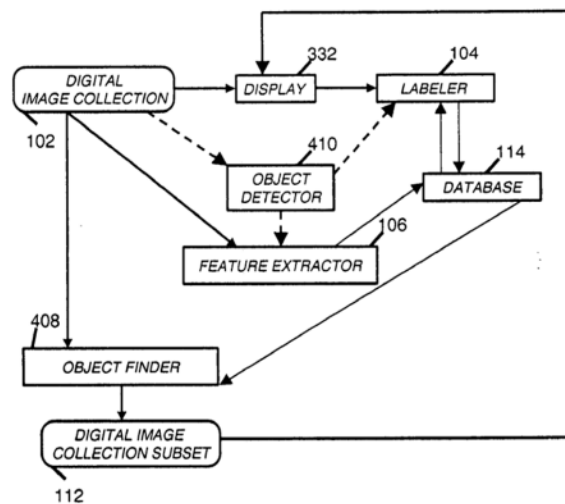


FIG. 15

Gallagher at [0048]–[0049]

An embodiment of the invention is illustrated in FIG. 2. A digital image collection 102 containing people is searched for a person of interest by a person finder 108. A digital image collection subset 112 is the set of images from the digital image collection 102 believed to contain the person of interest. The digital image collection 102 includes both images and videos. For convenience, the term “image” refers to both single images and videos. Videos are a collection of images with accompanying audio and sometimes text. The digital image collection subset 112 is displayed on the display 332 for review by the human user.

The search for a person of interest is initiated by a user as follows: Images or videos of the digital image collection 102 are displayed on the display 332 and viewed by the user. The user establishes one or more labels for one or more of the images with a labeler 104. A feature extractor 106 extracts features from the digital image collection in association with the label(s) from the labeler 104. The features are stored in association with labels in a database 114. A person detector 110 can optionally be used to assist in the labeling and feature extraction. When the digital image collection subset 112 is displayed on the display 332, the user can review the results and further label the displayed images.

Gallagher at [0058]–[0060]

FIG. 3 is a flow diagram showing a method for using a digital camera to identify images believed to contain a person of interest. Those skilled in the art will recognize that the processing platform for using the present invention can be a camera, a personal computer, a remote computer accessed over a network such as the Internet, a printer, or the like. In this embodiment, a user selects a few images or videos containing a person of interest, and the system determines and displays images or videos from a subset of the digital image collection believed to contain the person of interest. The displayed images can be reviewed by the user, and the user can indicate whether the displayed images do contain the person of interest. In addition, the user can verify or provide the name of the person of interest. Finally, based on the input from the user, the system can again determine a set of images believed to contain the person of interest.

In block 202, images are displayed on the display 332. In block 204, the user selects images, where each image contains the person of interest. At least one of the selected images contains a person besides the person of interest. For example, FIG. 4 shows a set of three selected images, each containing the person of interest, and one of the images contains two people. In block 206, the user provides a label via the labeler 104 that indicates the selected images contain the person of interest and the images and videos from the image collection are to be searched by the person finder 108 to identify those believed to contain the person of interest. In block 208, the person identifier accesses the features and associated labels stored in the database 114 and determines a digital image collection subset 112 of images and

'848 Patent Claim Limitation	Gallagher Exemplary Disclosure
	videos believed to contain the person of interest. In block 210, the digital image collection subset 112 is displayed on the display 332. For example, FIG. 5 shows images in the digital image collection subset 112. The digital image collection subset contains labeled images 220, images correctly believed to contain the person of interest 222, and images incorrectly believed to contain the person of interest 224. This is a consequence of the imperfect nature of current face detection and recognition technology. In block 212, the user reviews the digital image collection subset 112 and can indicate the correctness of each image in the digital image collection subset 112. This user indication of correctness is used to provide additional labels via the labeler 104 in block 214. For example, the user indicates via the user interface that all of the images and videos correctly believes to contain the person of interest 222 of the digital image collection subset 112 do contain the person of interest. Each image and video of the digital image collection is then labeled with the name of the person of interest if it has been provided by the user. If the name of the person of interest has not been provided by the user, the name of the person of interest can be determined in some cases by the labeler 104. The images and videos of the digital image collection subset 112 are examined for those having a label indicating the name of the person of interest and for which the person detector 110 determines contain only one person. Because the user has verified that the images and videos of the digital image collection subset 112 do contain the person of interest and the person detector 110 finds only a single person, the labeler 104 concludes that the name of the person in the associated label is the name of the person of interest. If the person detector 110 is an automatic error-prone algorithm, then the labeler 104 may need to implement a voting scheme if more than one image and videos have an associated label containing a person's name and the person detector 110 finds only one person, and the person's name in the associated label is not unanimous. For example, if there are 3 images among the digital image collection subset 112 that contain one detected person each by the person detector 110, and each image has a label containing a person's name, and the names are: "Hannah", "Hannah", and "Holly", then the voting scheme conducted by the labeled 104 determines that the person's name is "Hannah". The labeler 104 then labels the images and videos of the digital image collection subset 112 with a label containing the name of the person of interest (e.g. "Hannah"). The user can review the name of the person of interest determined by the labeler 104 via the display. After the user indicates that the images and videos of the digital image collection subset 112 contain the person of interest, the message "Label as Hannah?" appears, and the user can confirm the determined name of the person of interest by pressing "yes", or enter a different name for the person of interest by pressing "no". If the labeler 104 cannot determine the name of the person of interest, then a currently unused identifier is assigned to the person of interest (e.g. "Person 12"), and the images and videos of the digital image collection subset 112 are labeled by the labeler 104 accordingly.

'848 Patent Claim Limitation	Gallagher Exemplary Disclosure
	Alternatively, the labeler 104 can determine several candidate labels for the person of interest. The candidate labels can be displayed to the user in the form of a list. The list of candidate labels can be a list of labels that have been used in the past, or a list of the most likely labels for the current particular person of interest. The user can then select from the list the desired label for the person of interest. Gallagher at [0069]–[0073] Image/video capture time. Image capture time can be a precise minute in time, e.g. Mar. 27, 2004 at 10:17 AM. Or the image capture time can be less precise, e.g. 2004 or March 2004. The image capture time can be in the form of a probability distribution function e.g. Mar. 27, 2004 +/-2 days with 95% confidence. Often times the capture time is embedded in the file header of the digital image or video. For example, the EXIF image format (described at www.exif.org) allows the image or video capture device to store information associated with the image or video in the file header. The “Date\Time” entry is associated with the date and time the image was captured. In some cases, the digital image or video results from scanning film and the image capture time is determined by detection of the date printed into the image (as is often done at capture time) area, usually in the lower left corner of the image. The date a photograph is printed is often printed on the back of the print. Alternatively, some film systems contain a magnetic layer in the film for storing information such as the capture date. Capture condition metadata (e.g. flash fire information, shutter speed, aperture, ISO, scene brightness, etc.) Geographic location. The location is preferably stored in units of latitude and longitude. Scene environment information. Scene environment information is information derived from the pixel values of an image or video in regions not containing a person. For example, the mean value of the non-people regions in an image or video is an example of scene environment information. Another example of scene environment information is texture samples (e.g. a sampling of pixel values from a region of wallpaper in an image). Geographic location and scene environment information are important clues to the identity of persons in the associated images. For example, a photographer's visit to grandmother's house could be the only location where grandmother is photographed. When two images are captured with similar geographic locations and environments, it is more likely that detected persons in the two images are the same as well. Scene environment information can be used by the person detector 110 to register two images. This is useful when the people being photographed are mostly stationary, but the camera moves slightly between consecutive photographs. The scene environment information is used to register the two images, thereby aligning the positions of the people in the two frames. This alignment is used by the person finder 108 because when two persons have the same position in two images captured closely in time and registered, then the likelihood that the two people are the same individual is high.

Gallagher at [0137]–[0139]

In some cases, the modified features 254 form the person identifier 250 are straightforward to generate from the database 114. For example, when the database contains only global features and no local features, then the features associated with each label (whether or not the label contains position information) will be identical. For example, if the only feature is image capture time, then each label associated with the image is associated with the image capture time. Also, if the labels contain position information, then associating features with the labels is easy because either the features do not include local features and therefore the same features are associated with each label, or the features contain local features and the position of the image region over which the local features are computed is used to associate the features with the labels (based on proximity).

A person classifier 256 uses the modified features 254 and a identity of the person of interest 252 to determine a digital image collection subset 112 of images and videos believed to contain the person of interest. The modified features 254 includes some features having associated labels (known as labeled features). Other features (known as unlabeled features) do not have associated labels (e.g. all of the image and videos in the digital image collection 102 that were not labeled by the labeler 104). The person classifier 256 uses labeled features to classify the unlabeled features. This problem, although in practice quite difficult, is studied in the field of pattern recognition. Any classifier may be used to classify the unlabeled features. Preferably, the person classifier determines a proposed label for each of the unlabeled features and a confidence, belief, or probability associated with the proposed label. In general, classifiers assign labels to unlabeled features by considering the similarity between a particular set of unlabeled features and labeled sets of features. With some classifiers (e.g. Gaussian Maximum Likelihood), labeled sets of features associated with a single individual person are aggregated to form a model of appearance for the individual. The digital image collection subset 112 is the collection of images and videos having an associated proposed label with a probability that exceeds a threshold T_0 , where T_0 ranges from $0 \leq T_0 \leq 1.0$. Preferably, the digital image collection subset 112 also contains the image and videos associated with features having labels matching the identity of the person of interest 252. The images and videos of the digital image collection subset are sorted so that images and videos determined to have the highest belief of containing the person of interest appear at the top of the subset, following only the images and videos with features having labels matching the identity of the person of interest 252.

The person classifier 256 can measure the similarity between sets of features associated with two or more persons to determine the similarity of the persons, and thereby the likelihood that the persons are the same. Measuring the similarity of sets of features is accomplished by measuring the similarity of subsets of the features. For example, when the local features describe clothing, the following method is used to compare two sets of features. If the difference in image capture time is small (i.e. less than a few hours) and if the quantitative description of the clothing is similar in each of the two sets of features is

'848 Patent Claim Limitation	Gallagher Exemplary Disclosure
	similar, then the likelihood of the two sets of local features belonging to the same person is increased. If, additionally, the clothes have a very unique or distinctive pattern (e.g. a shirt of large green, red, and blue patches) for both sets of local features, then the likelihood is even greater that the associated people are the same individual. Gallagher at [0146] Preferably, the user can adjust the value of T_0 through the user interface. As the value increases, the digital image collection subset 112 contains fewer images or videos, but the likelihood that the images and videos in the digital image collection subset 112 actually do contain the person of interest increases. In this manner, the user can determine the number and accuracy of the search results. To the extent Maxell contends Gallagher does not disclose this limitation, a person of ordinary skill in the art would have readily arrived at this limitation by combining or modifying it in view of their general knowledge and/or the prior art references disclosed in the corresponding section of Samsung's Invalidity Contentions.
[11pre] 11. The recording and reproducing apparatus according to claim 8,	Gallagher discloses "[t]he recording and reproducing apparatus according to claim 8." See above.
[11a] wherein the memory further stores instructions that, when executed by the processor, cause the processor to: control the reproduction of the image information in a reproducing mode set from one of a first reproducing mode and a second reproducing mode,	Gallagher discloses "wherein the memory further stores instructions that, when executed by the processor, cause the processor to: control the reproduction of the image information in a reproducing mode set from one of a first reproducing mode and a second reproducing mode." For example:

Gallagher at Fig. 2

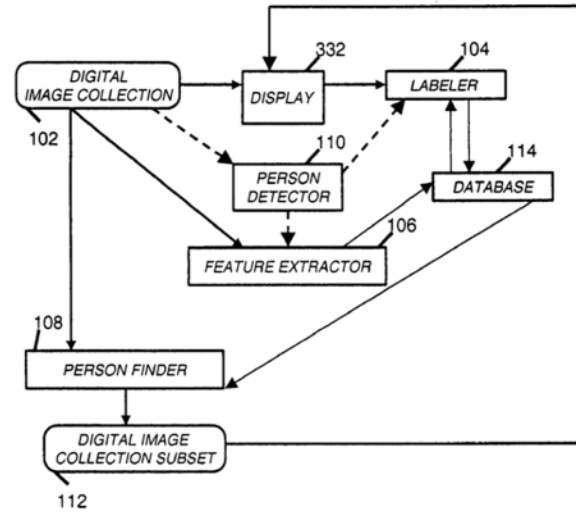
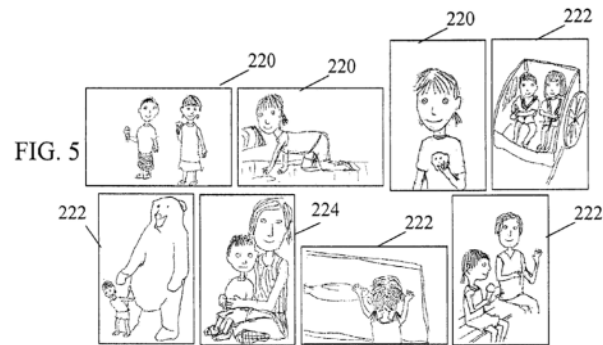


FIG. 2

Gallagher at Fig. 3

'848 Patent Claim Limitation	Gallagher Exemplary Disclosure
	<pre> graph TD 202[images or videos are displayed] --> 204[User selects image(s)] 204 --> 206[user provides a label] 206 --> 208[determine digital image collection subset] 208 --> 210[images and videos of subset are displayed] 210 --> 212[user reviews subset] 212 --> 214[user provides additional label] 214 --> 208 </pre> FIG. 3 Gallagher at Fig. 4 FIG. 4

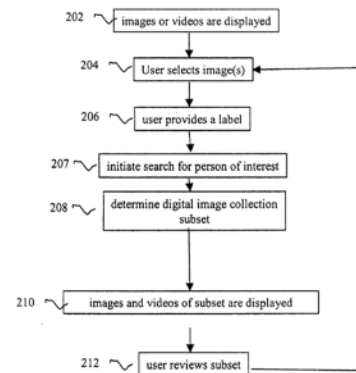
Gallagher at Fig. 5



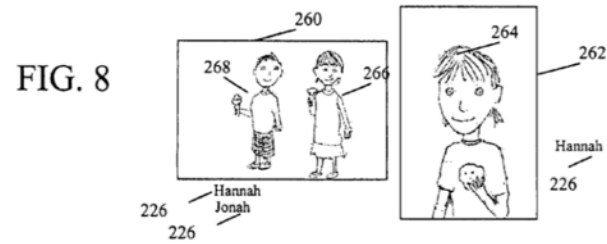
Gallagher at Fig. 6



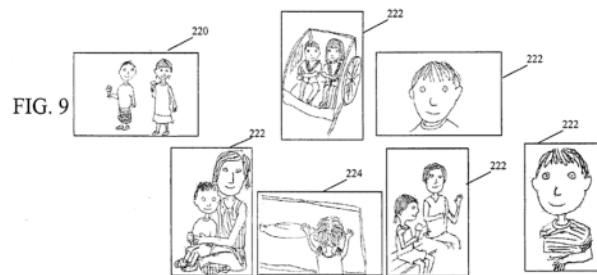
Gallagher at Fig. 7



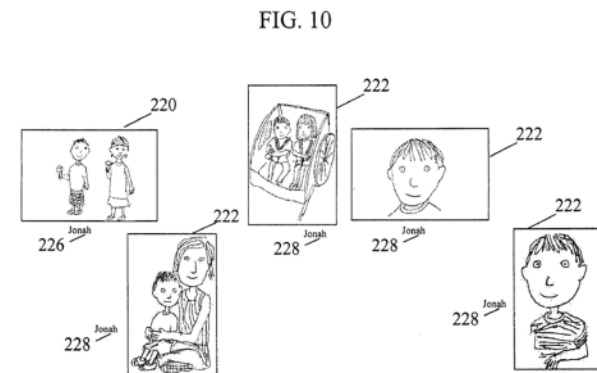
Gallagher at Fig. 8



Gallagher at Fig. 9



Gallagher at Fig. 10



Gallagher at Fig. 12A

'848 Patent Claim Limitation

Gallagher Exemplary Disclosure

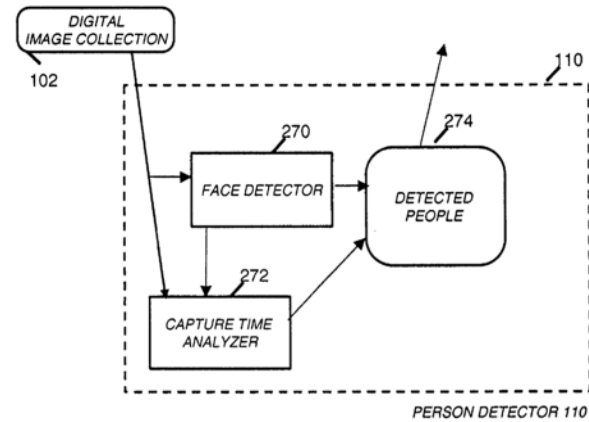


FIG. 12A

Gallagher at Fig. 13

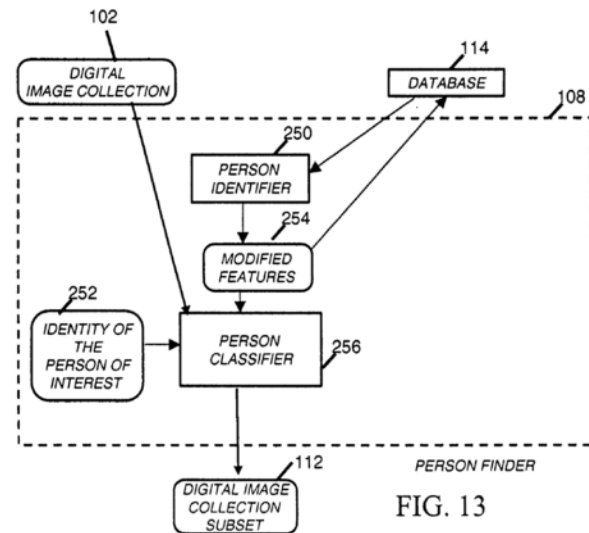


FIG. 13

Gallagher at Fig. 15

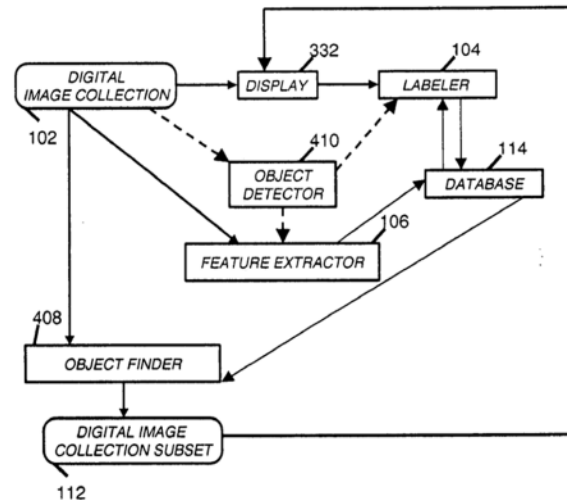


FIG. 15

Gallagher at [0048]–[0049]

An embodiment of the invention is illustrated in FIG. 2. A digital image collection 102 containing people is searched for a person of interest by a person finder 108. A digital image collection subset 112 is the set of images from the digital image collection 102 believed to contain the person of interest. The digital image collection 102 includes both images and videos. For convenience, the term “image” refers to both single images and videos. Videos are a collection of images with accompanying audio and sometimes text. The digital image collection subset 112 is displayed on the display 332 for review by the human user.

The search for a person of interest is initiated by a user as follows: Images or videos of the digital image collection 102 are displayed on the display 332 and viewed by the user. The user establishes one or more labels for one or more of the images with a labeler 104. A feature extractor 106 extracts features from the digital image collection in association with the label(s) from the labeler 104. The features are stored in association with labels in a database 114. A person detector 110 can optionally be used to assist in the labeling and feature extraction. When the digital image collection subset 112 is displayed on the display 332, the user can review the results and further label the displayed images.

Gallagher at [0058]–[0060]

FIG. 3 is a flow diagram showing a method for using a digital camera to identify images believed to contain a person of interest. Those skilled in the art will recognize that the processing platform for using the present invention can be a camera, a personal computer, a remote computer assessed over a network such as the Internet, a printer, or the like. In this embodiment, a user selects a few images or videos containing a person of interest, and the system determines and displays images or videos from a subset of the digital image collection believed to contain the person of interest. The displayed images can be reviewed by the user, and the user can indicate whether the displayed images do contain the person of interest. In addition, the user can verify or provide the name of the person of interest. Finally, based on the input from the user, the system can again determine a set of images believed to contain the person of interest.

In block 202, images are displayed on the display 332. In block 204, the user selects images, where each image contains the person of interest. At least one of the selected images contains a person besides the person of interest. For example, FIG. 4 shows a set of three selected images, each containing the person of interest, and one of the images contains two people. In block 206, the user provides a label via the labeler 104 that indicates the selected images contain the person of interest and the images and videos from the image collection are to be searched by the person finder 108 to identify those believed to contain the person of interest. In block 208, the person identifier accesses the features and associated labels stored in the database 114 and determines a digital image collection subset 112 of images and videos believed to contain the person of interest. In block 210, the digital image collection subset 112 is displayed on the display 332. For example, FIG. 5 shows images in the digital image collection subset 112. The digital image collection subset contains labeled images 220, images correctly believed to contain the person of interest 222, and images incorrectly believed to contain the person of interest 224. This is a consequence of the imperfect nature of current face detection and recognition technology. In block 212, the user reviews the digital image collection subset 112 and can indicate the correctness of each image in the digital image collection subset 112. This user indication of correctness is used to provide additional labels via the labeler 104 in block 214. For example, the user indicates via the user interface that all of the images and videos correctly believes to contain the person of interest 222 of the digital image collection subset 112 do contain the person of interest. Each image and video of the digital image collection is then labeled with the name of the person of interest if it has been provided by the user. If the name of the person of interest has not been provided by the user, the name of the person of interest can be determined in some cases by the labeler 104. The images and videos of the digital image collection subset 112 are examined for those having a label indicating the name of the person of interest and for which the person detector 110 determines contain only one person. Because the user has verified that the images and videos of the digital image collection subset 112 do contain the person of interest and

'848 Patent Claim Limitation	Gallagher Exemplary Disclosure
	the person detector 110 finds only a single person, the labeler 104 concludes that the name of the person in the associated label is the name of the person of interest. If the person detector 110 is an automatic error-prone algorithm, then the labeler 104 may need to implement a voting scheme if more than one image and videos have an associated label containing a person's name and the person detector 110 finds only one person, and the person's name in the associated label is not unanimous. For example, if there are 3 images among the digital image collection subset 112 that contain one detected person each by the person detector 110, and each image has a label containing a person's name, and the names are: "Hannah", "Hannah", and "Holly", then the voting scheme conducted by the labeled 104 determines that the person's name is "Hannah". The labeler 104 then labels the images and videos of the digital image collection subset 112 with a label containing the name of the person of interest (e.g. "Hannah"). The user can review the name of the person of interest determined by the labeler 104 via the display. After the user indicates that the images and videos of the digital image collection subset 112 contain the person of interest, the message "Label as Hannah?" appears, and the user can confirm the determined name of the person of interest by pressing "yes", or enter a different name for the person of interest by pressing "no". If the labeler 104 cannot determine the name of the person of interest, then a currently unused identifier is assigned to the person of interest (e.g. "Person 12"), and the images and videos of the digital image collection subset 112 are labeled by the labeler 104 accordingly. Alternatively, the labeler 104 can determine several candidate labels for the person of interest. The candidate labels can be displayed to the user in the form of a list. The list of candidate labels can be a list of labels that have been used in the past, or a list of the most likely labels for the current particular person of interest. The user can then select from the list the desired label for the person of interest. Gallagher at [0069]–[0073] Image/video capture time. Image capture time can be a precise minute in time, e.g. Mar. 27, 2004 at 10:17 AM. Or the image capture time can be less precise, e.g. 2004 or March 2004. The image capture time can be in the form of a probability distribution function e.g. Mar. 27, 2004 +/-2 days with 95% confidence. Often times the capture time is embedded in the file header of the digital image or video. For example, the EXIF image format (described at www.exif.org) allows the image or video capture device to store information associated with the image or video in the file header. The "Date/Time" entry is associated with the date and time the image was captured. In some cases, the digital image or video results from scanning film and the image capture time is determined by detection of the date printed into the image (as is often done at capture time) area, usually in the lower left corner of the image. The date a photograph is printed is often printed on the back of the print. Alternatively, some film systems contain a magnetic layer in the film for storing information such as the capture date.

