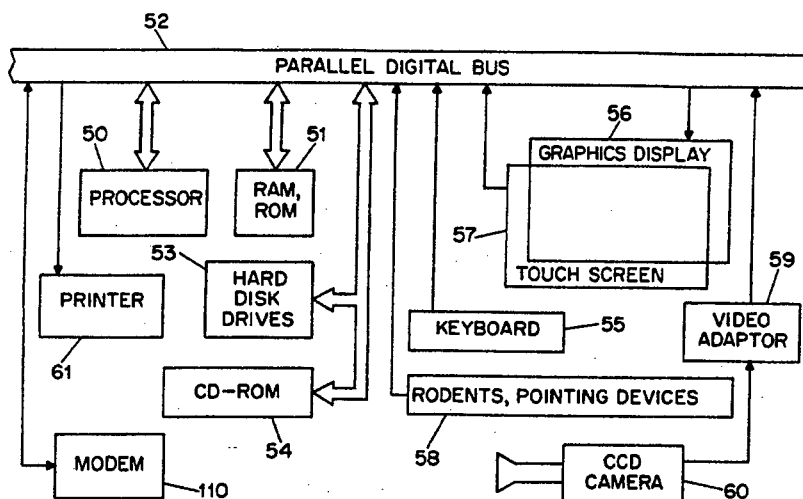




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(54) Title: SPECTACLE IMAGING SYSTEM



(57) Abstract

A system is provided permitting a patient to visualize how he or she would look given a particular choice (57) of spectacle frames. The system takes into account the prescription information (spherical, and for astigmatic correction the cylinder and axis) and provides for the patient an image (56) showing how the patient would look if wearing the spectacle frames with lenses according to the prescription.

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DESCRIPTION

SPECTACLE IMAGING SYSTEM

1 BACKGROUND OF THE INVENTION

2 This invention relates generally to systems for permitting
3 ophthalmological and optometric patients to visualize and select
4 spectacles, and relates more particularly to systems permitting such
5 visualizations with attention to details peculiar to spectacles due to the
6 optical effects of lenses.

7 Among the many activities undertaken when a patient visits
8 an ophthalmologist, optometrist, or optician for spectacles is the selection
9 of frames and lens styles. Most patients appreciate the importance of
10 considering the aesthetic appearance of the proposed frames in
11 connection with the patient's face, but few patients appreciate that the
12 overall aesthetic presentation involves not only the frames themselves
13 but also the manner in which the proposed lenses will affect the part of
14 the body seen through the lens by others.

15 The time-honored process by which a patient selects a frame
16 is to try on dozens or hundreds of frames by physical placement of the
17 frames on the face. This is time-consuming, of course, and requires that
18 the frames be physically present and available. It generally takes place
19 in front of a conventional flat mirror, a consequence of which is that the
20 patient sees an image that is the left-to-right reverse of what everyone
21 else sees.

22 It is thus desired to have a computer system that would
23 permit trying on of frames without the requirement of physical presence
24 of the frames and that would streamline the trying-on of many proposed
25 frames, and which permits the patient to see an image that is not
26 reversed as a mirror image would be.

27 The selection of frames and lenses is also driven by lifestyle
28 issues, such as the hobbies and activities enjoyed by the patient, whether
29 there will be a considerable amount of night driving, the shape of the

1 patient's face, and hairstyles worn by the patient. It is thus desired to
2 have a computer system that would receive such information from the
3 patient; the system would desirably take the information into account
4 when preparing a list or queue of candidate frame and lens styles to be
5 shown to the patient.

6 Those familiar with computer systems will appreciate that
7 many systems have been proposed to assist customers in viewing or
8 "trying on" consumer goods and the like, having in common with the
9 present system the use of a camera to capture an image of the customer
10 and the user of a display for the customer. Proposed systems have been
11 directed to customers trying on clothing, trying out hairstyles, and
12 simulating the effects of cosmetic surgery. For a variety of reasons, only
13 some of which are technical in nature, most such systems have not been
14 commercially successful. In any event, no such systems known to
15 applicant have addressed the many problems that are peculiar to the
16 fitting of spectacles.