'848 Patent Claim Limitation	Gallagher Exemplary Disclosure
	Capture condition metadata (e.g. flash fire information, shutter speed, aperture, ISO, scene brightness, etc.) Geographic location. The location is preferably stored in units of latitude and longitude. Scene environment information. Scene environment information is information derived from the pixel values of an image or video in regions not containing a person. For example, the mean value of the non-people regions in an image or video is an example of scene environment information. Another example of scene environment information is texture samples (e.g. a sampling of pixel values from a region of wallpaper in an image). Geographic location and scene environment information are important clues to the identity of persons in the associated images. For example, a photographer's visit to grandmother's house could be the only location where grandmother is photographed. When two images are captured with similar geographic locations and environments, it is more likely that detected persons in the two images are the same as well. Scene environment information can be used by the person detector 110 to register two images. This is useful when the people being photographed are mostly stationary, but the camera moves slightly between consecutive photographs. The scene environment information is used to register the two images, thereby aligning the positions of the people in the two frames. This alignment is used by the person finder 108 because when two persons have the same position in two images captured closely in time and registered, then the likelihood that the two people are the same individual is high. Gallagher at [0137]–[0139] In some cases, the modified features 254 form the person identifier 250 are straightforward to generate from the database 114. For example, when the database contains only global features and no local features, then the features associated with each label (whether or not the label contains position information) will be identical. For example, if the only feature is image capture time, then each label associated with the image is associated with the image capture time. Also, if the labels contain position information, then associating features with the labels is easy because either the features do not include local features and therefore the same features are associated with each label, or the features contain local features and the position of the image region over which the local features are computed is used to associate the features with the labels (based on proximity). A person classifier 256 uses the modified features 254 and a identity of the person of interest 252 to determine a digital image collection subset 112 of images and videos believed to contain the person of interest. The modified features 254 includes some features having associated labels (known as labeled features). Other features (known as unlabeled features) do not have associated labels (e.g. all of the image and videos in the digital image collection 102 that were not labeled by the labeler 104). The person classifier 256 uses labeled features to classify the unlabeled features. This problem, although in practice

'848 Patent Claim Limitation	Gallagher Exemplary Disclosure
	quite difficult, is studied in the field of pattern recognition. Any classifier may be used to classify the unlabeled features. Preferably, the person classifier determines a proposed label for each of the unlabeled features and a confidence, belief, or probability associated with the proposed label. In general, classifiers assign labels to unlabeled features by considering the similarity between a particular set of unlabeled features and labeled sets of features. With some classifiers (e.g. Gaussian Maximum Likelihood), labeled sets of features associated with a single individual person are aggregated to form a model of appearance for the individual. The digital image collection subset 112 is the collection of images and videos having an associated proposed label with a probability that exceeds a threshold T_0, where T_0 ranges from $0 \leq T_0 \leq 1.0$. Preferably, the digital image collection subset 112 also contains the image and videos associated with features having labels matching the identity of the person of interest 252. The images and videos of the digital image collection subset are sorted so that images and videos determined to have the highest belief of containing the person of interest appear at the top of the subset, following only the images and videos with features having labels matching the identity of the person of interest 252. The person classifier 256 can measure the similarity between sets of features associated with two or more persons to determine the similarity of the persons, and thereby the likelihood that the persons are the same. Measuring the similarity of sets of features is accomplished by measuring the similarity of subsets of the features. For example, when the local features describe clothing, the following method is used to compare two sets of features. If the difference in image capture time is small (i.e. less than a few hours) and if the quantitative description of the clothing is similar in each of the two sets of features is similar, then the likelihood of the two sets of local features belonging to the same person is increased. If, additionally, the clothes have a very unique or distinctive pattern (e.g. a shirt of large green, red, and blue patches) for both sets of local features, then the likelihood is even greater that the associated people are the same individual. Gallagher at [0146] Preferably, the user can adjust the value of T_0 through the user interface. As the value increases, the digital image collection subset 112 contains fewer images or videos, but the likelihood that the images and videos in the digital image collection subset 112 actually do contain the person of interest increases. In this manner, the user can determine the number and accuracy of the search results. To the extent Maxell contends Gallagher does not disclose this limitation, a person of ordinary skill in the art would have readily arrived at this limitation by combining or modifying it in view of their general knowledge and/or the prior art references disclosed in the corresponding section of Samsung's Invalidity Contentions.

'848 Patent Claim Limitation

[11b] wherein a reproducing time required for reproducing the image information under the first reproducing mode is shorter than a reproducing time required for reproducing the image information under the second reproducing mode, and

Gallagher Exemplary Disclosure

Gallagher discloses “wherein a reproducing time required for reproducing the image information under the first reproducing mode is shorter than a reproducing time required for reproducing the image information under the second reproducing mode.” For example:

Gallagher at Fig. 2

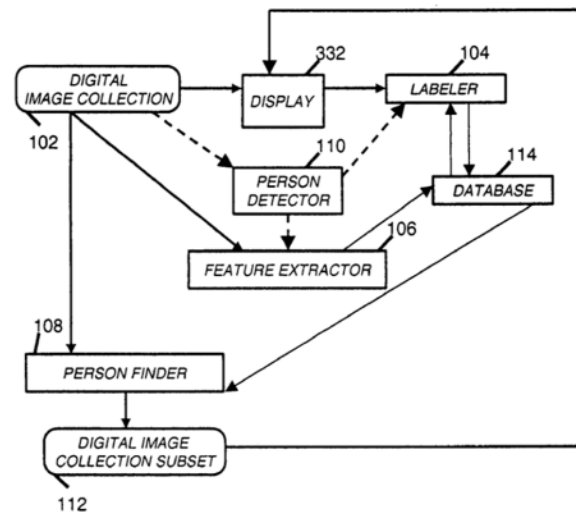
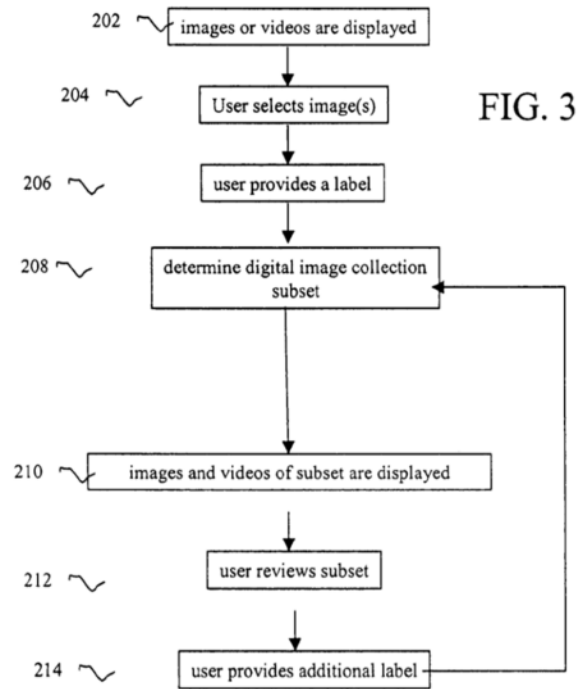


FIG. 2

Gallagher at Fig. 3



Gallagher at Fig. 4

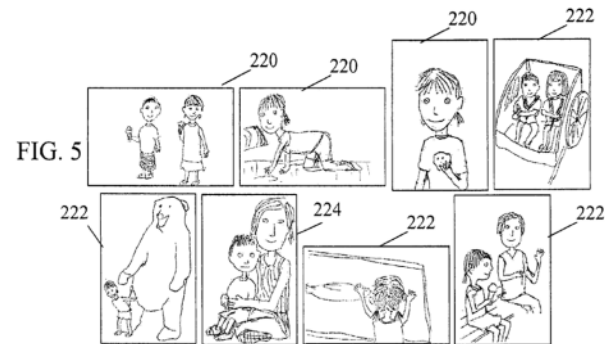
FIG. 4



Gallagher at Fig. 5

'848 Patent Claim Limitation

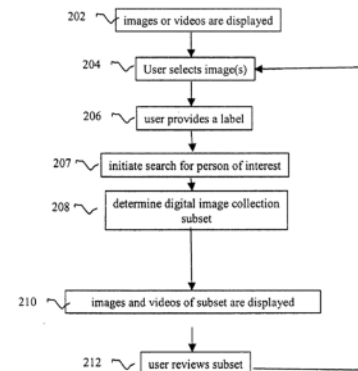
Gallagher Exemplary Disclosure



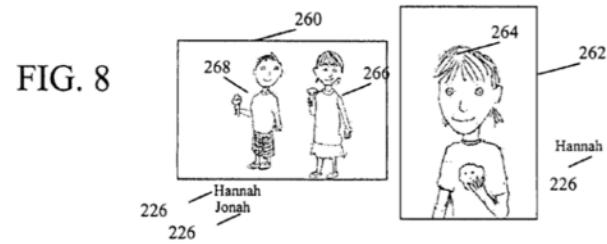
Gallagher at Fig. 6



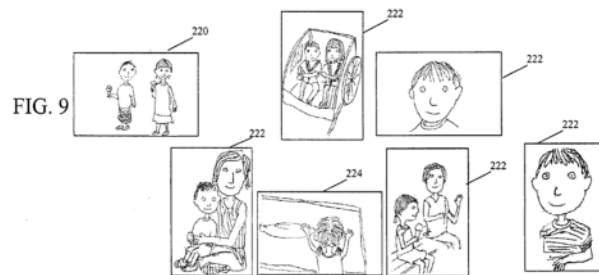
Gallagher at Fig. 7



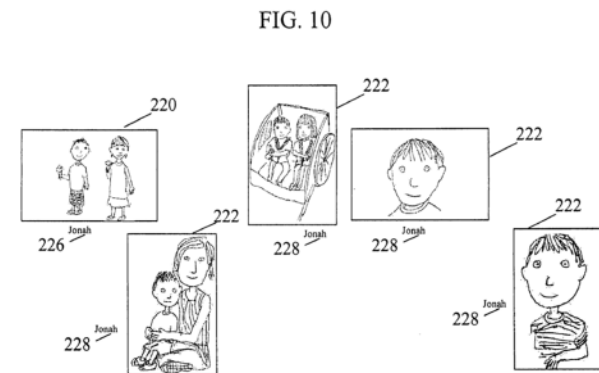
Gallagher at Fig. 8



Gallagher at Fig. 9



Gallagher at Fig. 10



Gallagher at Fig. 12A

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Gallagher Exemplary Disclosure

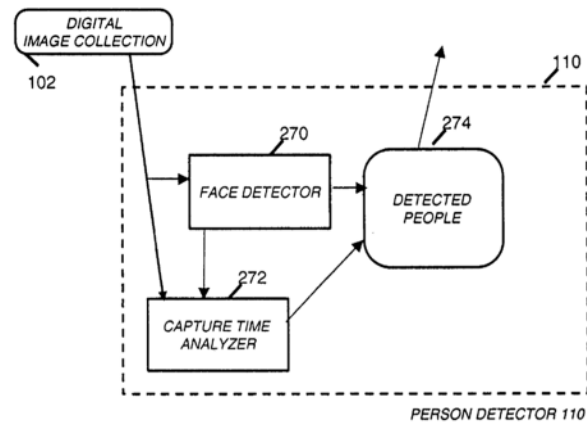


FIG. 12A

Gallagher at Fig. 13

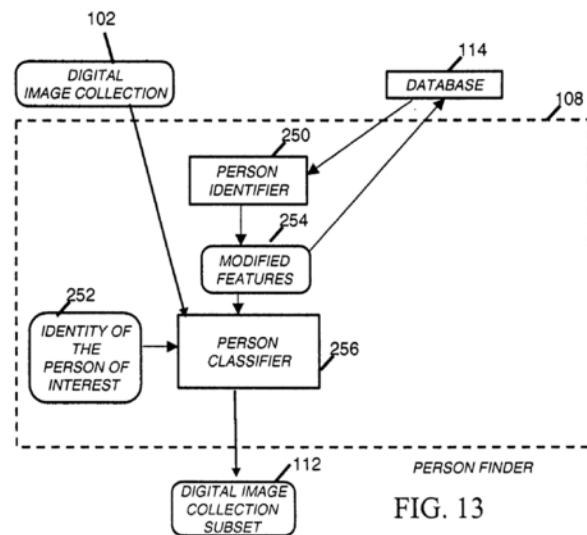


FIG. 13

Gallagher at Fig. 15

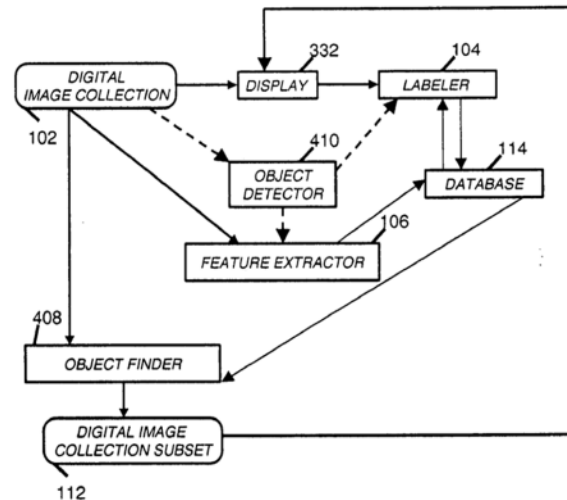


FIG. 15

Gallagher at [0048]–[0049]

An embodiment of the invention is illustrated in FIG. 2. A digital image collection 102 containing people is searched for a person of interest by a person finder 108. A digital image collection subset 112 is the set of images from the digital image collection 102 believed to contain the person of interest. The digital image collection 102 includes both images and videos. For convenience, the term “image” refers to both single images and videos. Videos are a collection of images with accompanying audio and sometimes text. The digital image collection subset 112 is displayed on the display 332 for review by the human user.

The search for a person of interest is initiated by a user as follows: Images or videos of the digital image collection 102 are displayed on the display 332 and viewed by the user. The user establishes one or more labels for one or more of the images with a labeler 104. A feature extractor 106 extracts features from the digital image collection in association with the label(s) from the labeler 104. The features are stored in association with labels in a database 114. A person detector 110 can optionally be used to assist in the labeling and feature extraction. When the digital image collection subset 112 is displayed on the display 332, the user can review the results and further label the displayed images.

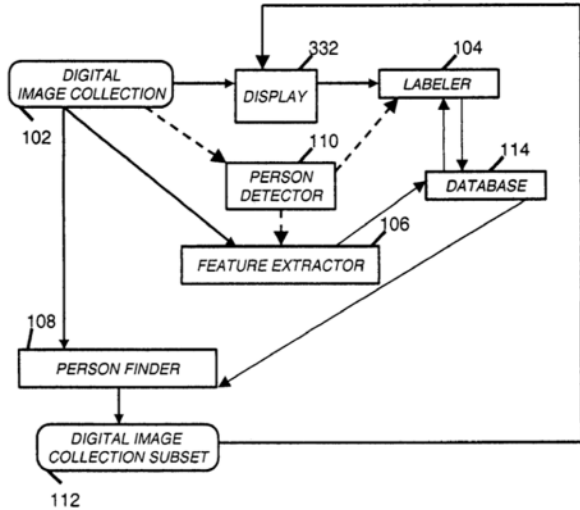
Gallagher at [0058]–[0060]

FIG. 3 is a flow diagram showing a method for using a digital camera to identify images believed to contain a person of interest. Those skilled in the art will recognize that the processing platform for using the present invention can be a camera, a personal computer, a remote computer assessed over a network such as the Internet, a printer, or the like. In this embodiment, a user selects a few images or videos containing a person of interest, and the system determines and displays images or videos from a subset of the digital image collection believed to contain the person of interest. The displayed images can be reviewed by the user, and the user can indicate whether the displayed images do contain the person of interest. In addition, the user can verify or provide the name of the person of interest. Finally, based on the input from the user, the system can again determine a set of images believed to contain the person of interest.

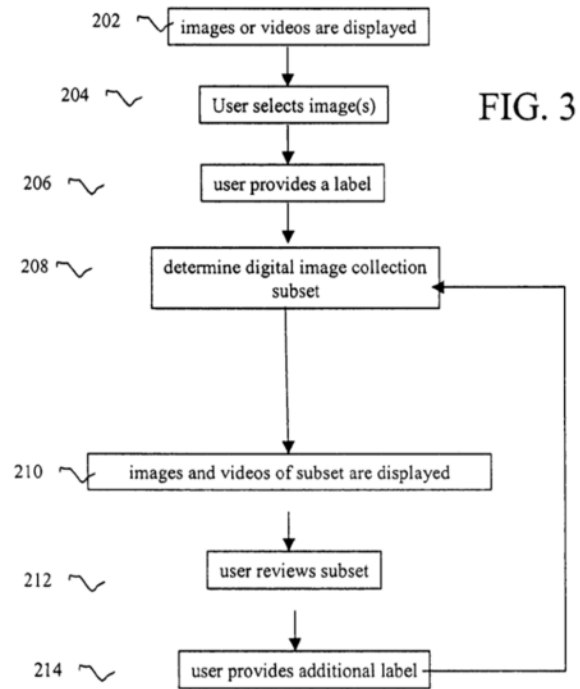
In block 202, images are displayed on the display 332. In block 204, the user selects images, where each image contains the person of interest. At least one of the selected images contains a person besides the person of interest. For example, FIG. 4 shows a set of three selected images, each containing the person of interest, and one of the images contains two people. In block 206, the user provides a label via the labeler 104 that indicates the selected images contain the person of interest and the images and videos from the image collection are to be searched by the person finder 108 to identify those believed to contain the person of interest. In block 208, the person identifier accesses the features and associated labels stored in the database 114 and determines a digital image collection subset 112 of images and videos believed to contain the person of interest. In block 210, the digital image collection subset 112 is displayed on the display 332. For example, FIG. 5 shows images in the digital image collection subset 112. The digital image collection subset contains labeled images 220, images correctly believed to contain the person of interest 222, and images incorrectly believed to contain the person of interest 224. This is a consequence of the imperfect nature of current face detection and recognition technology. In block 212, the user reviews the digital image collection subset 112 and can indicate the correctness of each image in the digital image collection subset 112. This user indication of correctness is used to provide additional labels via the labeler 104 in block 214. For example, the user indicates via the user interface that all of the images and videos correctly believes to contain the person of interest 222 of the digital image collection subset 112 do contain the person of interest. Each image and video of the digital image collection is then labeled with the name of the person of interest if it has been provided by the user. If the name of the person of interest has not been provided by the user, the name of the person of interest can be determined in some cases by the labeler 104. The images and videos of the digital image collection subset 112 are examined for those having a label indicating the name of the person of interest and for which the person detector 110 determines contain only one person. Because the user has verified that the images and videos of the digital image collection subset 112 do contain the person of interest and

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	the person detector 110 finds only a single person, the labeler 104 concludes that the name of the person in the associated label is the name of the person of interest. If the person detector 110 is an automatic error-prone algorithm, then the labeler 104 may need to implement a voting scheme if more than one image and videos have an associated label containing a person's name and the person detector 110 finds only one person, and the person's name in the associated label is not unanimous. For example, if there are 3 images among the digital image collection subset 112 that contain one detected person each by the person detector 110, and each image has a label containing a person's name, and the names are: "Hannah", "Hannah", and "Holly", then the voting scheme conducted by the labeled 104 determines that the person's name is "Hannah". The labeler 104 then labels the images and videos of the digital image collection subset 112 with a label containing the name of the person of interest (e.g. "Hannah"). The user can review the name of the person of interest determined by the labeler 104 via the display. After the user indicates that the images and videos of the digital image collection subset 112 contain the person of interest, the message "Label as Hannah?" appears, and the user can confirm the determined name of the person of interest by pressing "yes", or enter a different name for the person of interest by pressing "no". If the labeler 104 cannot determine the name of the person of interest, then a currently unused identifier is assigned to the person of interest (e.g. "Person 12"), and the images and videos of the digital image collection subset 112 are labeled by the labeler 104 accordingly. Alternatively, the labeler 104 can determine several candidate labels for the person of interest. The candidate labels can be displayed to the user in the form of a list. The list of candidate labels can be a list of labels that have been used in the past, or a list of the most likely labels for the current particular person of interest. The user can then select from the list the desired label for the person of interest. Gallagher at [0137]–[0139] In some cases, the modified features 254 form the person identifier 250 are straightforward to generate from the database 114. For example, when the database contains only global features and no local features, then the features associated with each label (whether or not the label contains position information) will be identical. For example, if the only feature is image capture time, then each label associated with the image is associated with the image capture time. Also, if the labels contain position information, then associating features with the labels is easy because either the features do not include local features and therefore the same features are associated with each label, or the features contain local features and the position of the image region over which the local features are computed is used to associate the features with the labels (based on proximity). A person classifier 256 uses the modified features 254 and a identity of the person of interest 252 to determine a digital image collection subset 112 of images and videos believed to contain the person of

'848 Patent Claim Limitation	Gallagher Exemplary Disclosure
	interest. The modified features 254 includes some features having associated labels (known as labeled features). Other features (known as unlabeled features) do not have associated labels (e.g. all of the image and videos in the digital image collection 102 that were not labeled by the labeler 104). The person classifier 256 uses labeled features to classify the unlabeled features. This problem, although in practice quite difficult, is studied in the field of pattern recognition. Any classifier may be used to classify the unlabeled features. Preferably, the person classifier determines a proposed label for each of the unlabeled features and a confidence, belief, or probability associated with the proposed label. In general, classifiers assign labels to unlabeled features by considering the similarity between a particular set of unlabeled features and labeled sets of features. With some classifiers (e.g. Gaussian Maximum Likelihood), labeled sets of features associated with a single individual person are aggregated to form a model of appearance for the individual. The digital image collection subset 112 is the collection of images and videos having an associated proposed label with a probability that exceeds a threshold T_0, where T_0 ranges from $0 \leq T_0 \leq 1.0$. Preferably, the digital image collection subset 112 also contains the image and videos associated with features having labels matching the identity of the person of interest 252. The images and videos of the digital image collection subset are sorted so that images and videos determined to have the highest belief of containing the person of interest appear at the top of the subset, following only the images and videos with features having labels matching the identity of the person of interest 252. The person classifier 256 can measure the similarity between sets of features associated with two or more persons to determine the similarity of the persons, and thereby the likelihood that the persons are the same. Measuring the similarity of sets of features is accomplished by measuring the similarity of subsets of the features. For example, when the local features describe clothing, the following method is used to compare two sets of features. If the difference in image capture time is small (i.e. less than a few hours) and if the quantitative description of the clothing is similar in each of the two sets of features is similar, then the likelihood of the two sets of local features belonging to the same person is increased. If, additionally, the clothes have a very unique or distinctive pattern (e.g. a shirt of large green, red, and blue patches) for both sets of local features, then the likelihood is even greater that the associated people are the same individual. Gallagher at [0146] Preferably, the user can adjust the value of T_0 through the user interface. As the value increases, the digital image collection subset 112 contains fewer images or videos, but the likelihood that the images and videos in the digital image collection subset 112 actually do contain the person of interest increases. In this manner, the user can determine the number and accuracy of the search results.