17 A most striking difficulty with trying on spectacles (as
18 distinguished, for example, from trying on clothing or a hair style) is that
19 by definition when the proposed new frame is on the patient's face, the
20 patient's old spectacles are not. The patient cannot see clearly because
21 no corrective lenses are in the optical path when viewing oneself in a
22 mirror.

23 Other difficulties also present themselves when one is trying
24 on spectacles. The mere placement of empty frames (frames lacking
25 lenses) on the face gives little or no clue to the patient as to how the
26 proposed prescription lenses will change how the patient appears to
27 others. Depending on the prescription, and as will be described further
28 below, the lenses may magnify the eyes or make them appear smaller;
29 the line of the face visible through the lenses is also affected. Yet
30 another consequence of the choice of a particular frame is that it may
31 have a lens area larger or smaller than that of another frame. For those
32 with very strong prescriptions it is sometimes noted after the
33 prescription has been filled that if a frame with large lenses was

1 selected, the distortions from the strong lenses are prominent. Trying on
2 empty frames does not readily permit the patient to assess this
3 consequence. But nothing in prior art systems known to applicant
4 addresses, let alone solves, these difficulties.

5 It is thus desirable to provide a system for trying on
6 spectacles that provides an image for the patient that portrays with some
7 fidelity the appearance that will be presented if the proposed frames and
8 proposed lenses were to be manufactured and placed on the face. It is
9 desirable that the portrayal take into account the lens area, the spherical
10 correction of the lenses, and, where astigmatic correction will be
11 provided, the effects of that correction.

12 For most opticians the ordering, stocking, and reordering of
13 lenses and frames is a purely manual, and thus profoundly inefficient,
14 process. It is thus desired to have a computer system which, after a
15 patient and practitioner have agreed on a frame and lenses, would
16 automatically order the items if not already in stock or reorder them
17 otherwise. It is also desired to have a computer system that would
18 automatically prepare insurance claim forms for those patients who are
19 eligible for reimbursement.

20

21 SUMMARY OF THE INVENTION

22 A system is provided permitting a patient to visualize how
23 he or she would look given a particular choice of spectacle frames. The
24 system takes into account the prescription information (spherical, and for
25 astigmatic correction the cylinder and axis) and provides for the patient
26 an image showing substantially faithfully how the patient would look if
27 wearing the spectacle frames with lenses according to the prescription.
28 In addition to prescription information, the program would also take into
29 account the following: Physiognomy, e.g. shape of face (round, oval,
30 square), placement of eyes, ears, cosmetic considerations, coloring, and
31 size of eyes and nose, in proposing a group of frames for customer
32 selection.

33

1 The system takes lifestyle information from the patient into
2 account when preparing a queue of candidate frame and lens styles to be
3 shown to the patient. Once the frame and lenses have been chosen, the
4 system automatically orders the items if not already in stock or reorders
5 them otherwise.

6 7 BRIEF DESCRIPTION OF THE DRAWINGS

8 The invention will be disclosed in connection with drawings,
9 of which:

10 Fig. 1 shows in block diagram form the hardware aspects of
11 the system according to the invention;

12 Figs. 2a, 2b, and 2c show respectively in pictorial form a
13 human face, and the face with negative and positive curvature spherical
14 correction lenses before the eyes;

15 Figs. 3a, 3b, and 3c show in detail a side of a human face,
16 together with respectively zero, positive, and negative curvature of
17 corrective lens;

18 Fig. 4a shows in detail a side of a human face and depicting
19 an internal reflection of a lens due to a high negative curvature;

20 Fig. 4b shows in detail a side of a human face and depicting
21 the consequence of a strong cylindrical correction;

22 Fig. 5a, 5b, and 5c show steps in a patient session with the
23 system of the invention;

24 Fig. 6 shows in flowchart form a portion of the software of
25 the system according to the invention; and

26 Figs. 7a and 7b shows typical lenses with negative and
27 positive curvature respectively.

28 Where possible, like elements are depicted with like
29 reference numerals.

30 31 DETAILED DESCRIPTION OF AN EMBODIMENT

32 The hardware of the system of the invention will first be
33 discussed. Fig. 1 shows the system in block diagram form, with a

1 standard parallel digital bus 52 (preferably the bus of an AT-compatible
2 personal computer) linking the rest of the hardware. A processor 50
3 (preferably compatible with the Intel 80X86 family of processors)
4 executes instructions fetched via the bus and manipulates data read and
5 written via the bus. RAM and ROM 51 are provided; the ROM contains
6 BIOS code for the system. Hard disk drives 53 are provided, containing
7 the operating system (preferably MS-DOS) and the stored program
8 described further below. A CD-ROM drive 54 is also preferably provided.
9 A touchscreen is provided, comprising video display 56 and touch panel
10 57. Traditional types of user input are provided at a keyboard 55 and
11 optionally also at the touchscreen or by means of a rodent (preferably a
12 mouse or joystick) or other pointing device 58. Modem 110, preferably a
13 V32bis/V42bis modem, provides a connection to the public switched
14 network, not shown in Fig. 1. The hardware ensemble is completed with
15 a video camera 60 (preferably a CCD camera) and a video adaptor 59
16 which converts the NTSC-scanned video signal from the camera to digital
17 form for storage on hard disk drive 53 and later display on display 56
18 (preferably VGA or super VGA graphics display).

19 Fig. 2a shows in pictorial form a human face 72 with eyes
20 70 and dark regions 71 (comprising iris and pupil). Fig. 2b shows what
21 happens when corrective lenses 73 with negative curvature are
22 positioned in front of the eyes 71 (not visible as such in Fig. 2b). The
23 result from the point of view of others is that the image 71' of the eyes is
24 smaller, and that the image 70' of the iris and pupil is smaller. Fig. 2c
25 shows what happens when corrective lenses 74 with positive curvature
26 are positioned in front of the eyes 71 (not visible as such in Fig. 2c). The
27 result from the point of view of others is that the image 71" of the eyes is
28 larger, and that the image 70" of the iris and pupil is larger.

29 Fig. 3a shows in detail a side of a human face 72, together
30 with a zero-curvature lens 75. Most pertinently the line of the face 76
31 visible through the lens 75, representing a boundary between skin and
32 air, is continuous with the line of the face above and below the lens 75.
33 In real life this is almost never seen except in the case of actors and

1 actresses who wear spectacles simply for the appearance; such
2 spectacles are fitted with lenses 75 with zero curvature, meaning that
3 the front and rear surfaces of the lenses are parallel.

4 Fig 3b shows in detail a side of a human face 72, together
5 with a positive curvature lens 74. Most pertinently the line of the face
6 77 visible through the lens 74 is discontinuous with the line of the face
7 above and below the lens 74, and has been moved outward (to the left in
8 Fig. 3b). Fig 3c shows in detail a side of a human face 72, together with
9 a negative curvature lens 73. Most pertinently the line of the face 78
10 visible through the lens 73 is discontinuous with the line of the face
11 above and below the lens 73, and has been moved inward (to the right in
12 Fig. 3c).

13 Negatively curved lenses 73 are typically used to correct
14 nearsightedness (myopia). Positively curved lenses 74 are typically used
15 to correct farsightedness (due to hyperopia and/or presbyopia).

16 Fig. 4a shows in detail a side of a human face 72, together
17 with a strongly negative curvature lens 73. As in Fig. 3c the line of the
18 face 78 visible through the lens 73 has been moved inward (in an amount
19 proportional to the strength of the lens 73), but another effect may be
20 seen. The negatively curved lens 73 is, by definition, much thicker
21 around the edges than in the middle. This great thickness yields a great
22 lens thickness where it meets the spectacle frame at the edge. The edge
23 79 gives rise to internal reflections which are visible to observers. Edge
24 79 may also be seen in Fig. 7a.

25 Fig. 4b shows in detail a side of a human face 72, together
26 with a lens 81 with a cylindrical curvature. Lenses 81 with a cylindrical
27 curvature are typically used to correct astigmatism. The angular axis at
28 which the cylindrically curved lens 81 is presented to the eye is selected
29 to correct an aberration in the optical path of the eye, typically in the
30 corneal shape of the eye or less often in the lens of the eye. From the
31 perspective of the observer the lens 81 may, depending on its angular
32 axis for the cylindrical shape, cause the line of the face 80 visible
33 through the lens 81 to be discontinuous with the line of the face above

1 and below the lens 74. In the particular case of Fig. 4b the line has
2 moved outward in the upper lens area and inward in the lower lens area.