'848 Patent Claim Limitation	Gallagher Exemplary Disclosure
	To the extent Maxell contends Gallagher does not disclose this limitation, a person of ordinary skill in the art would have readily arrived at this limitation by combining or modifying it in view of their general knowledge and/or the prior art references disclosed in the corresponding section of Samsung's Invalidity Contentions.
[11c] the image information reproduced under the second mode includes the image information reproduced under the first reproducing mode and other of the image information not reproduced under the first reproducing mode.	Gallagher discloses “the image information reproduced under the second mode includes the image information reproduced under the first reproducing mode and other of the image information not reproduced under the first reproducing mode.” For example: Gallagher at Fig. 2  <pre> graph TD 102[DIGITAL IMAGE COLLECTION] --> 108[PERSON FINDER] 102 --> 110[PERSON DETECTOR] 102 --> 332[DISPLAY] 102 --> 104[LABELER] 102 --> 114[DATABASE] 108 --> 112[DIGITAL IMAGE COLLECTION SUBSET] 110 --> 106[FEATURE EXTRACTOR] 106 --> 104 104 --> 114 114 --> 104 114 --> 332 332 --> 104 </pre> The flowchart illustrates a system for processing digital image collections. It starts with a 'DIGITAL IMAGE COLLECTION' (102) which feeds into four parallel paths: a 'PERSON FINDER' (108) leading to a 'DIGITAL IMAGE COLLECTION SUBSET' (112); a 'PERSON DETECTOR' (110) leading to a 'FEATURE EXTRACTOR' (106); a 'DISPLAY' (332); and a 'LABELER' (104). The 'FEATURE EXTRACTOR' (106) also feeds into the 'LABELER' (104). The 'LABELER' (104) is connected to a 'DATABASE' (114) via bidirectional arrows. The 'DATABASE' (114) also feeds into the 'DISPLAY' (332). The 'DISPLAY' (332) and 'LABELER' (104) are connected by bidirectional arrows. FIG. 2

Gallagher at Fig. 3



Gallagher at Fig. 4

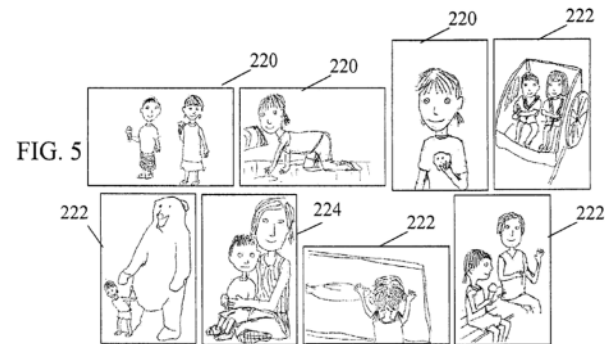
FIG. 4



Gallagher at Fig. 5

'848 Patent Claim Limitation

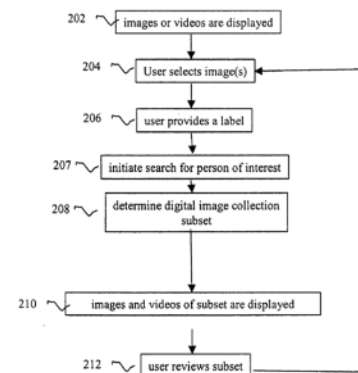
Gallagher Exemplary Disclosure



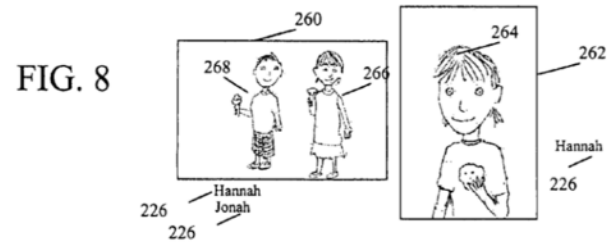
Gallagher at Fig. 6



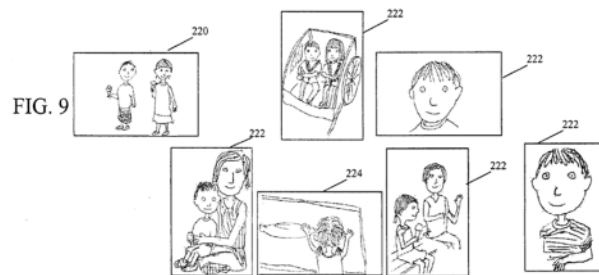
Gallagher at Fig. 7



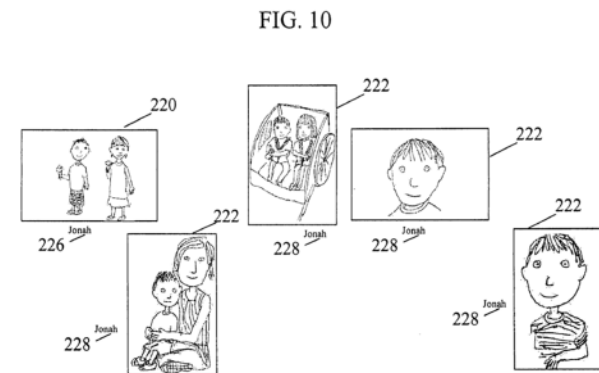
Gallagher at Fig. 8



Gallagher at Fig. 9



Gallagher at Fig. 10



Gallagher at Fig. 12A

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Gallagher Exemplary Disclosure

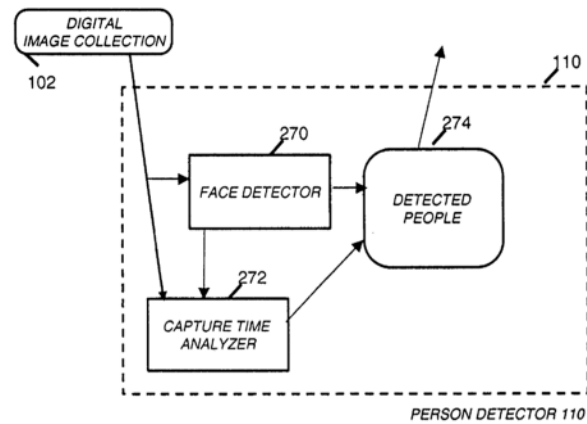


FIG. 12A

Gallagher at Fig. 13

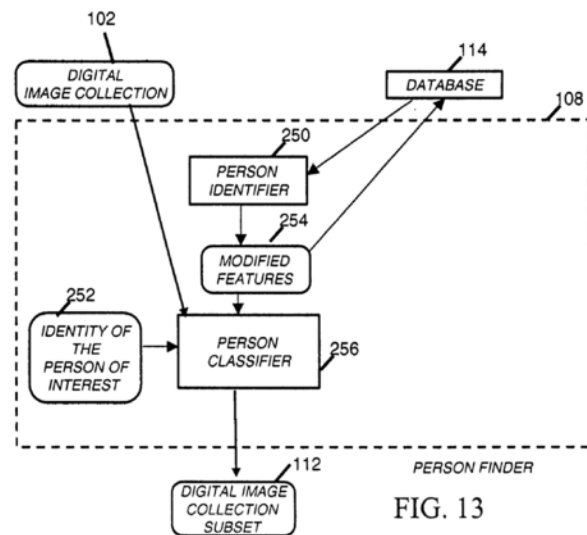


FIG. 13

Gallagher at Fig. 15

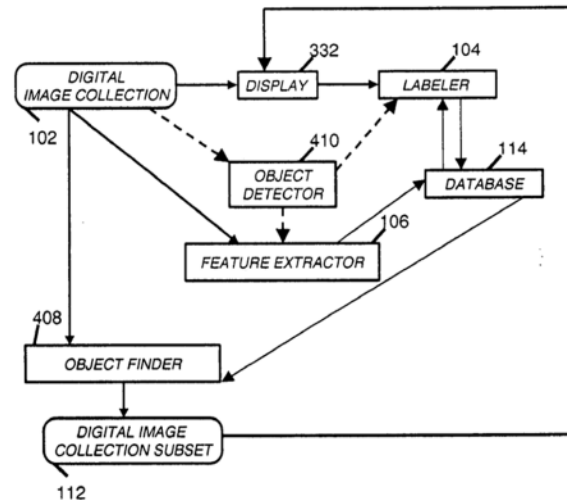


FIG. 15

Gallagher at [0048]–[0049]

An embodiment of the invention is illustrated in FIG. 2. A digital image collection 102 containing people is searched for a person of interest by a person finder 108. A digital image collection subset 112 is the set of images from the digital image collection 102 believed to contain the person of interest. The digital image collection 102 includes both images and videos. For convenience, the term “image” refers to both single images and videos. Videos are a collection of images with accompanying audio and sometimes text. The digital image collection subset 112 is displayed on the display 332 for review by the human user.

The search for a person of interest is initiated by a user as follows: Images or videos of the digital image collection 102 are displayed on the display 332 and viewed by the user. The user establishes one or more labels for one or more of the images with a labeler 104. A feature extractor 106 extracts features from the digital image collection in association with the label(s) from the labeler 104. The features are stored in association with labels in a database 114. A person detector 110 can optionally be used to assist in the labeling and feature extraction. When the digital image collection subset 112 is displayed on the display 332, the user can review the results and further label the displayed images.

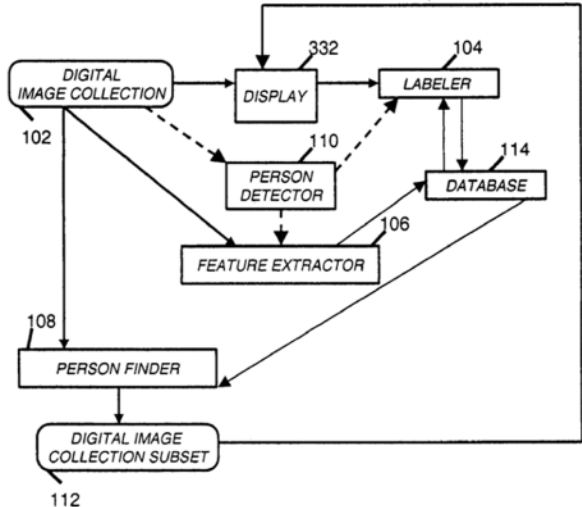
Gallagher at [0058]–[0060]

FIG. 3 is a flow diagram showing a method for using a digital camera to identify images believed to contain a person of interest. Those skilled in the art will recognize that the processing platform for using the present invention can be a camera, a personal computer, a remote computer assessed over a network such as the Internet, a printer, or the like. In this embodiment, a user selects a few images or videos containing a person of interest, and the system determines and displays images or videos from a subset of the digital image collection believed to contain the person of interest. The displayed images can be reviewed by the user, and the user can indicate whether the displayed images do contain the person of interest. In addition, the user can verify or provide the name of the person of interest. Finally, based on the input from the user, the system can again determine a set of images believed to contain the person of interest.

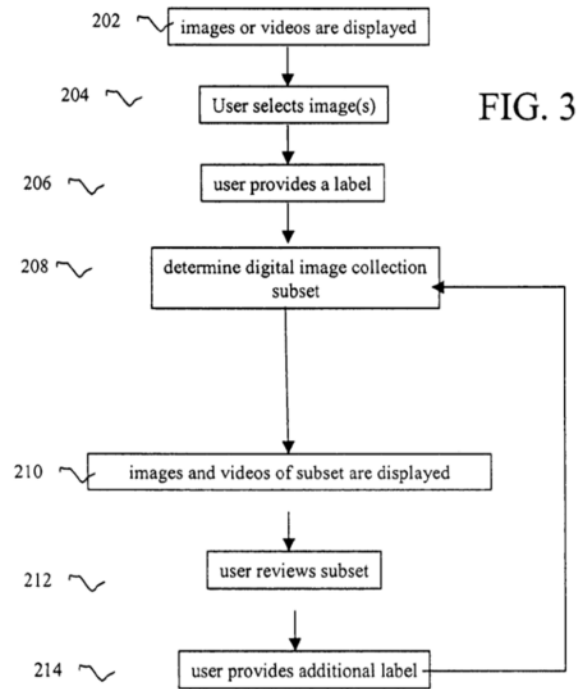
In block 202, images are displayed on the display 332. In block 204, the user selects images, where each image contains the person of interest. At least one of the selected images contains a person besides the person of interest. For example, FIG. 4 shows a set of three selected images, each containing the person of interest, and one of the images contains two people. In block 206, the user provides a label via the labeler 104 that indicates the selected images contain the person of interest and the images and videos from the image collection are to be searched by the person finder 108 to identify those believed to contain the person of interest. In block 208, the person identifier accesses the features and associated labels stored in the database 114 and determines a digital image collection subset 112 of images and videos believed to contain the person of interest. In block 210, the digital image collection subset 112 is displayed on the display 332. For example, FIG. 5 shows images in the digital image collection subset 112. The digital image collection subset contains labeled images 220, images correctly believed to contain the person of interest 222, and images incorrectly believed to contain the person of interest 224. This is a consequence of the imperfect nature of current face detection and recognition technology. In block 212, the user reviews the digital image collection subset 112 and can indicate the correctness of each image in the digital image collection subset 112. This user indication of correctness is used to provide additional labels via the labeler 104 in block 214. For example, the user indicates via the user interface that all of the images and videos correctly believes to contain the person of interest 222 of the digital image collection subset 112 do contain the person of interest. Each image and video of the digital image collection is then labeled with the name of the person of interest if it has been provided by the user. If the name of the person of interest has not been provided by the user, the name of the person of interest can be determined in some cases by the labeler 104. The images and videos of the digital image collection subset 112 are examined for those having a label indicating the name of the person of interest and for which the person detector 110 determines contain only one person. Because the user has verified that the images and videos of the digital image collection subset 112 do contain the person of interest and

'848 Patent Claim Limitation	Gallagher Exemplary Disclosure
	the person detector 110 finds only a single person, the labeler 104 concludes that the name of the person in the associated label is the name of the person of interest. If the person detector 110 is an automatic error-prone algorithm, then the labeler 104 may need to implement a voting scheme if more than one image and videos have an associated label containing a person's name and the person detector 110 finds only one person, and the person's name in the associated label is not unanimous. For example, if there are 3 images among the digital image collection subset 112 that contain one detected person each by the person detector 110, and each image has a label containing a person's name, and the names are: "Hannah", "Hannah", and "Holly", then the voting scheme conducted by the labeled 104 determines that the person's name is "Hannah". The labeler 104 then labels the images and videos of the digital image collection subset 112 with a label containing the name of the person of interest (e.g. "Hannah"). The user can review the name of the person of interest determined by the labeler 104 via the display. After the user indicates that the images and videos of the digital image collection subset 112 contain the person of interest, the message "Label as Hannah?" appears, and the user can confirm the determined name of the person of interest by pressing "yes", or enter a different name for the person of interest by pressing "no". If the labeler 104 cannot determine the name of the person of interest, then a currently unused identifier is assigned to the person of interest (e.g. "Person 12"), and the images and videos of the digital image collection subset 112 are labeled by the labeler 104 accordingly. Alternatively, the labeler 104 can determine several candidate labels for the person of interest. The candidate labels can be displayed to the user in the form of a list. The list of candidate labels can be a list of labels that have been used in the past, or a list of the most likely labels for the current particular person of interest. The user can then select from the list the desired label for the person of interest. Gallagher at [0137]–[0139] In some cases, the modified features 254 form the person identifier 250 are straightforward to generate from the database 114. For example, when the database contains only global features and no local features, then the features associated with each label (whether or not the label contains position information) will be identical. For example, if the only feature is image capture time, then each label associated with the image is associated with the image capture time. Also, if the labels contain position information, then associating features with the labels is easy because either the features do not include local features and therefore the same features are associated with each label, or the features contain local features and the position of the image region over which the local features are computed is used to associate the features with the labels (based on proximity). A person classifier 256 uses the modified features 254 and a identity of the person of interest 252 to determine a digital image collection subset 112 of images and videos believed to contain the person of

'848 Patent Claim Limitation	Gallagher Exemplary Disclosure
	interest. The modified features 254 includes some features having associated labels (known as labeled features). Other features (known as unlabeled features) do not have associated labels (e.g. all of the image and videos in the digital image collection 102 that were not labeled by the labeler 104). The person classifier 256 uses labeled features to classify the unlabeled features. This problem, although in practice quite difficult, is studied in the field of pattern recognition. Any classifier may be used to classify the unlabeled features. Preferably, the person classifier determines a proposed label for each of the unlabeled features and a confidence, belief, or probability associated with the proposed label. In general, classifiers assign labels to unlabeled features by considering the similarity between a particular set of unlabeled features and labeled sets of features. With some classifiers (e.g. Gaussian Maximum Likelihood), labeled sets of features associated with a single individual person are aggregated to form a model of appearance for the individual. The digital image collection subset 112 is the collection of images and videos having an associated proposed label with a probability that exceeds a threshold T_0, where T_0 ranges from $0 \leq T_0 \leq 1.0$. Preferably, the digital image collection subset 112 also contains the image and videos associated with features having labels matching the identity of the person of interest 252. The images and videos of the digital image collection subset are sorted so that images and videos determined to have the highest belief of containing the person of interest appear at the top of the subset, following only the images and videos with features having labels matching the identity of the person of interest 252. The person classifier 256 can measure the similarity between sets of features associated with two or more persons to determine the similarity of the persons, and thereby the likelihood that the persons are the same. Measuring the similarity of sets of features is accomplished by measuring the similarity of subsets of the features. For example, when the local features describe clothing, the following method is used to compare two sets of features. If the difference in image capture time is small (i.e. less than a few hours) and if the quantitative description of the clothing is similar in each of the two sets of features is similar, then the likelihood of the two sets of local features belonging to the same person is increased. If, additionally, the clothes have a very unique or distinctive pattern (e.g. a shirt of large green, red, and blue patches) for both sets of local features, then the likelihood is even greater that the associated people are the same individual. Gallagher at [0146] Preferably, the user can adjust the value of T_0 through the user interface. As the value increases, the digital image collection subset 112 contains fewer images or videos, but the likelihood that the images and videos in the digital image collection subset 112 actually do contain the person of interest increases. In this manner, the user can determine the number and accuracy of the search results.

'848 Patent Claim Limitation	Gallagher Exemplary Disclosure
	To the extent Maxell contends Gallagher does not disclose this limitation, a person of ordinary skill in the art would have readily arrived at this limitation by combining or modifying it in view of their general knowledge and/or the prior art references disclosed in the corresponding section of Samsung's Invalidity Contentions.
[12pre] 12. The recording and reproducing apparatus according to claim 11,	Gallagher discloses "[t]he recording and reproducing apparatus according to claim 11." See above.
[12a] wherein the memory further stores instructions that, when executed by the processor, cause the processor to: control the reproduction of the image information in the reproducing mode set from one of the first reproducing mode, the second reproducing mode, and a third reproducing mode,	Gallagher discloses "wherein the memory further stores instructions that, when executed by the processor, cause the processor to: control the reproduction of the image information in the reproducing mode set from one of the first reproducing mode, the second reproducing mode, and a third reproducing mode." For example: Gallagher at Fig. 2  <pre> graph TD 102[DIGITAL IMAGE COLLECTION 102] --> 332[DISPLAY 332] 332 --> 104[LABELER 104] 104 --> 110[PERSON DETECTOR 110] 110 --> 106[FEATURE EXTRACTOR 106] 106 --> 114[DATABASE 114] 114 --> 108[PERSON FINDER 108] 108 --> 112[DIGITAL IMAGE COLLECTION SUBSET 112] 112 --> 102 102 -.-> 110 110 -.-> 104 </pre> FIG. 2

Gallagher at Fig. 3



Gallagher at Fig. 4

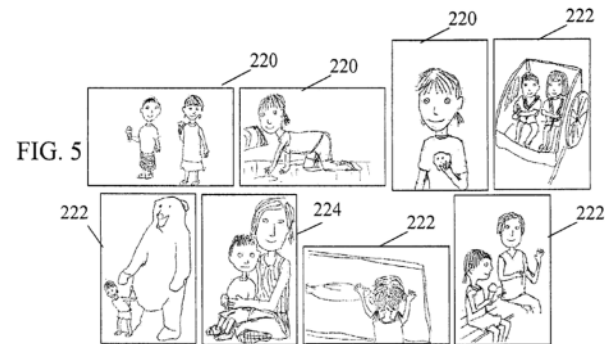
FIG. 4



Gallagher at Fig. 5

'848 Patent Claim Limitation

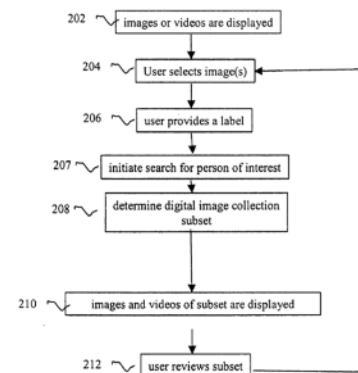
Gallagher Exemplary Disclosure



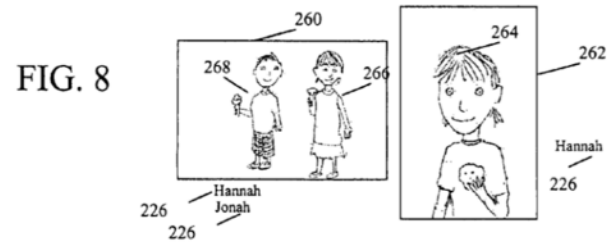
Gallagher at Fig. 6



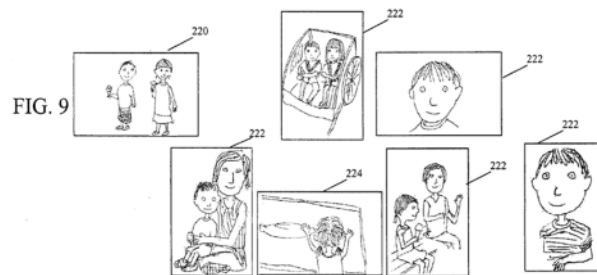
Gallagher at Fig. 7



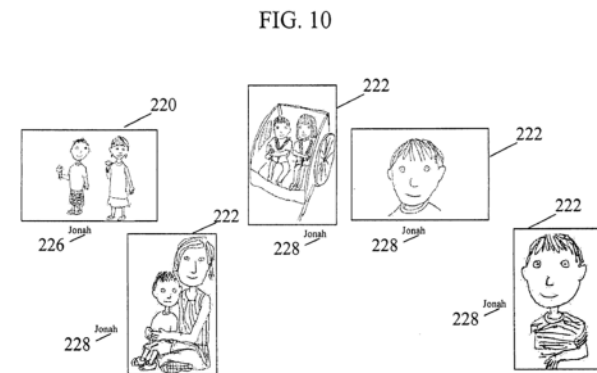
Gallagher at Fig. 8



Gallagher at Fig. 9



Gallagher at Fig. 10



Gallagher at Fig. 12A

'848 Patent Claim Limitation

Gallagher Exemplary Disclosure

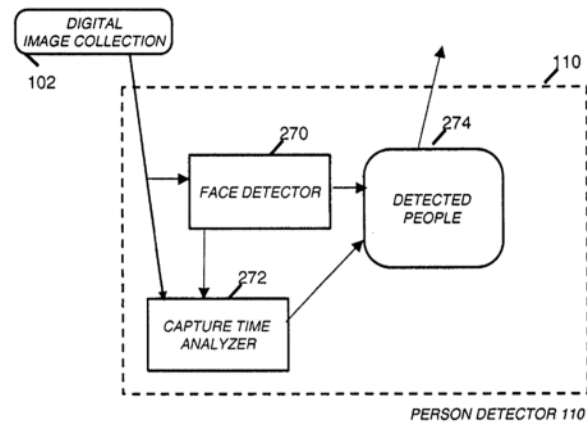


FIG. 12A

Gallagher at Fig. 13

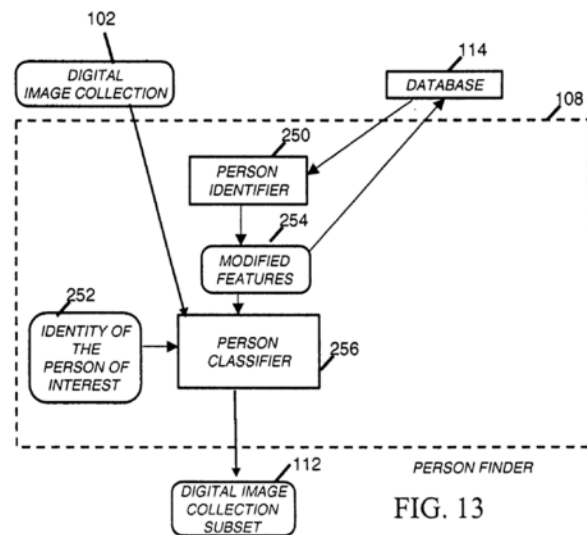


FIG. 13

Gallagher at Fig. 15

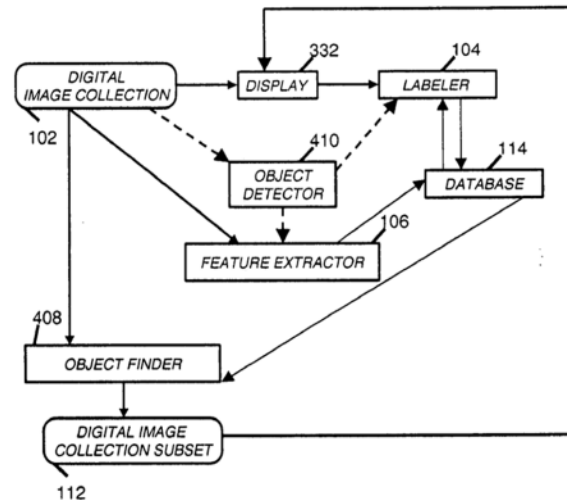


FIG. 15

Gallagher at [0048]–[0049]

An embodiment of the invention is illustrated in FIG. 2. A digital image collection 102 containing people is searched for a person of interest by a person finder 108. A digital image collection subset 112 is the set of images from the digital image collection 102 believed to contain the person of interest. The digital image collection 102 includes both images and videos. For convenience, the term “image” refers to both single images and videos. Videos are a collection of images with accompanying audio and sometimes text. The digital image collection subset 112 is displayed on the display 332 for review by the human user.