3 It is not uncommon for the eyes of a particular patient to
4 require lenses with both a spherical curvature (for correction of myopia,
5 presbyopia, or hyperopia) but also a cylindrical curvature (for correction
6 of astigmatism). Such lenses give rise to effects which are linear
7 combinations of those depicted in Figs. 2b, 3c, 4a, and 4b (for myopia and
8 astigmatism) or in Figs. 2c, 3b, and 4b (for hyperopia or presbyopia and
9 astigmatism). Finally, for presbyopic eyes, bifocals or trifocals are often
10 prescribed, giving rise to combinations of the above effects for each
11 optically distinct lens area of the bifocals or trifocals. For example, with
12 bifocals there will generally be a large main lens area with positive
13 spherical curvature and a smaller lower lens area with a smaller or
14 negative spherical curvature.

15 Fig. 5a, 5b, and 5c show steps in a patient session with the
16 system of the invention. Fig. 5a shows one of the first steps for the
17 patient, in which introductory information is provided to the patient on
18 the screen 56 and the patient is instructed to present front and,
19 optionally, side and oblique views to the camera 60. Lifestyle
20 information is requested and obtained from the patient. That and later
21 steps are facilitated by user inputs to touchscreen 57. In Fig. 5b the
22 patient is offered a multiplicity of frame styles on the screen 56, and
23 selects one via an input to touch screen 57.

24 Those skilled in the art will appreciate that a number of
25 approaches may be taken in presenting the multiplicity of frame styles,
26 only four of which are shown in Fig. 5b. Some users may wish to be
27 offered frames preselected by price, while others may wish to be offered
28 frames selected by color or material or designer make. The selection is
29 also ideally driven by lifestyle information previously provided by the
30 patient. Regardless of the path of user inputs, it is assumed that
31 eventually the user may arrive at a particular frame of interest.

32 The frame of interest displayed in Fig. 5b is shown by
33 means of detailed digital computer-readable information indicative of the

1 appearance of the frame, all of which was stored in the system,
2 preferably in CD-ROM drive 54 or hard disk drive 53. Preferably the
3 area where the frame will be displayed is defined as an array of pixels or
4 picture elements. The frame information includes data setting forth the
5 boundary of the lens areas for the left and right lenses. Then the frame
6 pixel data and face pixel data are aligned. For example, the frame must
7 be centered on the axis of bilateral symmetry of the case. This is
8 accomplished by having the user move back and forth in front of the
9 camera until properly positioned, or by means of data shifts in the pixel
10 data in the system. Likewise the frame depiction must be vertically
11 positioned with respect to the face, again either by mechanical alignment
12 when the camera snaps a picture of the face or by vertical data shifts.
13 Any skew (angular misalignment) is corrected either at the time of the
14 snapshot or in software by skew corrections well known to those skilled
15 in the art. The frame width, tied to the intraocular spacing for the lens
16 centers, needs to match the intraocular spacing for the snapshot as well,
17 and is corrected either at the time of the snapshot or in software by
18 expanding or shrinking either the face or the frame.

19 As mentioned above, the frame information includes data
20 setting forth the boundary of the lens areas for the left and right lenses.
21 After the alignment, deskewing, and resizing are accomplished, steps are
22 taken in software to reshape or resize the face as seen through the lens
23 areas. For a lens area having a positive spherical curvature, the face as
24 seen through the lens area is expanded relative to the center of the lens
25 area. For a lens area having a negative spherical curvature, the face as
26 seen through the lens area is reduced with respect to the center of the
27 lens area, and edge effects are simulated taking into account the lens
28 size.

29 For a lens area having a cylindrical curvature, the face as
30 seen through the lens area is reshaped to correspond to the cylindrical
31 curvature. For a lens area having a positive cylindrical curvature, the
32 face as seen through the lens area is expanded relative to the axis of the
33 cylinder. For a lens area having a negative curvature, the face as seen

1 through the lens area is reduced with respect to the axis of the cylinder.

2 For bifocals and trifocals these processes are performed for
3 each active lens area.

4 Turning now to Fig. 5c, there is shown on display 56 a face
5 72, with the pixel data for the face 72 having been reshaped as described
6 above.

7 The computer readable data indicative of the image of the
8 user may also be reversed in a left to right manner prior to being
9 displayed. In this manner, a mirror image display is achieved.

10 Fig. 6 shows in flowchart form a portion of the software of
11 the system according to the invention. In box 90 the system receives
12 information (preferably from the care provider rather than from the
13 patient) regarding the lens prescription. At 91 the patient provides
14 information (preferably including the name and including lifestyle
15 information) and the patient presents front and other views to the
16 camera 60. Data therefrom is stored on hard disk 53. This corresponds
17 to Fig. 5a.

18 In box 92 the system presents frame choices to the patient,
19 as described above in connection with Fig. 5b, the pixel data having been
20 retrieved from memory 53 or 54. A patient selection is received via
21 touchscreen 57 in box 93, and software then performs the above-
22 described data manipulations to superpose in software the frame and the
23 face, and to transform the face area showing through the lens areas.
24 After the transformations are done, in box 94, the simulated image is
25 displayed, corresponding with box 5c. The user may select another frame
26 type or indicate a successful selection at 95, after which a report and/or
27 insurance claim form is printed in box 96, via printer 61. Once the
28 frame and lenses have been chosen, the system automatically orders the
29 items if not already in stock or reorders them otherwise. To this end the
30 system keeps track of the inventory at all times. The ordering and
31 reordering is preferably accomplished via modem 110 shown in Fig. 1.

32 Fig. 7a shows in cross section a typical negatively curved
33 lens 73. Edge 79 is shown, discussed above in connection with Fig. 4a.

1 Virtual image focal point 100 is to the left of the lens, away from the eye.
2 Fig. 7b shows in cross section a typical positively curved lens 74. Actual
3 image focal point 101 is to the right of the lens, within the eye.

4 The system of the invention will also demonstrate lens
5 "tints," both solid and gradient. In addition, the system will provide the
6 viewer the ability to see the difference between Reflective and "Anti-
7 Reflective" surfaces. It will also allow the viewer to see how different
8 sun glass tints look to the viewer, and, how the surroundings will be
9 perceived by the viewer. Further, the system will allow the viewer to see
10 how special tints will apply to their particular profession.

11 Those skilled in the art will readily appreciate that
12 numerous changes and modifications could be made to the embodiment
13 described herein without departing in any way from the invention. For
14 example, while the embodiment is described in which a processor 50
15 executes a stored program and performs the described data
16 manipulations for generating the simulated display, one could readily
17 employ multiple processors, one or more of which are optimized for
18 graphics manipulations such as superpositions or visual layering.
19 Likewise, the system could be realized just as well in random logic,
20 employing no stored program whatsoever. The camera need not be a
21 CCD camera but could use other imaging technologies such as a vidicon
22 tube. User selections could be by other inputs rather than touchscreen --
23 keyboard, mouse or other rodents, joystick, or speech recognition for
24 example. The frame pixel data and lens area data could be distributed
25 by CD-ROM disk or by modem or other commonly used data
26 transmission techniques. Frame data could be compacted so as to reduce
27 the number of distinct frame items of data required, by using a
28 particular frame shape together with data entries indicative of the
29 available colors, for example. These and all obvious variations of the
30 disclosed embodiment are intended to be embraced by the claims.

CLAIMS

1 1. A spectacle imaging system comprising a processor,
2 memory, input means, and a display, the memory containing images in
3 computer-readable form of a plurality of spectacles including information
4 indicative of the left and right lens areas thereof, the system further
5 comprising:

6 a video camera yielding a video signal and positioned
7 to view a user of the system;

8 conversion means for converting the video signal to
9 computer-readable form;

10 means responsive to inputs from the user at the input
11 means for displaying the plurality of spectacles on the display and for
12 receiving information indicative of the user's choice of a one of the
13 plurality of spectacles;

14 means responsive to inputs from a user at the input
15 means for controllably activating the video camera and the conversion
16 means for receiving an image of the user and for storing in the memory
17 computer-readable data indicative of the image of the user;

18 means responsive to inputs at the input means for
19 receiving first prescription information indicative of the spherical
20 refractive power of lenses;

21 means responsive to the computer-readable data
22 indicative of the image of the said one of the plurality of spectacles for
23 determining the portion of the computer-readable data indicative of the
24 image of the user within left and right lens areas of the spectacles; and