The search for a person of interest is initiated by a user as follows: Images or videos of the digital image collection 102 are displayed on the display 332 and viewed by the user. The user establishes one or more labels for one or more of the images with a labeler 104. A feature extractor 106 extracts features from the digital image collection in association with the label(s) from the labeler 104. The features are stored in association with labels in a database 114. A person detector 110 can optionally be used to assist in the labeling and feature extraction. When the digital image collection subset 112 is displayed on the display 332, the user can review the results and further label the displayed images.

Gallagher at [0058]–[0060]

FIG. 3 is a flow diagram showing a method for using a digital camera to identify images believed to contain a person of interest. Those skilled in the art will recognize that the processing platform for using the present invention can be a camera, a personal computer, a remote computer assessed over a network such as the Internet, a printer, or the like. In this embodiment, a user selects a few images or videos containing a person of interest, and the system determines and displays images or videos from a subset of the digital image collection believed to contain the person of interest. The displayed images can be reviewed by the user, and the user can indicate whether the displayed images do contain the person of interest. In addition, the user can verify or provide the name of the person of interest. Finally, based on the input from the user, the system can again determine a set of images believed to contain the person of interest.

In block 202, images are displayed on the display 332. In block 204, the user selects images, where each image contains the person of interest. At least one of the selected images contains a person besides the person of interest. For example, FIG. 4 shows a set of three selected images, each containing the person of interest, and one of the images contains two people. In block 206, the user provides a label via the labeler 104 that indicates the selected images contain the person of interest and the images and videos from the image collection are to be searched by the person finder 108 to identify those believed to contain the person of interest. In block 208, the person identifier accesses the features and associated labels stored in the database 114 and determines a digital image collection subset 112 of images and videos believed to contain the person of interest. In block 210, the digital image collection subset 112 is displayed on the display 332. For example, FIG. 5 shows images in the digital image collection subset 112. The digital image collection subset contains labeled images 220, images correctly believed to contain the person of interest 222, and images incorrectly believed to contain the person of interest 224. This is a consequence of the imperfect nature of current face detection and recognition technology. In block 212, the user reviews the digital image collection subset 112 and can indicate the correctness of each image in the digital image collection subset 112. This user indication of correctness is used to provide additional labels via the labeler 104 in block 214. For example, the user indicates via the user interface that all of the images and videos correctly believes to contain the person of interest 222 of the digital image collection subset 112 do contain the person of interest. Each image and video of the digital image collection is then labeled with the name of the person of interest if it has been provided by the user. If the name of the person of interest has not been provided by the user, the name of the person of interest can be determined in some cases by the labeler 104. The images and videos of the digital image collection subset 112 are examined for those having a label indicating the name of the person of interest and for which the person detector 110 determines contain only one person. Because the user has verified that the images and videos of the digital image collection subset 112 do contain the person of interest and

'848 Patent Claim Limitation	Gallagher Exemplary Disclosure
	the person detector 110 finds only a single person, the labeler 104 concludes that the name of the person in the associated label is the name of the person of interest. If the person detector 110 is an automatic error-prone algorithm, then the labeler 104 may need to implement a voting scheme if more than one image and videos have an associated label containing a person's name and the person detector 110 finds only one person, and the person's name in the associated label is not unanimous. For example, if there are 3 images among the digital image collection subset 112 that contain one detected person each by the person detector 110, and each image has a label containing a person's name, and the names are: "Hannah", "Hannah", and "Holly", then the voting scheme conducted by the labeled 104 determines that the person's name is "Hannah". The labeler 104 then labels the images and videos of the digital image collection subset 112 with a label containing the name of the person of interest (e.g. "Hannah"). The user can review the name of the person of interest determined by the labeler 104 via the display. After the user indicates that the images and videos of the digital image collection subset 112 contain the person of interest, the message "Label as Hannah?" appears, and the user can confirm the determined name of the person of interest by pressing "yes", or enter a different name for the person of interest by pressing "no". If the labeler 104 cannot determine the name of the person of interest, then a currently unused identifier is assigned to the person of interest (e.g. "Person 12"), and the images and videos of the digital image collection subset 112 are labeled by the labeler 104 accordingly. Alternatively, the labeler 104 can determine several candidate labels for the person of interest. The candidate labels can be displayed to the user in the form of a list. The list of candidate labels can be a list of labels that have been used in the past, or a list of the most likely labels for the current particular person of interest. The user can then select from the list the desired label for the person of interest. Gallagher at [0069]–[0073] Image/video capture time. Image capture time can be a precise minute in time, e.g. Mar. 27, 2004 at 10:17 AM. Or the image capture time can be less precise, e.g. 2004 or March 2004. The image capture time can be in the form of a probability distribution function e.g. Mar. 27, 2004 +/-2 days with 95% confidence. Often times the capture time is embedded in the file header of the digital image or video. For example, the EXIF image format (described at www.exif.org) allows the image or video capture device to store information associated with the image or video in the file header. The "Date\Time" entry is associated with the date and time the image was captured. In some cases, the digital image or video results from scanning film and the image capture time is determined by detection of the date printed into the image (as is often done at capture time) area, usually in the lower left corner of the image. The date a photograph is printed is often printed on the back of the print. Alternatively, some film systems contain a magnetic layer in the film for storing information such as the capture date.

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	Capture condition metadata (e.g. flash fire information, shutter speed, aperture, ISO, scene brightness, etc.) Geographic location. The location is preferably stored in units of latitude and longitude. Scene environment information. Scene environment information is information derived from the pixel values of an image or video in regions not containing a person. For example, the mean value of the non-people regions in an image or video is an example of scene environment information. Another example of scene environment information is texture samples (e.g. a sampling of pixel values from a region of wallpaper in an image). Geographic location and scene environment information are important clues to the identity of persons in the associated images. For example, a photographer's visit to grandmother's house could be the only location where grandmother is photographed. When two images are captured with similar geographic locations and environments, it is more likely that detected persons in the two images are the same as well. Scene environment information can be used by the person detector 110 to register two images. This is useful when the people being photographed are mostly stationary, but the camera moves slightly between consecutive photographs. The scene environment information is used to register the two images, thereby aligning the positions of the people in the two frames. This alignment is used by the person finder 108 because when two persons have the same position in two images captured closely in time and registered, then the likelihood that the two people are the same individual is high. Gallagher at [0137]–[0139] In some cases, the modified features 254 form the person identifier 250 are straightforward to generate from the database 114. For example, when the database contains only global features and no local features, then the features associated with each label (whether or not the label contains position information) will be identical. For example, if the only feature is image capture time, then each label associated with the image is associated with the image capture time. Also, if the labels contain position information, then associating features with the labels is easy because either the features do not include local features and therefore the same features are associated with each label, or the features contain local features and the position of the image region over which the local features are computed is used to associate the features with the labels (based on proximity). A person classifier 256 uses the modified features 254 and a identity of the person of interest 252 to determine a digital image collection subset 112 of images and videos believed to contain the person of interest. The modified features 254 includes some features having associated labels (known as labeled features). Other features (known as unlabeled features) do not have associated labels (e.g. all of the image and videos in the digital image collection 102 that were not labeled by the labeler 104). The person classifier 256 uses labeled features to classify the unlabeled features. This problem, although in practice

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	quite difficult, is studied in the field of pattern recognition. Any classifier may be used to classify the unlabeled features. Preferably, the person classifier determines a proposed label for each of the unlabeled features and a confidence, belief, or probability associated with the proposed label. In general, classifiers assign labels to unlabeled features by considering the similarity between a particular set of unlabeled features and labeled sets of features. With some classifiers (e.g. Gaussian Maximum Likelihood), labeled sets of features associated with a single individual person are aggregated to form a model of appearance for the individual. The digital image collection subset 112 is the collection of images and videos having an associated proposed label with a probability that exceeds a threshold T_0, where T_0 ranges from $0 \leq T_0 \leq 1.0$. Preferably, the digital image collection subset 112 also contains the image and videos associated with features having labels matching the identity of the person of interest 252. The images and videos of the digital image collection subset are sorted so that images and videos determined to have the highest belief of containing the person of interest appear at the top of the subset, following only the images and videos with features having labels matching the identity of the person of interest 252. The person classifier 256 can measure the similarity between sets of features associated with two or more persons to determine the similarity of the persons, and thereby the likelihood that the persons are the same. Measuring the similarity of sets of features is accomplished by measuring the similarity of subsets of the features. For example, when the local features describe clothing, the following method is used to compare two sets of features. If the difference in image capture time is small (i.e. less than a few hours) and if the quantitative description of the clothing is similar in each of the two sets of features is similar, then the likelihood of the two sets of local features belonging to the same person is increased. If, additionally, the clothes have a very unique or distinctive pattern (e.g. a shirt of large green, red, and blue patches) for both sets of local features, then the likelihood is even greater that the associated people are the same individual. Gallagher at [0146] Preferably, the user can adjust the value of T_0 through the user interface. As the value increases, the digital image collection subset 112 contains fewer images or videos, but the likelihood that the images and videos in the digital image collection subset 112 actually do contain the person of interest increases. In this manner, the user can determine the number and accuracy of the search results. To the extent Maxell contends Gallagher does not disclose this limitation, a person of ordinary skill in the art would have readily arrived at this limitation by combining or modifying it in view of their general knowledge and/or the prior art references disclosed in the corresponding section of Samsung's Invalidity Contentions.

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[12b] wherein a reproducing time required for reproducing the image information under the third reproducing mode is longer than the reproducing time required for reproducing the image information under the second reproducing mode.

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Gallagher discloses “wherein a reproducing time required for reproducing the image information under the third reproducing mode is longer than the reproducing time required for reproducing the image information under the second reproducing mode.” For example:

Gallagher at Fig. 2

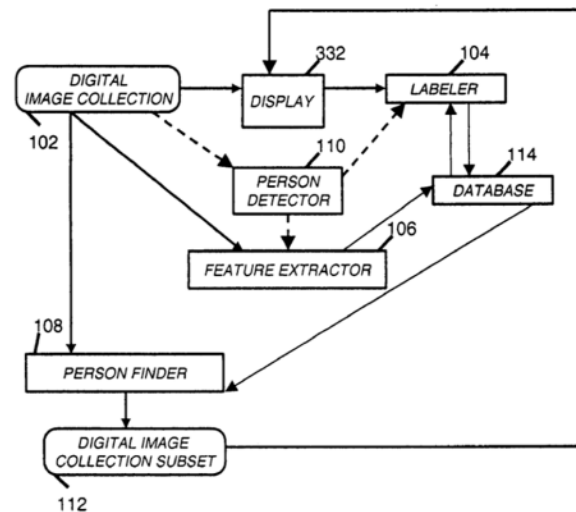
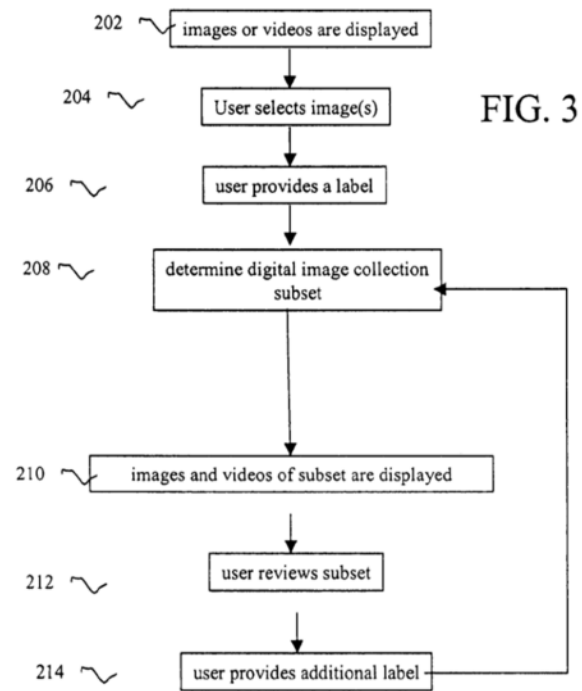


FIG. 2

Gallagher at Fig. 3



Gallagher at Fig. 4

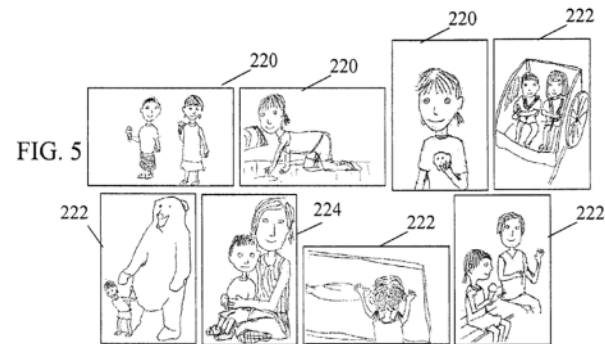
FIG. 4



Gallagher at Fig. 5

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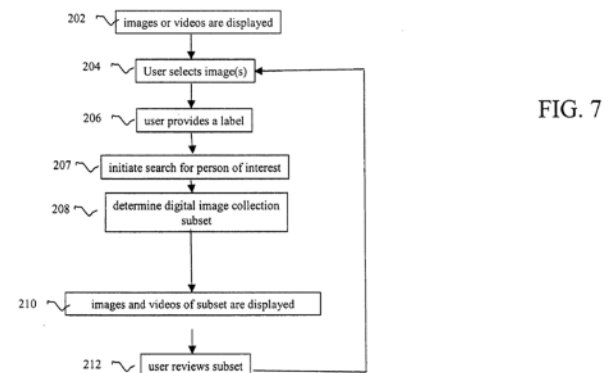
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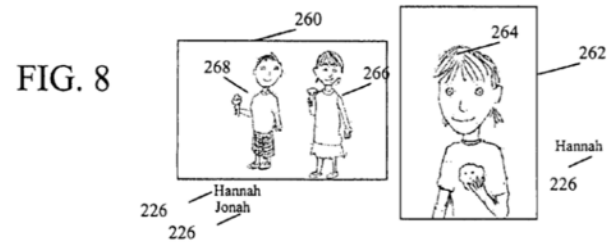
Gallagher at Fig. 6



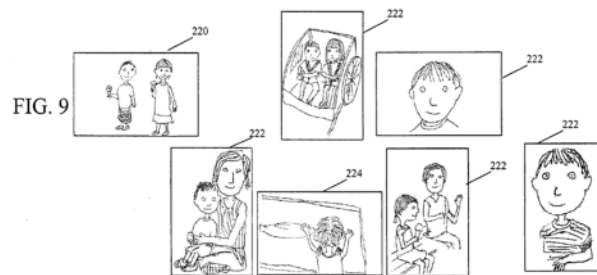
Gallagher at Fig. 7



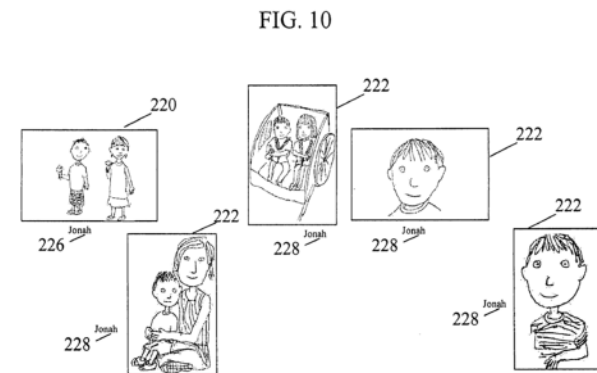
Gallagher at Fig. 8



Gallagher at Fig. 9



Gallagher at Fig. 10



Gallagher at Fig. 12A

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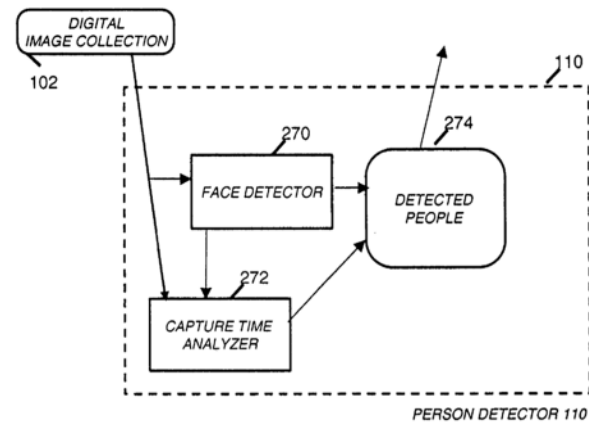


FIG. 12A

Gallagher at Fig. 13

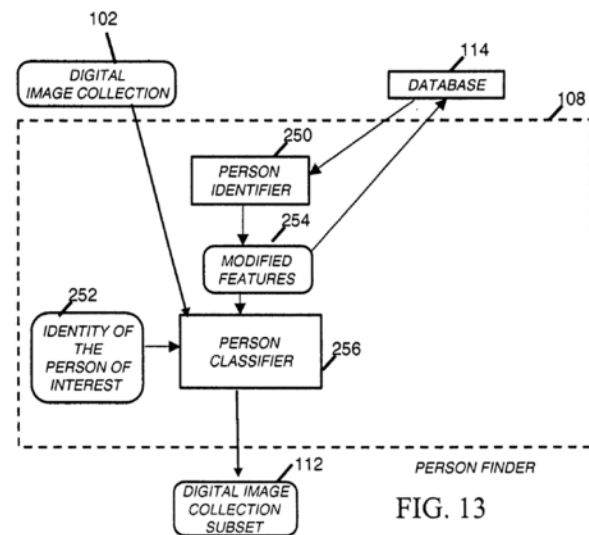


FIG. 13

Gallagher at Fig. 15

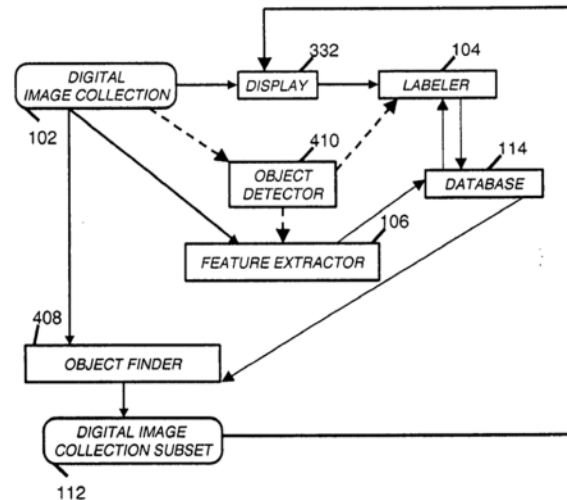


FIG. 15

Gallagher at [0048]–[0049]

An embodiment of the invention is illustrated in FIG. 2. A digital image collection 102 containing people is searched for a person of interest by a person finder 108. A digital image collection subset 112 is the set of images from the digital image collection 102 believed to contain the person of interest. The digital image collection 102 includes both images and videos. For convenience, the term “image” refers to both single images and videos. Videos are a collection of images with accompanying audio and sometimes text. The digital image collection subset 112 is displayed on the display 332 for review by the human user.

The search for a person of interest is initiated by a user as follows: Images or videos of the digital image collection 102 are displayed on the display 332 and viewed by the user. The user establishes one or more labels for one or more of the images with a labeler 104. A feature extractor 106 extracts features from the digital image collection in association with the label(s) from the labeler 104. The features are stored in association with labels in a database 114. A person detector 110 can optionally be used to assist in the labeling and feature extraction. When the digital image collection subset 112 is displayed on the display 332, the user can review the results and further label the displayed images.

Gallagher at [0058]–[0060]

FIG. 3 is a flow diagram showing a method for using a digital camera to identify images believed to contain a person of interest. Those skilled in the art will recognize that the processing platform for using the present invention can be a camera, a personal computer, a remote computer assessed over a network such as the Internet, a printer, or the like. In this embodiment, a user selects a few images or videos containing a person of interest, and the system determines and displays images or videos from a subset of the digital image collection believed to contain the person of interest. The displayed images can be reviewed by the user, and the user can indicate whether the displayed images do contain the person of interest. In addition, the user can verify or provide the name of the person of interest. Finally, based on the input from the user, the system can again determine a set of images believed to contain the person of interest.

In block 202, images are displayed on the display 332. In block 204, the user selects images, where each image contains the person of interest. At least one of the selected images contains a person besides the person of interest. For example, FIG. 4 shows a set of three selected images, each containing the person of interest, and one of the images contains two people. In block 206, the user provides a label via the labeler 104 that indicates the selected images contain the person of interest and the images and videos from the image collection are to be searched by the person finder 108 to identify those believed to contain the person of interest. In block 208, the person identifier accesses the features and associated labels stored in the database 114 and determines a digital image collection subset 112 of images and videos believed to contain the person of interest. In block 210, the digital image collection subset 112 is displayed on the display 332. For example, FIG. 5 shows images in the digital image collection subset 112. The digital image collection subset contains labeled images 220, images correctly believed to contain the person of interest 222, and images incorrectly believed to contain the person of interest 224. This is a consequence of the imperfect nature of current face detection and recognition technology. In block 212, the user reviews the digital image collection subset 112 and can indicate the correctness of each image in the digital image collection subset 112. This user indication of correctness is used to provide additional labels via the labeler 104 in block 214. For example, the user indicates via the user interface that all of the images and videos correctly believes to contain the person of interest 222 of the digital image collection subset 112 do contain the person of interest. Each image and video of the digital image collection is then labeled with the name of the person of interest if it has been provided by the user. If the name of the person of interest has not been provided by the user, the name of the person of interest can be determined in some cases by the labeler 104. The images and videos of the digital image collection subset 112 are examined for those having a label indicating the name of the person of interest and for which the person detector 110 determines contain only one person. Because the user has verified that the images and videos of the digital image collection subset 112 do contain the person of interest and

'848 Patent Claim Limitation	Gallagher Exemplary Disclosure
	the person detector 110 finds only a single person, the labeler 104 concludes that the name of the person in the associated label is the name of the person of interest. If the person detector 110 is an automatic error-prone algorithm, then the labeler 104 may need to implement a voting scheme if more than one image and videos have an associated label containing a person's name and the person detector 110 finds only one person, and the person's name in the associated label is not unanimous. For example, if there are 3 images among the digital image collection subset 112 that contain one detected person each by the person detector 110, and each image has a label containing a person's name, and the names are: "Hannah", "Hannah", and "Holly", then the voting scheme conducted by the labeled 104 determines that the person's name is "Hannah". The labeler 104 then labels the images and videos of the digital image collection subset 112 with a label containing the name of the person of interest (e.g. "Hannah"). The user can review the name of the person of interest determined by the labeler 104 via the display. After the user indicates that the images and videos of the digital image collection subset 112 contain the person of interest, the message "Label as Hannah?" appears, and the user can confirm the determined name of the person of interest by pressing "yes", or enter a different name for the person of interest by pressing "no". If the labeler 104 cannot determine the name of the person of interest, then a currently unused identifier is assigned to the person of interest (e.g. "Person 12"), and the images and videos of the digital image collection subset 112 are labeled by the labeler 104 accordingly. Alternatively, the labeler 104 can determine several candidate labels for the person of interest. The candidate labels can be displayed to the user in the form of a list. The list of candidate labels can be a list of labels that have been used in the past, or a list of the most likely labels for the current particular person of interest. The user can then select from the list the desired label for the person of interest. Gallagher at [0137]–[0139] In some cases, the modified features 254 form the person identifier 250 are straightforward to generate from the database 114. For example, when the database contains only global features and no local features, then the features associated with each label (whether or not the label contains position information) will be identical. For example, if the only feature is image capture time, then each label associated with the image is associated with the image capture time. Also, if the labels contain position information, then associating features with the labels is easy because either the features do not include local features and therefore the same features are associated with each label, or the features contain local features and the position of the image region over which the local features are computed is used to associate the features with the labels (based on proximity). A person classifier 256 uses the modified features 254 and a identity of the person of interest 252 to determine a digital image collection subset 112 of images and videos believed to contain the person of

'848 Patent Claim Limitation	Gallagher Exemplary Disclosure
	interest. The modified features 254 includes some features having associated labels (known as labeled features). Other features (known as unlabeled features) do not have associated labels (e.g. all of the image and videos in the digital image collection 102 that were not labeled by the labeler 104). The person classifier 256 uses labeled features to classify the unlabeled features. This problem, although in practice quite difficult, is studied in the field of pattern recognition. Any classifier may be used to classify the unlabeled features. Preferably, the person classifier determines a proposed label for each of the unlabeled features and a confidence, belief, or probability associated with the proposed label. In general, classifiers assign labels to unlabeled features by considering the similarity between a particular set of unlabeled features and labeled sets of features. With some classifiers (e.g. Gaussian Maximum Likelihood), labeled sets of features associated with a single individual person are aggregated to form a model of appearance for the individual. The digital image collection subset 112 is the collection of images and videos having an associated proposed label with a probability that exceeds a threshold T_0, where T_0 ranges from $0 \leq T_0 \leq 1.0$. Preferably, the digital image collection subset 112 also contains the image and videos associated with features having labels matching the identity of the person of interest 252. The images and videos of the digital image collection subset are sorted so that images and videos determined to have the highest belief of containing the person of interest appear at the top of the subset, following only the images and videos with features having labels matching the identity of the person of interest 252. The person classifier 256 can measure the similarity between sets of features associated with two or more persons to determine the similarity of the persons, and thereby the likelihood that the persons are the same. Measuring the similarity of sets of features is accomplished by measuring the similarity of subsets of the features. For example, when the local features describe clothing, the following method is used to compare two sets of features. If the difference in image capture time is small (i.e. less than a few hours) and if the quantitative description of the clothing is similar in each of the two sets of features is similar, then the likelihood of the two sets of local features belonging to the same person is increased. If, additionally, the clothes have a very unique or distinctive pattern (e.g. a shirt of large green, red, and blue patches) for both sets of local features, then the likelihood is even greater that the associated people are the same individual. Gallagher at [0146] Preferably, the user can adjust the value of T_0 through the user interface. As the value increases, the digital image collection subset 112 contains fewer images or videos, but the likelihood that the images and videos in the digital image collection subset 112 actually do contain the person of interest increases. In this manner, the user can determine the number and accuracy of the search results.

'848 Patent Claim Limitation	Gallagher Exemplary Disclosure
	To the extent Maxell contends Gallagher does not disclose this limitation, a person of ordinary skill in the art would have readily arrived at this limitation by combining or modifying it in view of their general knowledge and/or the prior art references disclosed in the corresponding section of Samsung's Invalidity Contentions.
[13pre] 13. A recording and reproducing apparatus for recording and reproducing image information, comprising:	To the extent the preamble is limiting, Gallagher discloses "[a] recording and reproducing apparatus for recording and reproducing image information." See above at limitation [8pre].
[13a] a photographing sensor configured to photograph an object and generate image information;	Gallagher discloses "a photographing sensor configured to photograph an object and generate image information." See above at limitation [8c].
[13b] a recorder configured to record the image information generated by the photographing sensor in a recording medium;	Gallagher discloses "a recorder configured to record the image information generated by the photographing sensor in a recording medium." See above at limitation [8d].
[13c] a reproducer configured to reproduce the image information recorded by the recorder;	Gallagher discloses "a reproducer configured to reproduce the image information recorded by the recorder." See above at limitation [8f].
[13d] processing circuitry configured to:	Gallagher discloses "processing circuitry." See above at limitation [8a].
[13e] execute a face-recognizing process on the image information generated by the photographing sensor to recognize a face,	Gallagher discloses "execute a face-recognizing process on the image information generated by the photographing sensor to recognize a face." See above at limitation [8e].
[13f] register a person in the image information as a specific person in a mode selected from a	Gallagher discloses "register a person in the image information as a specific person in a mode selected from a first setting mode and a second setting mode, wherein, when the first setting mode is selected, a person

'848 Patent Claim Limitation	Gallagher Exemplary Disclosure
first setting mode and a second setting mode, wherein, when the first setting mode is selected, a person with a face is obtained by newly photographing the person in a photographing mode and thereafter registered as the specific person, and,	with a face is obtained by newly photographing the person in a photographing mode and thereafter registered as the specific person.” See above at limitation [8g].
[13g] when the second setting mode is selected, a person with a face in the image information is selected from a plurality of faces in the image information recorded in the recording medium and thereafter registered as the specific person,	Gallagher discloses “when the second setting mode is selected, a person with a face in the image information is selected from a plurality of faces in the image information recorded in the recording medium and thereafter registered as the specific person.” See above at limitation [8h].
[13h] firstly pick out image information which includes the registered specific person,	Gallagher discloses “firstly pick out image information which includes the registered specific person.” For example:

Gallagher at Fig. 2

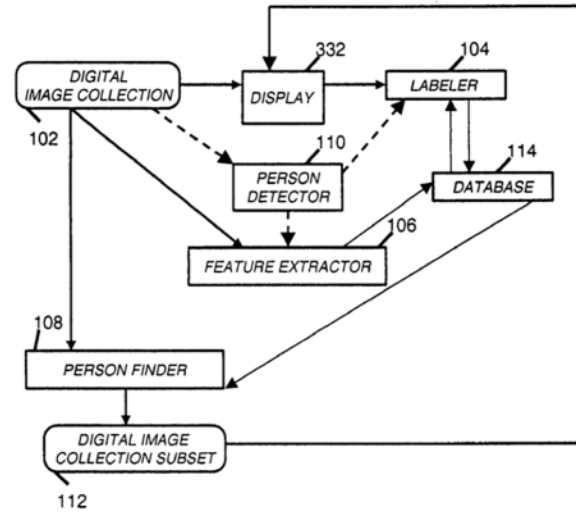
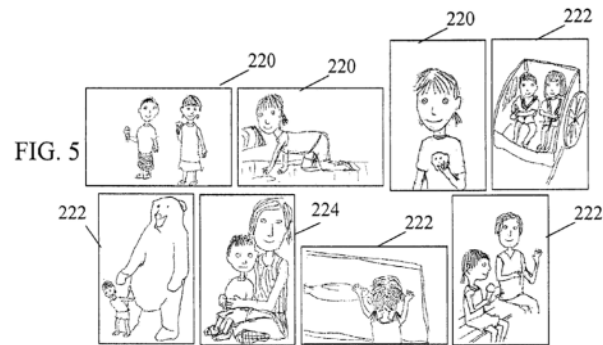


FIG. 2

Gallagher at Fig. 3

'848 Patent Claim Limitation	Gallagher Exemplary Disclosure
	<pre> graph TD 202[images or videos are displayed] --> 204[User selects image(s)] 204 --> 206[user provides a label] 206 --> 208[determine digital image collection subset] 208 --> 210[images and videos of subset are displayed] 210 --> 212[user reviews subset] 212 --> 214[user provides additional label] 214 --> 208 </pre> FIG. 3 Gallagher at Fig. 4 FIG. 4

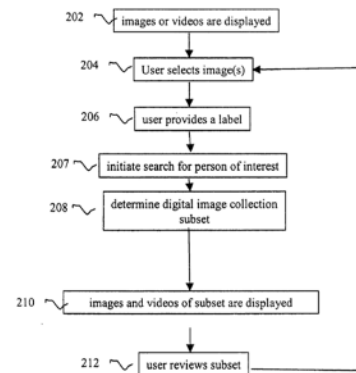
Gallagher at Fig. 5



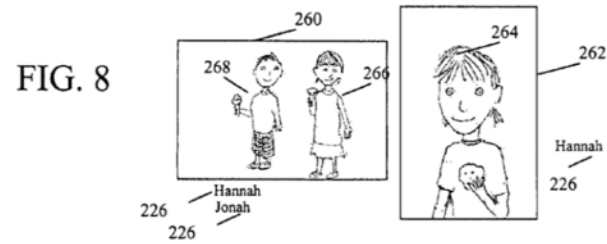
Gallagher at Fig. 6



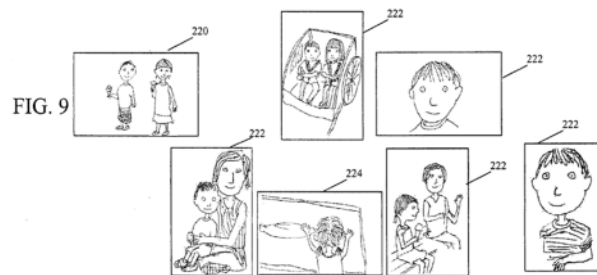
Gallagher at Fig. 7



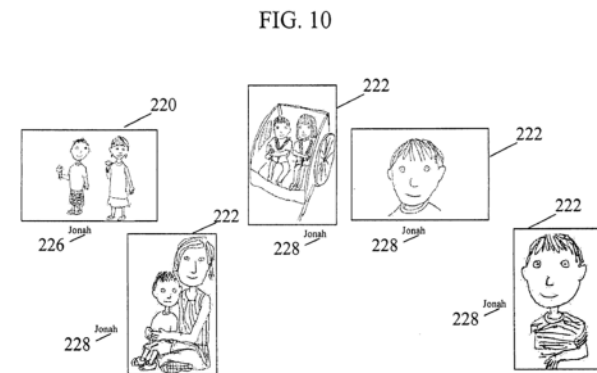
Gallagher at Fig. 8



Gallagher at Fig. 9



Gallagher at Fig. 10



Gallagher at Fig. 12A

'848 Patent Claim Limitation

Gallagher Exemplary Disclosure

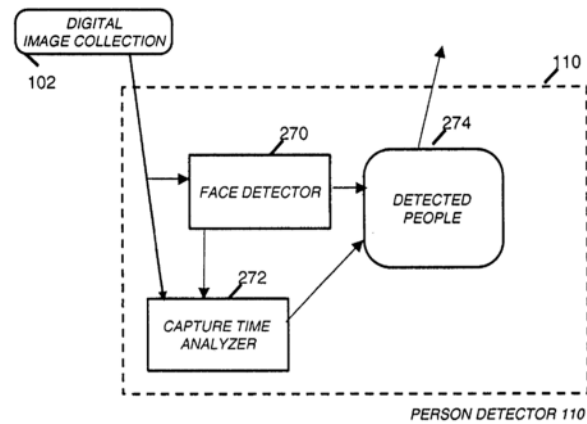


FIG. 12A

Gallagher at Fig. 13

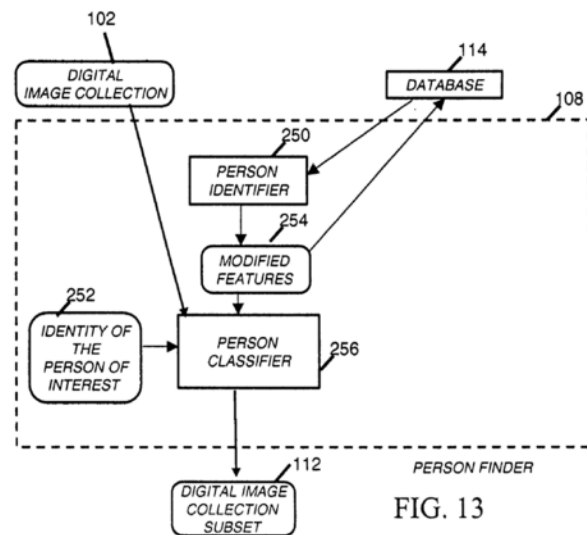


FIG. 13

Gallagher at Fig. 15

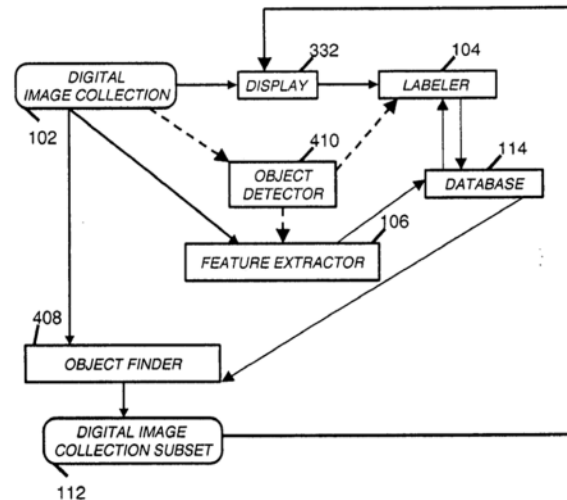


FIG. 15

Gallagher at [0048]–[0049]

An embodiment of the invention is illustrated in FIG. 2. A digital image collection 102 containing people is searched for a person of interest by a person finder 108. A digital image collection subset 112 is the set of images from the digital image collection 102 believed to contain the person of interest. The digital image collection 102 includes both images and videos. For convenience, the term “image” refers to both single images and videos. Videos are a collection of images with accompanying audio and sometimes text. The digital image collection subset 112 is displayed on the display 332 for review by the human user.

The search for a person of interest is initiated by a user as follows: Images or videos of the digital image collection 102 are displayed on the display 332 and viewed by the user. The user establishes one or more labels for one or more of the images with a labeler 104. A feature extractor 106 extracts features from the digital image collection in association with the label(s) from the labeler 104. The features are stored in association with labels in a database 114. A person detector 110 can optionally be used to assist in the labeling and feature extraction. When the digital image collection subset 112 is displayed on the display 332, the user can review the results and further label the displayed images.

Gallagher at [0058]–[0060]

FIG. 3 is a flow diagram showing a method for using a digital camera to identify images believed to contain a person of interest. Those skilled in the art will recognize that the processing platform for using the present invention can be a camera, a personal computer, a remote computer assessed over a network such as the Internet, a printer, or the like. In this embodiment, a user selects a few images or videos containing a person of interest, and the system determines and displays images or videos from a subset of the digital image collection believed to contain the person of interest. The displayed images can be reviewed by the user, and the user can indicate whether the displayed images do contain the person of interest. In addition, the user can verify or provide the name of the person of interest. Finally, based on the input from the user, the system can again determine a set of images believed to contain the person of interest.

In block 202, images are displayed on the display 332. In block 204, the user selects images, where each image contains the person of interest. At least one of the selected images contains a person besides the person of interest. For example, FIG. 4 shows a set of three selected images, each containing the person of interest, and one of the images contains two people. In block 206, the user provides a label via the labeler 104 that indicates the selected images contain the person of interest and the images and videos from the image collection are to be searched by the person finder 108 to identify those believed to contain the person of interest. In block 208, the person identifier accesses the features and associated labels stored in the database 114 and determines a digital image collection subset 112 of images and videos believed to contain the person of interest. In block 210, the digital image collection subset 112 is displayed on the display 332. For example, FIG. 5 shows images in the digital image collection subset 112. The digital image collection subset contains labeled images 220, images correctly believed to contain the person of interest 222, and images incorrectly believed to contain the person of interest 224. This is a consequence of the imperfect nature of current face detection and recognition technology. In block 212, the user reviews the digital image collection subset 112 and can indicate the correctness of each image in the digital image collection subset 112. This user indication of correctness is used to provide additional labels via the labeler 104 in block 214. For example, the user indicates via the user interface that all of the images and videos correctly believes to contain the person of interest 222 of the digital image collection subset 112 do contain the person of interest. Each image and video of the digital image collection is then labeled with the name of the person of interest if it has been provided by the user. If the name of the person of interest has not been provided by the user, the name of the person of interest can be determined in some cases by the labeler 104. The images and videos of the digital image collection subset 112 are examined for those having a label indicating the name of the person of interest and for which the person detector 110 determines contain only one person. Because the user has verified that the images and videos of the digital image collection subset 112 do contain the person of interest and

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	the person detector 110 finds only a single person, the labeler 104 concludes that the name of the person in the associated label is the name of the person of interest. If the person detector 110 is an automatic error-prone algorithm, then the labeler 104 may need to implement a voting scheme if more than one image and videos have an associated label containing a person's name and the person detector 110 finds only one person, and the person's name in the associated label is not unanimous. For example, if there are 3 images among the digital image collection subset 112 that contain one detected person each by the person detector 110, and each image has a label containing a person's name, and the names are: "Hannah", "Hannah", and "Holly", then the voting scheme conducted by the labeled 104 determines that the person's name is "Hannah". The labeler 104 then labels the images and videos of the digital image collection subset 112 with a label containing the name of the person of interest (e.g. "Hannah"). The user can review the name of the person of interest determined by the labeler 104 via the display. After the user indicates that the images and videos of the digital image collection subset 112 contain the person of interest, the message "Label as Hannah?" appears, and the user can confirm the determined name of the person of interest by pressing "yes", or enter a different name for the person of interest by pressing "no". If the labeler 104 cannot determine the name of the person of interest, then a currently unused identifier is assigned to the person of interest (e.g. "Person 12"), and the images and videos of the digital image collection subset 112 are labeled by the labeler 104 accordingly. Alternatively, the labeler 104 can determine several candidate labels for the person of interest. The candidate labels can be displayed to the user in the form of a list. The list of candidate labels can be a list of labels that have been used in the past, or a list of the most likely labels for the current particular person of interest. The user can then select from the list the desired label for the person of interest. Gallagher at [0069]–[0073] Image/video capture time. Image capture time can be a precise minute in time, e.g. Mar. 27, 2004 at 10:17 AM. Or the image capture time can be less precise, e.g. 2004 or March 2004. The image capture time can be in the form of a probability distribution function e.g. Mar. 27, 2004 +/-2 days with 95% confidence. Often times the capture time is embedded in the file header of the digital image or video. For example, the EXIF image format (described at www.exif.org) allows the image or video capture device to store information associated with the image or video in the file header. The "Date\Time" entry is associated with the date and time the image was captured. In some cases, the digital image or video results from scanning film and the image capture time is determined by detection of the date printed into the image (as is often done at capture time) area, usually in the lower left corner of the image. The date a photograph is printed is often printed on the back of the print. Alternatively, some film systems contain a magnetic layer in the film for storing information such as the capture date.

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	Capture condition metadata (e.g. flash fire information, shutter speed, aperture, ISO, scene brightness, etc.) Geographic location. The location is preferably stored in units of latitude and longitude. Scene environment information. Scene environment information is information derived from the pixel values of an image or video in regions not containing a person. For example, the mean value of the non-people regions in an image or video is an example of scene environment information. Another example of scene environment information is texture samples (e.g. a sampling of pixel values from a region of wallpaper in an image). Geographic location and scene environment information are important clues to the identity of persons in the associated images. For example, a photographer's visit to grandmother's house could be the only location where grandmother is photographed. When two images are captured with similar geographic locations and environments, it is more likely that detected persons in the two images are the same as well. Scene environment information can be used by the person detector 110 to register two images. This is useful when the people being photographed are mostly stationary, but the camera moves slightly between consecutive photographs. The scene environment information is used to register the two images, thereby aligning the positions of the people in the two frames. This alignment is used by the person finder 108 because when two persons have the same position in two images captured closely in time and registered, then the likelihood that the two people are the same individual is high. Gallagher at [0137]–[0139] In some cases, the modified features 254 form the person identifier 250 are straightforward to generate from the database 114. For example, when the database contains only global features and no local features, then the features associated with each label (whether or not the label contains position information) will be identical. For example, if the only feature is image capture time, then each label associated with the image is associated with the image capture time. Also, if the labels contain position information, then associating features with the labels is easy because either the features do not include local features and therefore the same features are associated with each label, or the features contain local features and the position of the image region over which the local features are computed is used to associate the features with the labels (based on proximity). A person classifier 256 uses the modified features 254 and a identity of the person of interest 252 to determine a digital image collection subset 112 of images and videos believed to contain the person of interest. The modified features 254 includes some features having associated labels (known as labeled features). Other features (known as unlabeled features) do not have associated labels (e.g. all of the image and videos in the digital image collection 102 that were not labeled by the labeler 104). The person classifier 256 uses labeled features to classify the unlabeled features. This problem, although in practice

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	quite difficult, is studied in the field of pattern recognition. Any classifier may be used to classify the unlabeled features. Preferably, the person classifier determines a proposed label for each of the unlabeled features and a confidence, belief, or probability associated with the proposed label. In general, classifiers assign labels to unlabeled features by considering the similarity between a particular set of unlabeled features and labeled sets of features. With some classifiers (e.g. Gaussian Maximum Likelihood), labeled sets of features associated with a single individual person are aggregated to form a model of appearance for the individual. The digital image collection subset 112 is the collection of images and videos having an associated proposed label with a probability that exceeds a threshold T_0, where T_0 ranges from $0 \leq T_0 \leq 1.0$. Preferably, the digital image collection subset 112 also contains the image and videos associated with features having labels matching the identity of the person of interest 252. The images and videos of the digital image collection subset are sorted so that images and videos determined to have the highest belief of containing the person of interest appear at the top of the subset, following only the images and videos with features having labels matching the identity of the person of interest 252. The person classifier 256 can measure the similarity between sets of features associated with two or more persons to determine the similarity of the persons, and thereby the likelihood that the persons are the same. Measuring the similarity of sets of features is accomplished by measuring the similarity of subsets of the features. For example, when the local features describe clothing, the following method is used to compare two sets of features. If the difference in image capture time is small (i.e. less than a few hours) and if the quantitative description of the clothing is similar in each of the two sets of features is similar, then the likelihood of the two sets of local features belonging to the same person is increased. If, additionally, the clothes have a very unique or distinctive pattern (e.g. a shirt of large green, red, and blue patches) for both sets of local features, then the likelihood is even greater that the associated people are the same individual. Gallagher at [0146] Preferably, the user can adjust the value of T_0 through the user interface. As the value increases, the digital image collection subset 112 contains fewer images or videos, but the likelihood that the images and videos in the digital image collection subset 112 actually do contain the person of interest increases. In this manner, the user can determine the number and accuracy of the search results. To the extent Maxell contends Gallagher does not disclose this limitation, a person of ordinary skill in the art would have readily arrived at this limitation by combining or modifying it in view of their general knowledge and/or the prior art references disclosed in the corresponding section of Samsung's Invalidity Contentions.