25 means responsive to the first prescription information
26 for controllably resizing the portion of the computer-readable data
27 indicative of the image of the user within left and right lens areas of the
28 spectacles radially with respect to a center of each lens area so as to
29 correspond to the first prescription information;

30 means for manipulating the computer-readable data
31 indicative of the image of the user and the computer-readable data

32 indicative of the image of the said one of the plurality of spectacles so as
33 to superpose the image of the said one of the plurality of spectacles over
34 the image of the user; and

35 means for displaying the superposed images on the
36 display;

37 whereby the display of the superposed images
38 substantially faithfully portrays the visual effect of lenses according to
39 the prescription on the appearance of the user within left and right lens
40 areas of the spectacles with respect to the spherical refractive power
41 thereof.

1 2. The system of claim 1, further comprising:

2 means responsive to inputs at the input means for
3 receiving second prescription information indicative of the cylindrical
4 refractive power of lenses and the angular axes thereof; and

5 means responsive to the second prescription
6 information for controllably resizing the portion of the computer-readable
7 data indicative of the image of the user within left and right lens areas
8 of the spectacles linearly with respect to an axis of each lens area so as
9 to correspond to the second prescription information;

10 whereby the display of the superposed images
11 portrays the visual effect of lenses according to the prescription on the
12 appearance of the user within left and right lens areas of the spectacles
13 with respect to the cylindrical refractive power and the angular axes
14 thereof.

1 3. The system of claim 1 or 2, wherein the input means is a
2 touch-screen at the video display.

1 4. The system of claims 1-3 further comprising:

2 means responsive to inputs at the input means for
3 receiving information indicative of the identity of the user;

4 a printer; and

5 means for printing, at the printer, information
6 indicative of the identity of the user, information indicative of the user's
7 choice of a one of the plurality of spectacles, information indicative of the
8 spherical refractive power of lenses, and information indicative of the
9 cylindrical refractive power of lenses and the angular axes thereof.

1 5. The system of claims 1-4 further comprising:
2 means for reversing left-for-right the computer-
3 readable data indicative of the image of the user,
4 whereby the display of the superposed images on the
5 display corresponds to a mirror image.

1 6. The system of claims 1-5 further comprising:
2 means responsive to inputs at the input means for receiving information
3 indicative of the user;
4 a modem; and
5 means for communicating, via the modem, with
6 distant equipment for fulfilling inventory of the user's choice of a one of
7 the plurality of spectacles, information indicative of the spherical
8 refractive power of lenses, and information indicative of the cylindrical
9 refractive power of lenses and the angular axes thereof.

1 7. A spectacle imaging system comprising a processor,
2 memory, input means, and a display, the memory containing images in
3 computer-readable form of a plurality of spectacles including information
4 indicative of the left and right lens areas thereof, the system further
5 comprising:

6 a video camera yielding a video signal and positioned
7 to view a user of the system;

8 conversion means for converting the video signal to
9 computer-readable form;

12 means responsive to inputs from the user at the input
13 means for displaying the plurality of spectacles on the display and for

14 receiving information indicative of the user's choice of a one of the
15 plurality of spectacles;

16 means responsive to inputs from the user at the input
17 means for receiving lifestyle information from the user and, responsive to
18 the lifestyle information, for preselecting a portion of the plurality of
19 spectacles to be displayed on the display;

20 means responsive to inputs from the user at the input
21 means for displaying the plurality of spectacles on the display and for
22 receiving information indicative of the user's choice of a one of the
23 plurality of spectacles;

24 means responsive to inputs from a user at the input
25 means for controllably activating the video camera and the conversion
26 means for receiving an image of the user and for storing in the memory
27 computer-readable data indicative of the image of the user;

28 means for manipulating the computer-readable data
29 indicative of the image of the user and the computer-readable data
30 indicative of the image of the said one of the plurality of spectacles so as
31 to superpose the image of the said one of the plurality of spectacles over
32 the image of the user; and

33 means for displaying the superposed images on the
34 display.

1 8. The system of claims 1-7 further comprising:
2 means responsive to the data indicative of the image
3 of the user for deriving physiognomy data therefrom and, responsive to
4 the physiognomy data, for preselecting a portion of the plurality of
5 spectacles to be displayed on the display.