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[13i] secondly pick out the image information based on a predetermined condition from among the picked-out image information which includes the registered specific person, the predetermined condition being set in accordance with an instruction by a user, and

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Gallagher discloses “secondly pick out the image information based on a predetermined condition from among the picked-out image information which includes the registered specific person, the predetermined condition being set in accordance with an instruction by a user.” For example:

Gallagher at Fig. 2

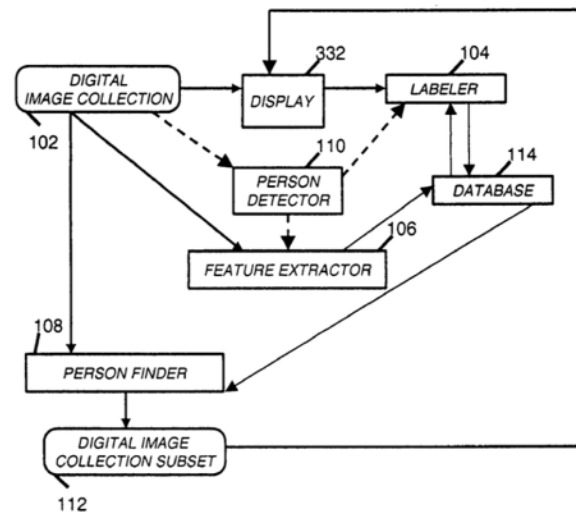
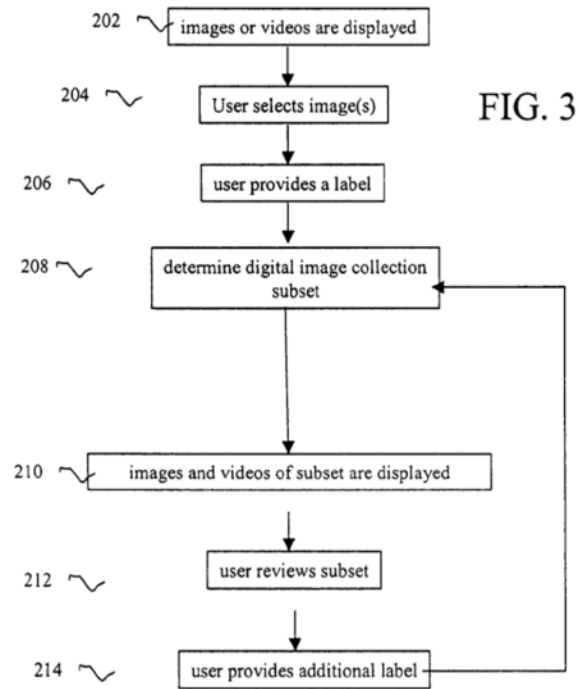


FIG. 2

Gallagher at Fig. 3



Gallagher at Fig. 4

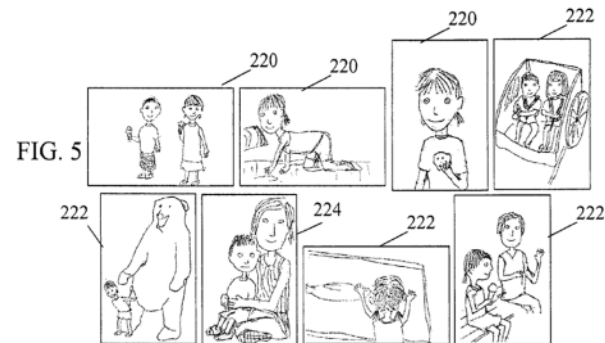
FIG. 4



Gallagher at Fig. 5

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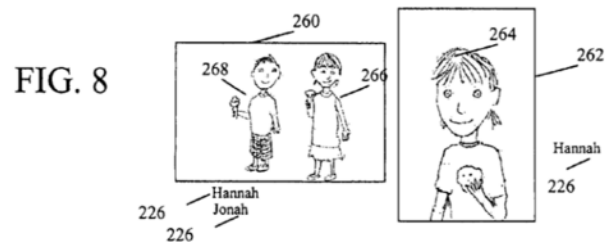
Gallagher Exemplary Disclosure



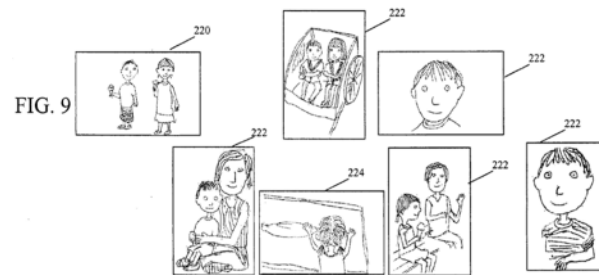
Gallagher at Fig. 6



Gallagher at Fig. 8

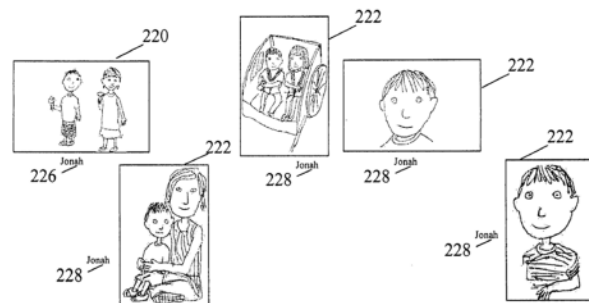


Gallagher at Fig. 9



Gallagher at Fig. 10

FIG. 10



Gallagher at Fig. 12A

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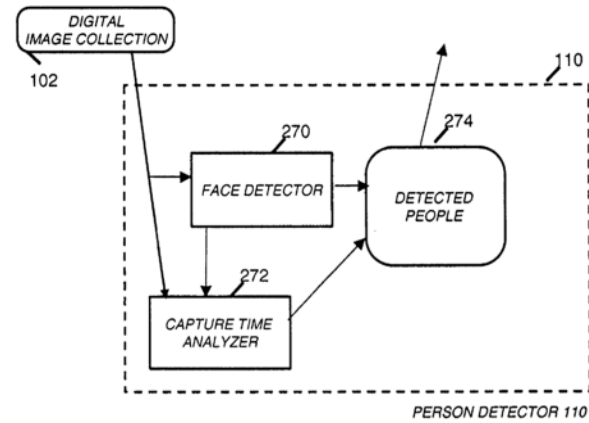


FIG. 12A

Gallagher at Fig. 13

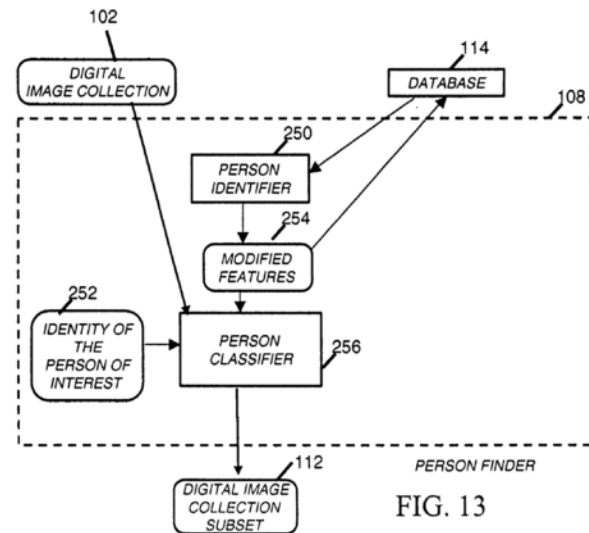


FIG. 13

Gallagher at Fig. 15

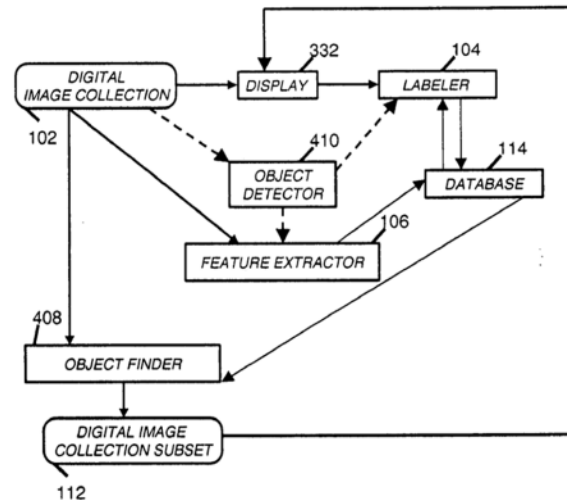


FIG. 15

Gallagher at [0048]–[0049]

An embodiment of the invention is illustrated in FIG. 2. A digital image collection 102 containing people is searched for a person of interest by a person finder 108. A digital image collection subset 112 is the set of images from the digital image collection 102 believed to contain the person of interest. The digital image collection 102 includes both images and videos. For convenience, the term “image” refers to both single images and videos. Videos are a collection of images with accompanying audio and sometimes text. The digital image collection subset 112 is displayed on the display 332 for review by the human user.

The search for a person of interest is initiated by a user as follows: Images or videos of the digital image collection 102 are displayed on the display 332 and viewed by the user. The user establishes one or more labels for one or more of the images with a labeler 104. A feature extractor 106 extracts features from the digital image collection in association with the label(s) from the labeler 104. The features are stored in association with labels in a database 114. A person detector 110 can optionally be used to assist in the labeling and feature extraction. When the digital image collection subset 112 is displayed on the display 332, the user can review the results and further label the displayed images.

Gallagher at [0058]–[0060]

FIG. 3 is a flow diagram showing a method for using a digital camera to identify images believed to contain a person of interest. Those skilled in the art will recognize that the processing platform for using the present invention can be a camera, a personal computer, a remote computer assessed over a network such as the Internet, a printer, or the like. In this embodiment, a user selects a few images or videos containing a person of interest, and the system determines and displays images or videos from a subset of the digital image collection believed to contain the person of interest. The displayed images can be reviewed by the user, and the user can indicate whether the displayed images do contain the person of interest. In addition, the user can verify or provide the name of the person of interest. Finally, based on the input from the user, the system can again determine a set of images believed to contain the person of interest.

In block 202, images are displayed on the display 332. In block 204, the user selects images, where each image contains the person of interest. At least one of the selected images contains a person besides the person of interest. For example, FIG. 4 shows a set of three selected images, each containing the person of interest, and one of the images contains two people. In block 206, the user provides a label via the labeler 104 that indicates the selected images contain the person of interest and the images and videos from the image collection are to be searched by the person finder 108 to identify those believed to contain the person of interest. In block 208, the person identifier accesses the features and associated labels stored in the database 114 and determines a digital image collection subset 112 of images and videos believed to contain the person of interest. In block 210, the digital image collection subset 112 is displayed on the display 332. For example, FIG. 5 shows images in the digital image collection subset 112. The digital image collection subset contains labeled images 220, images correctly believed to contain the person of interest 222, and images incorrectly believed to contain the person of interest 224. This is a consequence of the imperfect nature of current face detection and recognition technology. In block 212, the user reviews the digital image collection subset 112 and can indicate the correctness of each image in the digital image collection subset 112. This user indication of correctness is used to provide additional labels via the labeler 104 in block 214. For example, the user indicates via the user interface that all of the images and videos correctly believes to contain the person of interest 222 of the digital image collection subset 112 do contain the person of interest. Each image and video of the digital image collection is then labeled with the name of the person of interest if it has been provided by the user. If the name of the person of interest has not been provided by the user, the name of the person of interest can be determined in some cases by the labeler 104. The images and videos of the digital image collection subset 112 are examined for those having a label indicating the name of the person of interest and for which the person detector 110 determines contain only one person. Because the user has verified that the images and videos of the digital image collection subset 112 do contain the person of interest and

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	the person detector 110 finds only a single person, the labeler 104 concludes that the name of the person in the associated label is the name of the person of interest. If the person detector 110 is an automatic error-prone algorithm, then the labeler 104 may need to implement a voting scheme if more than one image and videos have an associated label containing a person's name and the person detector 110 finds only one person, and the person's name in the associated label is not unanimous. For example, if there are 3 images among the digital image collection subset 112 that contain one detected person each by the person detector 110, and each image has a label containing a person's name, and the names are: "Hannah", "Hannah", and "Holly", then the voting scheme conducted by the labeled 104 determines that the person's name is "Hannah". The labeler 104 then labels the images and videos of the digital image collection subset 112 with a label containing the name of the person of interest (e.g. "Hannah"). The user can review the name of the person of interest determined by the labeler 104 via the display. After the user indicates that the images and videos of the digital image collection subset 112 contain the person of interest, the message "Label as Hannah?" appears, and the user can confirm the determined name of the person of interest by pressing "yes", or enter a different name for the person of interest by pressing "no". If the labeler 104 cannot determine the name of the person of interest, then a currently unused identifier is assigned to the person of interest (e.g. "Person 12"), and the images and videos of the digital image collection subset 112 are labeled by the labeler 104 accordingly. Alternatively, the labeler 104 can determine several candidate labels for the person of interest. The candidate labels can be displayed to the user in the form of a list. The list of candidate labels can be a list of labels that have been used in the past, or a list of the most likely labels for the current particular person of interest. The user can then select from the list the desired label for the person of interest. Gallagher at [0069]–[0073] Image/video capture time. Image capture time can be a precise minute in time, e.g. Mar. 27, 2004 at 10:17 AM. Or the image capture time can be less precise, e.g. 2004 or March 2004. The image capture time can be in the form of a probability distribution function e.g. Mar. 27, 2004 +/-2 days with 95% confidence. Often times the capture time is embedded in the file header of the digital image or video. For example, the EXIF image format (described at www.exif.org) allows the image or video capture device to store information associated with the image or video in the file header. The "Date\Time" entry is associated with the date and time the image was captured. In some cases, the digital image or video results from scanning film and the image capture time is determined by detection of the date printed into the image (as is often done at capture time) area, usually in the lower left corner of the image. The date a photograph is printed is often printed on the back of the print. Alternatively, some film systems contain a magnetic layer in the film for storing information such as the capture date.

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	Capture condition metadata (e.g. flash fire information, shutter speed, aperture, ISO, scene brightness, etc.) Geographic location. The location is preferably stored in units of latitude and longitude. Scene environment information. Scene environment information is information derived from the pixel values of an image or video in regions not containing a person. For example, the mean value of the non-people regions in an image or video is an example of scene environment information. Another example of scene environment information is texture samples (e.g. a sampling of pixel values from a region of wallpaper in an image). Geographic location and scene environment information are important clues to the identity of persons in the associated images. For example, a photographer's visit to grandmother's house could be the only location where grandmother is photographed. When two images are captured with similar geographic locations and environments, it is more likely that detected persons in the two images are the same as well. Scene environment information can be used by the person detector 110 to register two images. This is useful when the people being photographed are mostly stationary, but the camera moves slightly between consecutive photographs. The scene environment information is used to register the two images, thereby aligning the positions of the people in the two frames. This alignment is used by the person finder 108 because when two persons have the same position in two images captured closely in time and registered, then the likelihood that the two people are the same individual is high. Gallagher at [0137]–[0139] In some cases, the modified features 254 form the person identifier 250 are straightforward to generate from the database 114. For example, when the database contains only global features and no local features, then the features associated with each label (whether or not the label contains position information) will be identical. For example, if the only feature is image capture time, then each label associated with the image is associated with the image capture time. Also, if the labels contain position information, then associating features with the labels is easy because either the features do not include local features and therefore the same features are associated with each label, or the features contain local features and the position of the image region over which the local features are computed is used to associate the features with the labels (based on proximity). A person classifier 256 uses the modified features 254 and a identity of the person of interest 252 to determine a digital image collection subset 112 of images and videos believed to contain the person of interest. The modified features 254 includes some features having associated labels (known as labeled features). Other features (known as unlabeled features) do not have associated labels (e.g. all of the image and videos in the digital image collection 102 that were not labeled by the labeler 104). The person classifier 256 uses labeled features to classify the unlabeled features. This problem, although in practice

'848 Patent Claim Limitation	Gallagher Exemplary Disclosure
	quite difficult, is studied in the field of pattern recognition. Any classifier may be used to classify the unlabeled features. Preferably, the person classifier determines a proposed label for each of the unlabeled features and a confidence, belief, or probability associated with the proposed label. In general, classifiers assign labels to unlabeled features by considering the similarity between a particular set of unlabeled features and labeled sets of features. With some classifiers (e.g. Gaussian Maximum Likelihood), labeled sets of features associated with a single individual person are aggregated to form a model of appearance for the individual. The digital image collection subset 112 is the collection of images and videos having an associated proposed label with a probability that exceeds a threshold T_0, where T_0 ranges from $0 \leq T_0 \leq 1.0$. Preferably, the digital image collection subset 112 also contains the image and videos associated with features having labels matching the identity of the person of interest 252. The images and videos of the digital image collection subset are sorted so that images and videos determined to have the highest belief of containing the person of interest appear at the top of the subset, following only the images and videos with features having labels matching the identity of the person of interest 252. The person classifier 256 can measure the similarity between sets of features associated with two or more persons to determine the similarity of the persons, and thereby the likelihood that the persons are the same. Measuring the similarity of sets of features is accomplished by measuring the similarity of subsets of the features. For example, when the local features describe clothing, the following method is used to compare two sets of features. If the difference in image capture time is small (i.e. less than a few hours) and if the quantitative description of the clothing is similar in each of the two sets of features is similar, then the likelihood of the two sets of local features belonging to the same person is increased. If, additionally, the clothes have a very unique or distinctive pattern (e.g. a shirt of large green, red, and blue patches) for both sets of local features, then the likelihood is even greater that the associated people are the same individual. Gallagher at [0146] Preferably, the user can adjust the value of T_0 through the user interface. As the value increases, the digital image collection subset 112 contains fewer images or videos, but the likelihood that the images and videos in the digital image collection subset 112 actually do contain the person of interest increases. In this manner, the user can determine the number and accuracy of the search results. To the extent Maxell contends Gallagher does not disclose this limitation, a person of ordinary skill in the art would have readily arrived at this limitation by combining or modifying it in view of their general knowledge and/or the prior art references disclosed in the corresponding section of Samsung's Invalidity Contentions.

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[13j] control the reproducer to selectively and sequentially reproduce the image information picked out based on the predetermined condition.	Gallagher discloses “control the reproducer to selectively and sequentially reproduce the image information picked out based on the predetermined condition.” See above at limitation [8i].
[16pre] 16. The recording and reproducing apparatus according to claim 13,	Gallagher discloses “[t]he recording and reproducing apparatus according to claim 13.” See above.
[16a] wherein the processing circuitry is further configured to control the reproducer to selectively and sequentially reproduce the image information picked out based on the predetermined condition in a reproducing mode set from one of a first reproducing mode and a second reproducing mode, and	Gallagher discloses “wherein the processing circuitry is further configured to control the reproducer to selectively and sequentially reproduce the image information picked out based on the predetermined condition in a reproducing mode set from one of a first reproducing mode and a second reproducing mode.” See above at limitation [11a].
[16b] wherein a reproducing time required for reproducing the image information under the first reproducing mode is shorter than a reproducing time required for reproducing the image information under the second reproducing mode, and	Gallagher discloses “wherein a reproducing time required for reproducing the image information under the first reproducing mode is shorter than a reproducing time required for reproducing the image information under the second reproducing mode.” See above at limitation [11b].
[16c] the image information reproduced under the second mode includes the image information reproduced under the first reproducing mode and other of the	Gallagher discloses “the image information reproduced under the second mode includes the image information reproduced under the first reproducing mode and other of the image information not reproduced under the first reproducing mode.” See above at limitation [11c].

'848 Patent Claim Limitation	Gallagher Exemplary Disclosure
image information not reproduced under the first reproducing mode.	
[17pre] 17. The recording and reproducing apparatus according to claim 16,	Gallagher discloses “[t]he recording and reproducing apparatus according to claim 16.” See above.
[17a] wherein the processing circuitry is further configured to control the reproducer to selectively and sequentially reproduce the image information picked out based on the predetermined condition in the reproducing mode set from one of the first reproducing mode, the second reproducing mode, and a third reproducing mode, and	Gallagher discloses “wherein the processing circuitry is further configured to control the reproducer to selectively and sequentially reproduce the image information picked out based on the predetermined condition in the reproducing mode set from one of the first reproducing mode, the second reproducing mode, and a third reproducing mode.” See above at limitation [12a].
[17b] wherein a reproducing time required for reproducing the image information under the third reproducing mode is longer than the reproducing time required for reproducing the image information under the second reproducing mode.	Gallagher discloses “wherein a reproducing time required for reproducing the image information under the third reproducing mode is longer than the reproducing time required for reproducing the image information under the second reproducing mode.” See above at limitation [12b].
[18pre] 18. A recording and reproducing apparatus for recording and reproducing image information, comprising:	To the extent the preamble is limiting, Gallagher discloses “[a] recording and reproducing apparatus for recording and reproducing image information.” See above at limitation [8pre].
[18a] a photographing sensor configured to photograph an	Gallagher discloses “a photographing sensor configured to photograph an object and generate image information.” See above at limitation [8c].

'848 Patent Claim Limitation	Gallagher Exemplary Disclosure
object and generate image information;	
[18b] a recorder configured to record the image information generated by the photographing sensor in a recording medium;	Gallagher discloses “a recorder configured to record the image information generated by the photographing sensor in a recording medium.” See above at limitation [8d].
[18c] a reproducer configured to reproduce the image information recorded by the recorder;	Gallagher discloses “a reproducer configured to reproduce the image information recorded by the recorder.” See above at limitation [8f].
[18d] processing circuitry configured to:	Gallagher discloses “processing circuitry.” See above at limitation [8a].
[18e] execute a face-recognizing process on the image information generated by the photographing sensor to recognize a face;	Gallagher discloses “execute a face-recognizing process on the image information generated by the photographing sensor to recognize a face.” See above at limitation [8e].
[18f] register a person in the image information as a specific person, wherein a person with a face is obtained by newly photographing the person in a photographing mode and thereafter registered as the specific person;	Gallagher discloses “register a person in the image information as a specific person, wherein a person with a face is obtained by newly photographing the person in a photographing mode and thereafter registered as the specific person.” For example:

Gallagher at Fig. 2

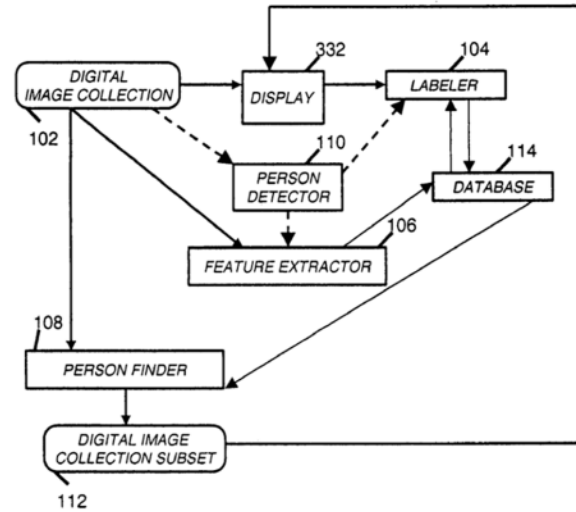
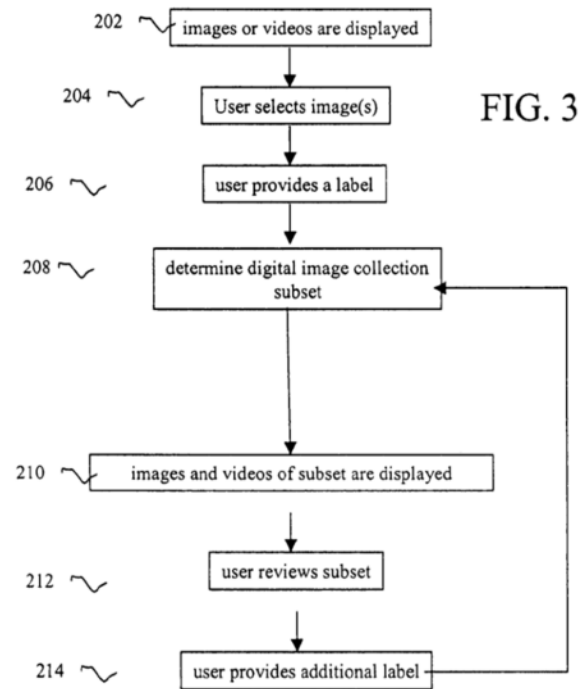


FIG. 2

Gallagher at Fig. 3

'848 Patent Claim Limitation

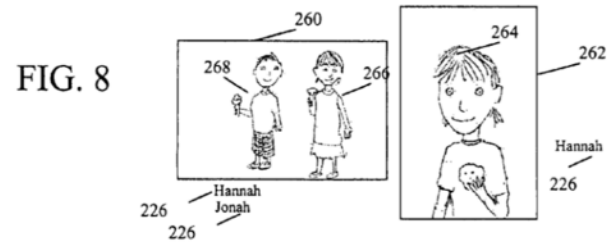
Gallagher Exemplary Disclosure



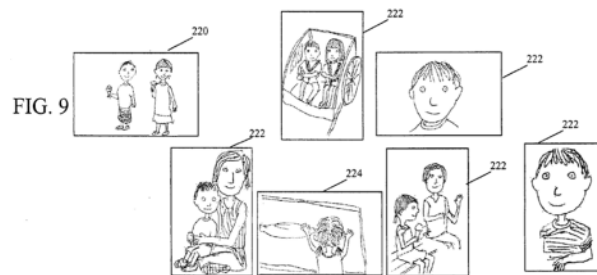
Gallagher at Fig. 6



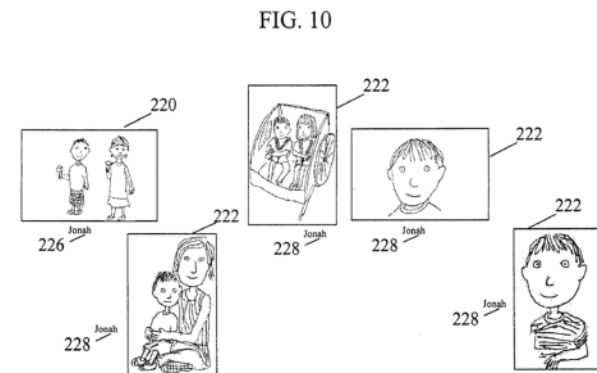
Gallagher at Fig. 8



Gallagher at Fig. 9



Gallagher at Fig. 10



Gallagher at Fig. 11

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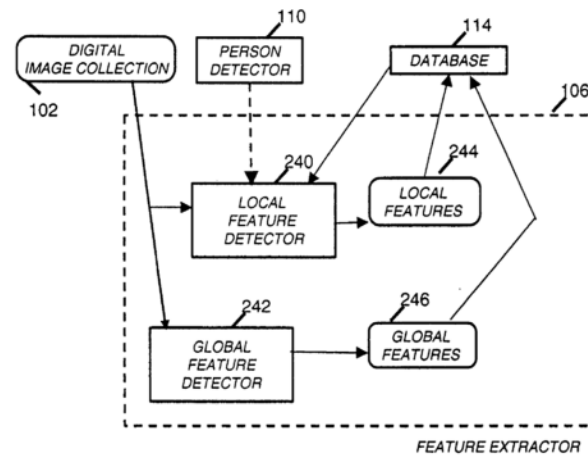


FIG. 11

Gallagher at Fig. 12A

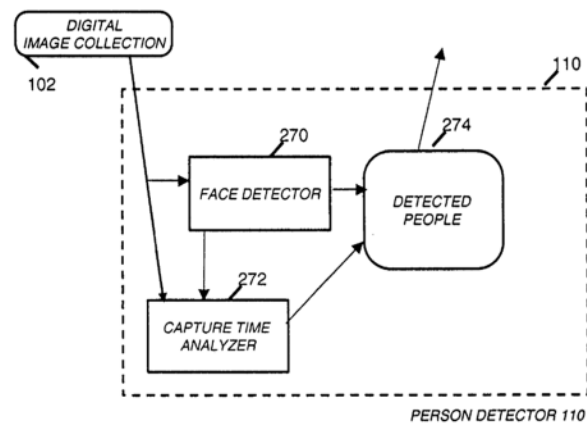


FIG. 12A

Gallagher at Fig. 13

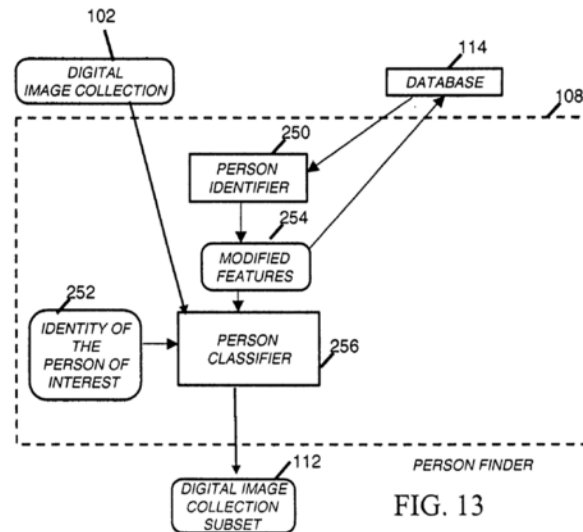


FIG. 13

Gallagher at Fig. 15

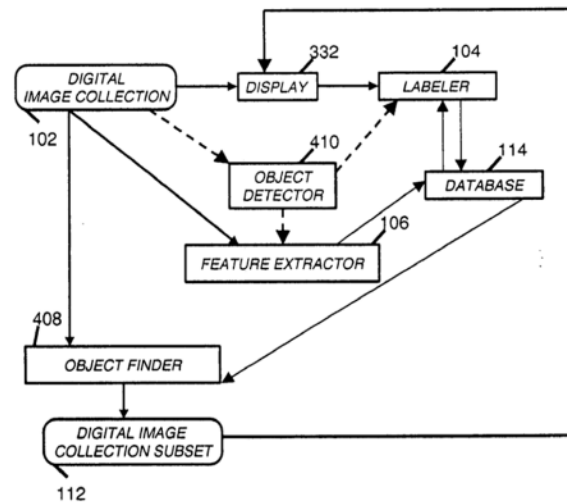


FIG. 15

Gallagher at [0048]–[0049]

An embodiment of the invention is illustrated in FIG. 2. A digital image collection 102 containing people is searched for a person of interest by a person finder 108. A digital image collection subset 112 is the set of images from the digital image collection 102 believed to contain the person of interest. The digital image collection 102 includes both images and videos. For convenience, the term “image” refers to both single images and videos. Videos are a collection of images with accompanying audio and sometimes text. The digital image collection subset 112 is displayed on the display 332 for review by the human user.

The search for a person of interest is initiated by a user as follows: Images or videos of the digital image collection 102 are displayed on the display 332 and viewed by the user. The user establishes one or more labels for one or more of the images with a labeler 104. A feature extractor 106 extracts features from the digital image collection in association with the label(s) from the labeler 104. The features are stored in association with labels in a database 114. A person detector 110 can optionally be used to assist in the labeling and feature extraction. When the digital image collection subset 112 is displayed on the display 332, the user can review the results and further label the displayed images.

Gallagher at [0050]–[0057]

A label from the labeler 104 indicates that a particular image or video contains a person of interest and includes at least one of the following:

- (1) the name of a person of interest in an image or video. A person's name can be a given name or a nickname.
- (2) an identifier associated with the person of interest such as a text string or identifier such as “Person A” or “Person B”.
- (3) the location of the person of interest within the image or video. Preferably, the location of the person of interest is specified by the coordinates (e.g. the pixel address of row and column) of the eyes of the person of interest (and the associated frame number in the case of video). Alternatively, the location of the person of interest can be specified by coordinates of a box that surrounds the body or the face of the person of interest. As a further alternative, the location of the person of interest can be specified by coordinates indicating a position contained within the person of interest. The user can indicate the location of the person of interest by using a mouse to click on the positions of the eyes for example. When the person detector 110 detects a person, the position of the person can be highlighted to the user by, for example, circling the face on the display 332. Then the user can provide the name or identifier for the highlighted person, thereby associating the position of the person with the user provided label. When more than one person is detected in an image, the positions of the persons can be highlighted in turn and labels can be provided by the user for any of the people.

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	(4) an indication to search for images or videos from the image collection believed to contain the person of interest. (5) the name or identifier of a person of interest who is not in the image. The digital image collection 102 contains at least one image having more than one person. A label is provided by the user via the labeler 104, indicating that the image contains a person of interest. Features related to the person of interest are determined by the feature extractor 106, and these features are used by the person finder 108 to identify other images in the collection that are believed to contain the person of interest. Note that the terms “tag”, “caption”, and “annotation” are used synonymously with the term “label.” Gallagher at [0061] Alternatively, if the labeler 104 cannot determine the name of the person of interest, the user can be asked to enter the name of the person of interest by displaying the message “Who is this?” on the display 332 and allowing the user to enter the name of the person of interest, which can then be used by the labeler 104 to label the images and videos of the digital image collection subset 112. Gallagher at [0063]–[0064] FIG. 7 is a flow diagram showing an alternative method for identifying images believed to contain a person of interest. In this embodiment, a user labels the people in one or more images or videos, initiates a search for a person of interest, and the system determines and displays images or videos from a subset of the digital image collection 102 believed to contain the person of interest. The displayed images can be reviewed by the user, and the user can indicate whether the displayed images do contain the person of interest. In addition, the user can verify or provide the name of the person of interest. Finally, based on the input from the user, the system can again determine a set of images believed to contain the person of interest. In block 202, images are displayed on the display 332. In block 204, the user selects images, where each image contains the person of interest. At least one of the selected images contains more than one person. In block 206, the user provides labels via the labeler 104 to identify the people in the selected images. Preferably, the label does not indicate the location of persons within the image or video. Preferably, the label indicates the name of the person or people in the selected images or videos. FIG. 8 shows two selected images and the associated labels 226 indicating the names of people in each of the two selected images. In block 207, the user initiates a search for a person of interest. The person of interest is the name of a person that has been used as a label when labeling people in selected images. For example, the user initiates a search for images of “Jonah.” In block 208, the person identifier accesses the features from the

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	features extractor 106 and associated labels stored in the database 114 and determines the digital image collection subset 112 of images and videos believed to contain the person of interest. In block 210, the digital image collection subset 112 is displayed on the display 332. FIG. 9 shows that the digital image collection subset 112 contains labeled images 220, images correctly believed to contain the person of interest 222, and images incorrectly believed to contain the person of interest 224. This is a consequence of the imperfect nature of current face detection and recognition technology. In block 212, the user reviews the digital image collection subset 112 and can indicate the correctness of each image in the digital image collection subset 112. This user indication of correctness is used to provide additional labels via the labeler 104 in block 204. For example, the user indicates via the user interface that all of the images and videos correctly believes to contain the person of interest 222 of the digital image collection subset 112 do contain the person of interest. The user can also indicate, via the user interface, those images of the images and videos of the digital image collection subset 112 do not contain the person of interest. The indicated images are then removed from the digital image collection subset 112, and the remaining images can be labeled as previously described. Each image and video of the digital image collection subset 112 is then labeled with the name of the person of interest. The user can review the name of the person of interest determined by the labeler 104 via the display. After the user indicates that the images and videos of the digital image collection subset 112 contain the person of interest, the message “Label as Jonah?” appears, and the user can confirm the determined name of the person of interest by pressing “yes”, or enter a different name for the person of interest by pressing “no.” FIG. 10 shows the digital image collection subset 112 after the user has removed images incorrectly believed to contain the person of interest, and an automatically generated label 228 used to label the images that have been reviewed by the user. Gallagher at [0065] Note that the person of interest and images or videos can be selected by any user interface known in the art. For example, if the display 332 is a touch sensitive display, then the approximate location of the person of interest can be found by determining the location that the user touches the display 332. Gallagher at [0137]–[0139] In some cases, the modified features 254 form the person identifier 250 are straightforward to generate from the database 114. For example, when the database contains only global features and no local features, then the features associated with each label (whether or not the label contains position information) will be identical. For example, if the only feature is image capture time, then each label associated with the image is associated with the image capture time. Also, if the labels contain position

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	information, then associating features with the labels is easy because either the features do not include local features and therefore the same features are associated with each label, or the features contain local features and the position of the image region over which the local features are computed is used to associate the features with the labels (based on proximity). A person classifier 256 uses the modified features 254 and a identity of the person of interest 252 to determine a digital image collection subset 112 of images and videos believed to contain the person of interest. The modified features 254 includes some features having associated labels (known as labeled features). Other features (known as unlabeled features) do not have associated labels (e.g. all of the image and videos in the digital image collection 102 that were not labeled by the labeler 104). The person classifier 256 uses labeled features to classify the unlabeled features. This problem, although in practice quite difficult, is studied in the field of pattern recognition. Any classifier may be used to classify the unlabeled features. Preferably, the person classifier determines a proposed label for each of the unlabeled features and a confidence, belief, or probability associated with the proposed label. In general, classifiers assign labels to unlabeled features by considering the similarity between a particular set of unlabeled features and labeled sets of features. With some classifiers (e.g. Gaussian Maximum Likelihood), labeled sets of features associated with a single individual person are aggregated to form a model of appearance for the individual. The digital image collection subset 112 is the collection of images and videos having an associated proposed label with a probability that exceeds a threshold T_0, where T_0 ranges from $0 \leq T_0 \leq 1.0$. Preferably, the digital image collection subset 112 also contains the image and videos associated with features having labels matching the identity of the person of interest 252. The images and videos of the digital image collection subset are sorted so that images and videos determined to have the highest belief of containing the person of interest appear at the top of the subset, following only the images and videos with features having labels matching the identity of the person of interest 252. The person classifier 256 can measure the similarity between sets of features associated with two or more persons to determine the similarity of the persons, and thereby the likelihood that the persons are the same. Measuring the similarity of sets of features is accomplished by measuring the similarity of subsets of the features. For example, when the local features describe clothing, the following method is used to compare two sets of features. If the difference in image capture time is small (i.e. less than a few hours) and if the quantitative description of the clothing is similar in each of the two sets of features is similar, then the likelihood of the two sets of local features belonging to the same person is increased. If, additionally, the clothes have a very unique or distinctive pattern (e.g. a shirt of large green, red, and blue patches) for both sets of local features, then the likelihood is even greater that the associated people are the same individual.

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	To the extent Maxell contends Gallagher does not disclose this limitation, a person of ordinary skill in the art would have readily arrived at this limitation by combining or modifying it in view of their general knowledge and/or the prior art references disclosed in the corresponding section of Samsung's Invalidity Contentions.
[18g] firstly pick out image information which includes the registered specific person,	Gallagher discloses "firstly pick out image information which includes the registered specific person." See above at limitation [13h].
[18h] secondly pick out the image information based on a predetermined condition from among the picked-out image information which includes the registered specific person, the predetermined condition being set in accordance with an instruction by a user, and	Gallagher discloses "secondly pick out the image information based on a predetermined condition from among the picked-out image information which includes the registered specific person, the predetermined condition being set in accordance with an instruction by a user." See above at limitation [13i].
[18i] control the reproducer to selectively and sequentially reproduce the image information picked out based on the predetermined condition.	Gallagher discloses "control the reproducer to selectively and sequentially reproduce the image information picked out based on the predetermined condition." See above at limitation [8i].
[19pre] 19. The recording and reproducing apparatus according to claim 18,	Gallagher discloses "[t]he recording and reproducing apparatus according to claim 18." See above.
[19a] wherein the processing circuitry is further configured to control the reproducer to selectively and sequentially reproduce the image information picked out based on the	Gallagher discloses "wherein the processing circuitry is further configured to control the reproducer to selectively and sequentially reproduce the image information picked out based on the predetermined condition in a reproducing mode set from one of a first reproducing mode and a second reproducing mode." See above at limitation [11a].

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predetermined condition in a reproducing mode set from one of a first reproducing mode and a second reproducing mode, and	
[19b] wherein a reproducing time required for reproducing the image information under the first reproducing mode is shorter than a reproducing time required for reproducing the image information under the second reproducing mode, and	Gallagher discloses “wherein a reproducing time required for reproducing the image information under the first reproducing mode is shorter than a reproducing time required for reproducing the image information under the second reproducing mode.” See above at limitation [11b].
[19c] the image information reproduced under the second mode includes the image information reproduced under the first reproducing mode and other of the image information not reproduced under the first reproducing mode.	Gallagher discloses “the image information reproduced under the second mode includes the image information reproduced under the first reproducing mode and other of the image information not reproduced under the first reproducing mode.” See above at limitation [11c].
[20pre] 20. The recording and reproducing apparatus according to claim 19,	Gallagher discloses “[t]he recording and reproducing apparatus according to claim 19.” See above.
[20a] wherein the processing circuitry is further configured to control the reproducer to selectively and sequentially reproduce the image information picked out based on the predetermined condition in the reproducing mode set from one of the first reproducing mode, the	Gallagher discloses “wherein the processing circuitry is further configured to control the reproducer to selectively and sequentially reproduce the image information picked out based on the predetermined condition in the reproducing mode set from one of the first reproducing mode, the second reproducing mode, and a third reproducing mode.” See above at limitation [12a].

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second reproducing mode, and a third reproducing mode, and	
[20b] wherein a reproducing time required for reproducing the image information under the third reproducing mode is longer than the reproducing time required for reproducing the image information under the second reproducing mode.	Gallagher discloses “wherein a reproducing time required for reproducing the image information under the third reproducing mode is longer than the reproducing time required for reproducing the image information under the second reproducing mode.” See above at limitation [12b].
[84pre] 84. A recording and reproducing apparatus for recording and reproducing image information, comprising:	Gallagher discloses “[a] recording and reproducing apparatus for recording and reproducing image information.” See above at limitation [8pre].
[84a] a processor;	Gallagher discloses “a processor.” See above at limitation [8a].
[84b] a display displaying a first option and a second option, wherein when the first option is selected, the recording and reproducing apparatus enters a record mode to capture video information, and when the second option is selected, the recording and reproducing apparatus enters a reproduction mode to reproduce and display recorded video information;	Gallagher discloses “a display displaying a first option and a second option, wherein when the first option is selected, the recording and reproducing apparatus enters a record mode to capture video information, and when the second option is selected, the recording and reproducing apparatus enters a reproduction mode to reproduce and display recorded video information.” For example:

Gallagher at Fig. 2

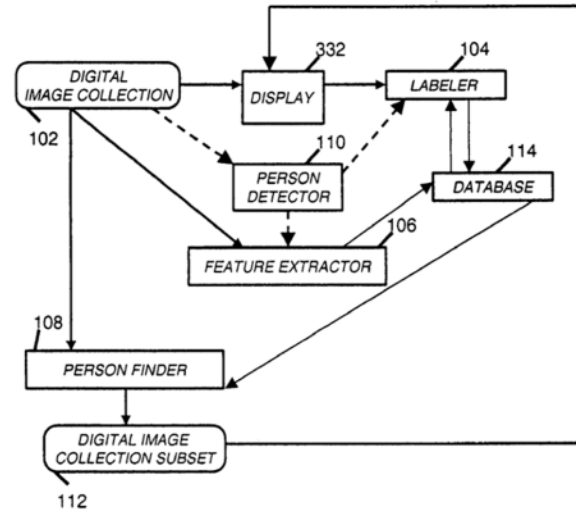
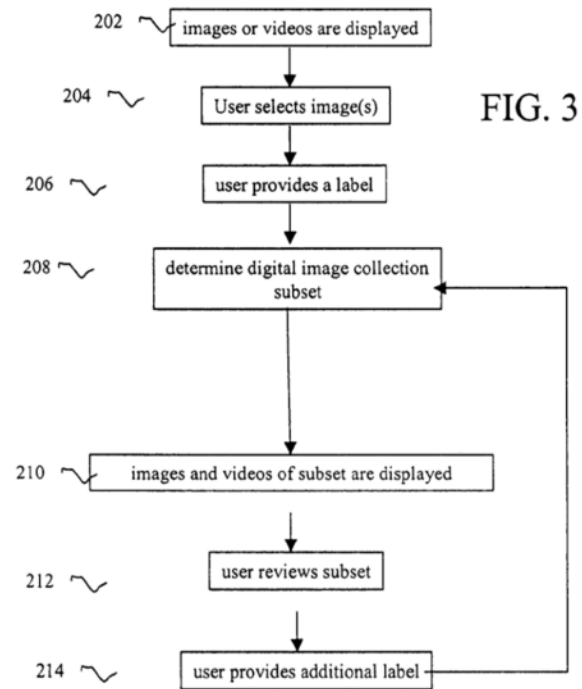


FIG. 2

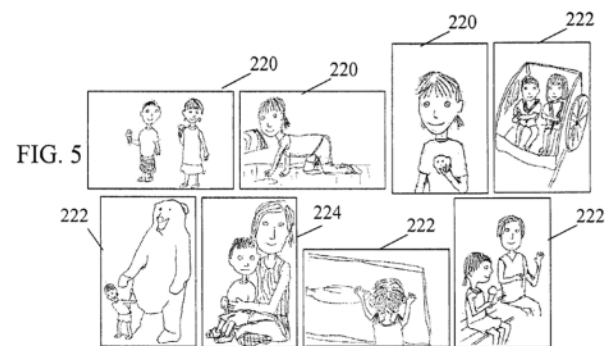
Gallagher at Fig. 3

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Gallagher at Fig. 5



Gallagher at Fig. 6



Gallagher at [0036]–[0040]

FIG. 1 is a block diagram of a digital camera phone 301 based imaging system that can implement the present invention. The digital camera phone 301 is one type of digital camera. Preferably, the digital camera phone 301 is a portable battery operated device, small enough to be easily handheld by a user when capturing and reviewing images. The digital camera phone 301 produces digital images that are stored using the image data/memory 330, which can be, for example, internal Flash EPROM memory, or a removable memory card. Other types of digital image storage media, such as magnetic hard drives, magnetic tape, or optical disks, can alternatively be used to provide the image/data memory 330.

The digital camera phone 301 includes a lens 305 that focuses light from a scene (not shown) onto an image sensor array 314 of a CMOS image sensor 311. The image sensor array 314 can provide color image information using the well-known Bayer color filter pattern. The image sensor array 314 is controlled by timing generator 312, which also controls a flash 303 in order to illuminate the scene when the ambient illumination is low. The image sensor array 314 can have, for example, 1280 columns×960 rows of pixels.

In some embodiments, the digital camera phone 301 can also store video clips, by summing multiple pixels of the image sensor array 314 together (e.g. summing pixels of the same color within each 4 column×4 row area of the image sensor array 314) to create a lower resolution video image frame. The video image frames are read from the image sensor array 314 at regular intervals, for example using a 24 frame per second readout rate.

The analog output signals from the image sensor array 314 are amplified and converted to digital data by the analog-to-digital (A/D) converter circuit 316 on the CMOS image sensor 311. The digital data is stored in a DRAM buffer memory 318 and subsequently processed by a digital processor 320 controlled by the firmware stored in firmware memory 328, which can be flash EPROM memory. The digital

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	processor 320 includes a real-time clock 324, which keeps the date and time even when the digital camera phone 301 and digital processor 320 are in their low power state. The processed digital image files are stored in the image/data memory 330. The image/data memory 330 can also be used to store the user's personal calendar information, as will be described later in reference to FIG. 11. The image/data memory can also store other types of data, such as phone numbers, to-do lists, and the like. Gallagher at [0048]–[0049] An embodiment of the invention is illustrated in FIG. 2. A digital image collection 102 containing people is searched for a person of interest by a person finder 108. A digital image collection subset 112 is the set of images from the digital image collection 102 believed to contain the person of interest. The digital image collection 102 includes both images and videos. For convenience, the term “image” refers to both single images and videos. Videos are a collection of images with accompanying audio and sometimes text. The digital image collection subset 112 is displayed on the display 332 for review by the human user. The search for a person of interest is initiated by a user as follows: Images or videos of the digital image collection 102 are displayed on the display 332 and viewed by the user. The user establishes one or more labels for one or more of the images with a labeler 104. A feature extractor 106 extracts features from the digital image collection in association with the label(s) from the labeler 104. The features are stored in association with labels in a database 114. A person detector 110 can optionally be used to assist in the labeling and feature extraction. When the digital image collection subset 112 is displayed on the display 332, the user can review the results and further label the displayed images. Gallagher at [0050]–[0057] A label from the labeler 104 indicates that a particular image or video contains a person of interest and includes at least one of the following: (1) the name of a person of interest in an image or video. A person's name can be a given name or a nickname. (2) an identifier associated with the person of interest such as a text string or identifier such as “Person A” or “Person B”. (3) the location of the person of interest within the image or video. Preferably, the location of the person of interest is specified by the coordinates (e.g. the pixel address of row and column) of the eyes of the person of interest (and the associated frame number in the case of video). Alternatively, the location of the person of interest can be specified by coordinates of a box that surrounds the body or the face of the

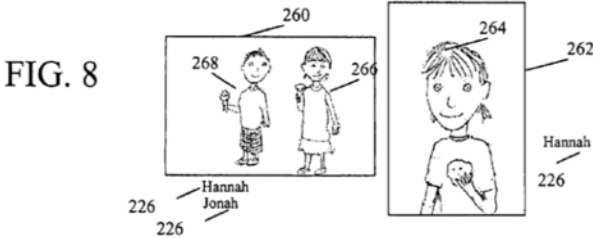
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	person of interest. As a further alternative, the location of the person of interest can be specified by coordinates indicating a position contained within the person of interest. The user can indicate the location of the person of interest by using a mouse to click on the positions of the eyes for example. When the person detector 110 detects a person, the position of the person can be highlighted to the user by, for example, circling the face on the display 332. Then the user can provide the name or identifier for the highlighted person, thereby associating the position of the person with the user provided label. When more than one person is detected in an image, the positions of the persons can be highlighted in turn and labels can be provided by the user for any of the people. (4) an indication to search for images or videos from the image collection believed to contain the person of interest. (5) the name or identifier of a person of interest who is not in the image. The digital image collection 102 contains at least one image having more than one person. A label is provided by the user via the labeler 104, indicating that the image contains a person of interest. Features related to the person of interest are determined by the feature extractor 106, and these features are used by the person finder 108 to identify other images in the collection that are believed to contain the person of interest. Note that the terms “tag”, “caption”, and “annotation” are used synonymously with the term “label.” Gallagher at [0063]–[0064] FIG. 7 is a flow diagram showing an alternative method for identifying images believed to contain a person of interest. In this embodiment, a user labels the people in one or more images or videos, initiates a search for a person of interest, and the system determines and displays images or videos from a subset of the digital image collection 102 believed to contain the person of interest. The displayed images can be reviewed by the user, and the user can indicate whether the displayed images do contain the person of interest. In addition, the user can verify or provide the name of the person of interest. Finally, based on the input from the user, the system can again determine a set of images believed to contain the person of interest. In block 202, images are displayed on the display 332. In block 204, the user selects images, where each image contains the person of interest. At least one of the selected images contains more than one person. In block 206, the user provides labels via the labeler 104 to identify the people in the selected images. Preferably, the label does not indicate the location of persons within the image or video. Preferably, the label indicates the name of the person or people in the selected images or videos. FIG. 8 shows two selected images and the associated labels 226 indicating the names of people in each of the two selected images. In block 207, the user initiates a search for a person of interest. The person of interest is the name

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	of a person that has been used as a label when labeling people in selected images. For example, the user initiates a search for images of “Jonah.” In block 208, the person identifier accesses the features from the features extractor 106 and associated labels stored in the database 114 and determines the digital image collection subset 112 of images and videos believed to contain the person of interest. In block 210, the digital image collection subset 112 is displayed on the display 332. FIG. 9 shows that the digital image collection subset 112 contains labeled images 220, images correctly believed to contain the person of interest 222, and images incorrectly believed to contain the person of interest 224. This is a consequence of the imperfect nature of current face detection and recognition technology. In block 212, the user reviews the digital image collection subset 112 and can indicate the correctness of each image in the digital image collection subset 112. This user indication of correctness is used to provide additional labels via the labeler 104 in block 204. For example, the user indicates via the user interface that all of the images and videos correctly believes to contain the person of interest 222 of the digital image collection subset 112 do contain the person of interest. The user can also indicate, via the user interface, those images of the images and videos of the digital image collection subset 112 do not contain the person of interest. The indicated images are then removed from the digital image collection subset 112, and the remaining images can be labeled as previously described. Each image and video of the digital image collection subset 112 is then labeled with the name of the person of interest. The user can review the name of the person of interest determined by the labeler 104 via the display. After the user indicates that the images and videos of the digital image collection subset 112 contain the person of interest, the message “Label as Jonah?” appears, and the user can confirm the determined name of the person of interest by pressing “yes”, or enter a different name for the person of interest by pressing “no.” FIG. 10 shows the digital image collection subset 112 after the user has removed images incorrectly believed to contain the person of interest, and an automatically generated label 228 used to label the images that have been reviewed by the user. Gallagher at [0065] Note that the person of interest and images or videos can be selected by any user interface known in the art. For example, if the display 332 is a touch sensitive display, then the approximate location of the person of interest can be found by determining the location that the user touches the display 332. Gallagher at [0074] The local feature detector 240 computes local features 244. Local features are features directly relating to the appearance of a person in an image or video. Computation of these features for a person in an image or video requires knowledge of the position of the person. The local feature detector 240 is passed

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	information related to the position of a person in an image of video from either the person detector 110, or the database 114, or both. The person detector 110 can be a manual operation where a user inputs the position of people in images and videos by outlining the people, indicating eye position, or the like. Preferable, the person detector 110 implements a face detection algorithm. Methods for detecting human faces are well known in the art of digital image processing. For example, a face detection method for finding human faces in images is described in the following article: Jones, M. J.; Viola, P., "Fast Multi-view Face Detection", IEEE Conference on Computer Vision and Pattern Recognition (CVPR), June 2003. Gallagher at [0137]–[0139] In some cases, the modified features 254 form the person identifier 250 are straightforward to generate from the database 114. For example, when the database contains only global features and no local features, then the features associated with each label (whether or not the label contains position information) will be identical. For example, if the only feature is image capture time, then each label associated with the image is associated with the image capture time. Also, if the labels contain position information, then associating features with the labels is easy because either the features do not include local features and therefore the same features are associated with each label, or the features contain local features and the position of the image region over which the local features are computed is used to associate the features with the labels (based on proximity). A person classifier 256 uses the modified features 254 and a identity of the person of interest 252 to determine a digital image collection subset 112 of images and videos believed to contain the person of interest. The modified features 254 includes some features having associated labels (known as labeled features). Other features (known as unlabeled features) do not have associated labels (e.g. all of the image and videos in the digital image collection 102 that were not labeled by the labeler 104). The person classifier 256 uses labeled features to classify the unlabeled features. This problem, although in practice quite difficult, is studied in the field of pattern recognition. Any classifier may be used to classify the unlabeled features. Preferably, the person classifier determines a proposed label for each of the unlabeled features and a confidence, belief, or probability associated with the proposed label. In general, classifiers assign labels to unlabeled features by considering the similarity between a particular set of unlabeled features and labeled sets of features. With some classifiers (e.g. Gaussian Maximum Likelihood), labeled sets of features associated with a single individual person are aggregated to form a model of appearance for the individual. The digital image collection subset 112 is the collection of images and videos having an associated proposed label with a probability that exceeds a threshold T_0, where T_0 ranges from $0 \leq T_0 \leq 1.0$. Preferably, the digital image collection subset 112 also contains the image and videos

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	associated with features having labels matching the identity of the person of interest 252. The images and videos of the digital image collection subset are sorted so that images and videos determined to have the highest belief of containing the person of interest appear at the top of the subset, following only the images and videos with features having labels matching the identity of the person of interest 252. The person classifier 256 can measure the similarity between sets of features associated with two or more persons to determine the similarity of the persons, and thereby the likelihood that the persons are the same. Measuring the similarity of sets of features is accomplished by measuring the similarity of subsets of the features. For example, when the local features describe clothing, the following method is used to compare two sets of features. If the difference in image capture time is small (i.e. less than a few hours) and if the quantitative description of the clothing is similar in each of the two sets of features is similar, then the likelihood of the two sets of local features belonging to the same person is increased. If, additionally, the clothes have a very unique or distinctive pattern (e.g. a shirt of large green, red, and blue patches) for both sets of local features, then the likelihood is even greater that the associated people are the same individual. To the extent Maxell contends Gallagher does not disclose this limitation, a person of ordinary skill in the art would have readily arrived at this limitation by combining or modifying it in view of their general knowledge and/or the prior art references disclosed in the corresponding section of Samsung's Invalidity Contentions.
[84c] a memory coupled to the processor and storing instructions that, when executed by the processor, cause the processor to:	Gallagher discloses "a memory coupled to the processor and storing instructions" therefor. See above at limitation [8b].
[84c.i] capture a photograph and generate image information of the photograph;	Gallagher discloses "capture a photograph and generate image information of the photograph." See above at limitation [8c].
[84c.ii] record the image information in a recording medium;	Gallagher discloses "record the image information in a recording medium." See above at limitation [8d].
[84c.iii] execute a face-recognizing process on the image information to recognize a face;	Gallagher discloses "execute a face-recognizing process on the image information to recognize a face." See above at limitation [8e].

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[84c.iv] reproduce the recorded image from the recording medium;	Gallagher discloses “reproduce the recorded image from the recording medium.” See above at limitation [8f].
[84c.v] register a person in the image information as a specific person in a mode selected from a first setting mode and a second setting mode, wherein, when the first setting mode is selected, an image information of a person with a face is obtained by newly photographing the person with a face in a photographing mode and, thereafter, the image information of the person with a face is used to register the person with a face as the specific person, and,	Gallagher discloses “register a person in the image information as a specific person in a mode selected from a first setting mode and a second setting mode, wherein, when the first setting mode is selected, an image information of a person with a face is obtained by newly photographing the person with a face in a photographing mode and, thereafter, the image information of the person with a face is used to register the person with a face as the specific person.” See above at limitation [8g].
[84c.vi] when the second setting mode is selected, a person with a face in an image information of a person with a face is selected from a plurality of faces in the image information recorded in the recording medium and, thereafter, the image information of the person with a face is used to register the person with a face as the specific person;	Gallagher discloses “when the second setting mode is selected, a person with a face in an image information of a person with a face is selected from a plurality of faces in the image information recorded in the recording medium and, thereafter, the image information of the person with a face is used to register the person with a face as the specific person.” See above at limitation [8h].
[84c.vii] selectively reproduce the recorded image which includes the registered specific person; and	Gallagher discloses “selectively reproduce the recorded image which includes the registered specific person.” See above at limitation [8i].

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[84c.viii] generate a thumbnail corresponding to the recorded image in the recording medium such that the thumbnail is displayed on the display with an icon having a predetermined shape when an importance level is set for the recorded image via a user interface;	Gallagher discloses “generate a thumbnail corresponding to the recorded image in the recording medium such that the thumbnail is displayed on the display with an icon having a predetermined shape when an importance level is set for the recorded image via a user interface.” For example: Gallagher at Fig. 8  FIG. 8 Gallagher at [0043] The digital processor 320 also creates a low-resolution “thumbnail” size image, which can be created as described in commonly-assigned U.S. Pat. No. 5,164,831 to Kuchta, et al., the disclosure of which is herein incorporated by reference. The thumbnail image can be stored in RAM memory 322 and supplied to a color display 332, which can be, for example, an active matrix LCD or organic light emitting diode (OLED). After images are captured, they can be quickly reviewed on the color LCD image display 332 by using the thumbnail image data. To the extent Maxell contends Gallagher does not disclose this limitation, a person of ordinary skill in the art would have readily arrived at this limitation by combining or modifying it in view of their general knowledge and/or the prior art references disclosed in the corresponding section of Samsung’s Invalidity Contentions.
[84d] a touch panel adhered to a screen of the display, wherein the first setting mode and the second setting mode are each selected using the touch panel;	Gallagher discloses “a touch panel adhered to a screen of the display, wherein the first setting mode and the second setting mode are each selected using the touch panel.” For example: Gallagher at [0065] Note that the person of interest and images or videos can be selected by any user interface known in the art. For example, if the display 332 is a touch sensitive display, then the approximate location of the person of interest can be found by determining the location that the user touches the display 332. To the extent Maxell contends Gallagher does not disclose this limitation, a person of ordinary skill in the art would have readily arrived at this limitation by combining or modifying it in view of their general

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	knowledge and/or the prior art references disclosed in the corresponding section of Samsung's Invalidity Contentions.
[84e] a video camera providing video image data, wherein, in response to the face-recognizing process recognizing that a face of a person is included in the video image data, the display displays the video image data with a frame surrounding at least a portion of the face of the person;	Gallagher discloses “a video camera providing video image data, wherein, in response to the face-recognizing process recognizing that a face of a person is included in the video image data, the display displays the video image data with a frame surrounding at least a portion of the face of the person.” For example: To the extent Maxell contends Gallagher does not disclose this limitation, a person of ordinary skill in the art would have readily arrived at this limitation by combining or modifying it in view of their general knowledge and/or the prior art references disclosed in the corresponding section of Samsung's Invalidity Contentions.
[84f] an analog/digital converter, wherein the analog/digital converter is configured to convert analog image data corresponding to the captured photograph into a digital image signal; and	Gallagher discloses “an analog/digital converter, wherein the analog/digital converter is configured to convert analog image data corresponding to the captured photograph into a digital image signal.” For example: Gallagher at Fig. 1 FIG. 1 Gallagher at [0036]–[0040] FIG. 1 is a block diagram of a digital camera phone 301 based imaging system that can implement the present invention. The digital camera phone 301 is one type of digital camera. Preferably, the digital camera phone 301 is a portable battery operated device, small enough to be easily handheld by a user

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	when capturing and reviewing images. The digital camera phone 301 produces digital images that are stored using the image data/memory 330, which can be, for example, internal Flash EPROM memory, or a removable memory card. Other types of digital image storage media, such as magnetic hard drives, magnetic tape, or optical disks, can alternatively be used to provide the image/data memory 330. The digital camera phone 301 includes a lens 305 that focuses light from a scene (not shown) onto an image sensor array 314 of a CMOS image sensor 311. The image sensor array 314 can provide color image information using the well-known Bayer color filter pattern. The image sensor array 314 is controlled by timing generator 312, which also controls a flash 303 in order to illuminate the scene when the ambient illumination is low. The image sensor array 314 can have, for example, 1280 columns×960 rows of pixels. In some embodiments, the digital camera phone 301 can also store video clips, by summing multiple pixels of the image sensor array 314 together (e.g. summing pixels of the same color within each 4 column×4 row area of the image sensor array 314) to create a lower resolution video image frame. The video image frames are read from the image sensor array 314 at regular intervals, for example using a 24 frame per second readout rate. The analog output signals from the image sensor array 314 are amplified and converted to digital data by the analog-to-digital (A/D) converter circuit 316 on the CMOS image sensor 311. The digital data is stored in a DRAM buffer memory 318 and subsequently processed by a digital processor 320 controlled by the firmware stored in firmware memory 328, which can be flash EPROM memory. The digital processor 320 includes a real-time clock 324, which keeps the date and time even when the digital camera phone 301 and digital processor 320 are in their low power state. The processed digital image files are stored in the image/data memory 330. The image/data memory 330 can also be used to store the user's personal calendar information, as will be described later in reference to FIG. 11. The image/data memory can also store other types of data, such as phone numbers, to-do lists, and the like. To the extent Maxell contends Gallagher does not disclose this limitation, a person of ordinary skill in the art would have readily arrived at this limitation by combining or modifying it in view of their general knowledge and/or the prior art references disclosed in the corresponding section of Samsung's Invalidity Contentions.
[84g] a codec for compressing the digital image signal using a predetermined compression encoding method and generating	Gallagher discloses “a codec for compressing the digital image signal using a predetermined compression encoding method and generating encoded image information, wherein the encoded image information is stored in the recording medium.” For example:

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encoded image information, wherein the encoded image information is stored in the recording medium,	Gallagher at Fig. 1 FIG. 1 Gallagher at [0036]–[0040] FIG. 1 is a block diagram of a digital camera phone 301 based imaging system that can implement the present invention. The digital camera phone 301 is one type of digital camera. Preferably, the digital camera phone 301 is a portable battery operated device, small enough to be easily handheld by a user when capturing and reviewing images. The digital camera phone 301 produces digital images that are stored using the image data/memory 330, which can be, for example, internal Flash EPROM memory, or a removable memory card. Other types of digital image storage media, such as magnetic hard drives, magnetic tape, or optical disks, can alternatively be used to provide the image/data memory 330. The digital camera phone 301 includes a lens 305 that focuses light from a scene (not shown) onto an image sensor array 314 of a CMOS image sensor 311. The image sensor array 314 can provide color image information using the well-known Bayer color filter pattern. The image sensor array 314 is controlled by timing generator 312, which also controls a flash 303 in order to illuminate the scene when the ambient illumination is low. The image sensor array 314 can have, for example, 1280 columns×960 rows of pixels. In some embodiments, the digital camera phone 301 can also store video clips, by summing multiple pixels of the image sensor array 314 together (e.g. summing pixels of the same color within each 4 column×4 row area of the image sensor array 314) to create a lower resolution video image frame. The video image frames are read from the image sensor array 314 at regular intervals, for example using a 24 frame per second readout rate.

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	The analog output signals from the image sensor array 314 are amplified and converted to digital data by the analog-to-digital (A/D) converter circuit 316 on the CMOS image sensor 311. The digital data is stored in a DRAM buffer memory 318 and subsequently processed by a digital processor 320 controlled by the firmware stored in firmware memory 328, which can be flash EPROM memory. The digital processor 320 includes a real-time clock 324, which keeps the date and time even when the digital camera phone 301 and digital processor 320 are in their low power state. The processed digital image files are stored in the image/data memory 330. The image/data memory 330 can also be used to store the user's personal calendar information, as will be described later in reference to FIG. 11. The image/data memory can also store other types of data, such as phone numbers, to-do lists, and the like. Gallagher at [0041] In the still image mode, the digital processor 320 performs color interpolation followed by color and tone correction, in order to produce rendered sRGB image data. The digital processor 320 can also provide various image sizes selected by the user. The rendered sRGB image data is then JPEG compressed and stored as a JPEG image file in the image/data memory 330. The JPEG file uses the so-called "Exif" image format described earlier. This format includes an Exif application segment that stores particular image metadata using various TIFF tags. Separate TIFF tags can be used, for example, to store the date and time the picture was captured, the lens f/number and other camera settings, and to store image captions. In particular, the ImageDescription tag can be used to store labels. The real-time clock 324 provides a capture date/time value, which is stored as date/time metadata in each Exif image file. To the extent Maxell contends Gallagher does not disclose this limitation, a person of ordinary skill in the art would have readily arrived at this limitation by combining or modifying it in view of their general knowledge and/or the prior art references disclosed in the corresponding section of Samsung's Invalidity Contentions.
[84h] wherein the video camera captures video information corresponding to a scene and the processor:	Gallagher discloses "wherein the video camera captures video information corresponding to a scene and the processor." For example:

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	Gallagher at Fig. 1 FIG. 1 To the extent Maxell contends Gallagher does not disclose this limitation, a person of ordinary skill in the art would have readily arrived at this limitation by combining or modifying it in view of their general knowledge and/or the prior art references disclosed in the corresponding section of Samsung’s Invalidity Contentions.
[84h.i] automatically sets a plurality of sections corresponding to the video information of the scene; and	Gallagher discloses “automatically sets a plurality of sections corresponding to the video information of the scene.” For example: To the extent Maxell contends Gallagher does not disclose this limitation, a person of ordinary skill in the art would have readily arrived at this limitation by combining or modifying it in view of their general knowledge and/or the prior art references disclosed in the corresponding section of Samsung’s Invalidity Contentions.
[84h.ii] generates a plurality of thumbnails corresponding to the plurality of sections, wherein each of the plurality of thumbnails is associated with the same video information corresponding to the scene, and the display displays the plurality of thumbnails; and	Gallagher discloses “generates a plurality of thumbnails corresponding to the plurality of sections, wherein each of the plurality of thumbnails is associated with the same video information corresponding to the scene, and the display displays the plurality of thumbnails.” For example: Gallagher at [0043] The digital processor 320 also creates a low-resolution “thumbnail” size image, which can be created as described in commonly-assigned U.S. Pat. No. 5,164,831 to Kuchta, et al., the disclosure of which is herein incorporated by reference. The thumbnail image can be stored in RAM memory 322 and supplied

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	to a color display 332, which can be, for example, an active matrix LCD or organic light emitting diode (OLED). After images are captured, they can be quickly reviewed on the color LCD image display 332 by using the thumbnail image data. To the extent Maxell contends Gallagher does not disclose this limitation, a person of ordinary skill in the art would have readily arrived at this limitation by combining or modifying it in view of their general knowledge and/or the prior art references disclosed in the corresponding section of Samsung's Invalidity Contentions.
[84i] wherein the display is configured to display at least a plurality of images recorded in the recording medium such that contents of each image in the plurality of images includes a face of a different person and background objects and displaying the plurality of images includes displaying the faces without displaying all of the background objects included in the contents of each image of the plurality of images.	Gallagher discloses "wherein the display is configured to display at least a plurality of images recorded in the recording medium such that contents of each image in the plurality of images includes a face of a different person and background objects and displaying the plurality of images includes displaying the faces without displaying all of the background objects included in the contents of each image of the plurality of images." For example: To the extent Maxell contends Gallagher does not disclose this limitation, a person of ordinary skill in the art would have readily arrived at this limitation by combining or modifying it in view of their general knowledge and/or the prior art references disclosed in the corresponding section of Samsung's Invalidity Contentions.