1 9. A spectacle imaging system comprising a processor,
2 memory, input means, and a display, the memory containing images in
3 computer-readable form of a plurality of spectacles including information
4 indicative of the left and right lens areas thereof, the system further

5 comprising:

6 a video camera yielding a video signal and positioned
7 to view a user of the system;

8 conversion means for converting the video signal to
9 computer-readable form;

10 means responsive to the data indicative of the image
11 of the user for deriving physiognomy data therefrom and, responsive to
12 the physiognomy data, for preselecting a portion of the plurality of
13 spectacles to be displayed on the display.

14 means responsive to inputs from the user at the input
15 means for displaying the plurality of spectacles on the display and for
16 receiving information indicative of the user's choice of a one of the
17 plurality of spectacles;

18 means responsive to inputs from the user at the input
19 means for displaying the plurality of spectacles on the display and for
20 receiving information indicative of the user's choice of a one of the
21 plurality of spectacles;

22 means responsive to inputs from a user at the input
23 means for controllably activating the video camera and the conversion
24 means for receiving an image of the user and for storing in the memory
25 computer-readable data indicative of the image of the user;

26 means for manipulating the computer-readable data
27 indicative of the image of the user and the computer-readable data
28 indicative of the image of the said one of the plurality of spectacles so as
29 to superpose the image of the said one of the plurality of spectacles over
30 the image of the user; and

31 means for displaying the superposed images on the
32 display.

1 10. A method for use with a spectacle imaging system, the
2 system comprising a processor, memory, input means, and a display, the
3 memory containing images in computer-readable form of a plurality of
4 spectacles including information indicative of the left and right lens

5 areas thereof, the system further comprising a video camera yielding a
6 video signal and positioned to view a user of the system, and conversion
7 means for converting the video signal to computer-readable form, the
8 method comprising the steps of:

9 activating the video camera to receive an image of the
10 user;

11 converting the image to computer-readable data;

12 storing the computer-readable data indicative of the
13 image in the memory;

14 displaying the plurality of spectacles on the display;

15 receiving inputs from the user at the input means

16 indicative of the user's choice of a one of the plurality of spectacles;

17 receiving first prescription information at the input
18 means indicative of the spherical refractive power of lenses;

19 determining the portion of the computer-readable
20 data indicative of the image of the user within left and right lens areas
21 of the chosen spectacle;

22 resizing the portion of the computer-readable data
23 indicative of the image of the user within left and right lens areas of the
24 spectacles radially with respect to a center of each lens area so as to
25 correspond to the first prescription information; and

26 manipulating the computer-readable data indicative of
27 the image of the user and the computer-readable data indicative of the
28 image of the said one of the plurality of spectacles so as to superpose the
29 image of the said one of the plurality of spectacles over the image of the
30 user; and

31 displaying the superposed image on the display.

1 11. The method of claim 10, further comprising the step of:
2 receiving at the input means second prescription
3 information indicative of the cylindrical refractive power of lenses and
4 the angular axes thereof;

5 the resizing step further comprising:
6 resizing the portion of the computer-readable data
7 indicative of the image of the user within left and right lens areas of the
8 spectacles linearly with respect to an axis of each lens area so as to
9 correspond to the second prescription information.

1 12. The method of claims 10-11 wherein the system further
2 comprises a printer, the method further comprising the steps of:
3 receiving at the input means information indicative of
4 the identity of the user; and
5 printing, at the printer, information indicative of the
6 identity of the user, information indicative of the user's choice of a one of
7 the plurality of spectacles, information indicative of the spherical
8 refractive power of lenses, and information indicative of the cylindrical
9 refractive power of lenses and the angular axes thereof.

1 13. The method of claim 10-12 further comprising the step,
2 performed before the step of displaying the superposed images on the
3 display, of:
4 reversing left-for-right the computer-readable data
5 indicative of the image of the user.

1 14. The method of claim 10-14 wherein the system further
2 comprises a modem, the method further comprising the steps of:
3 receiving at the input means information indicative of
4 the user; and
5 communicating, via the modem, with distant
6 equipment for fulfilling inventory of the user's choice of a one of the
7 plurality of spectacles, information indicative of the spherical refractive
8 power of lenses, and information indicative of the cylindrical refractive
9 power of lenses and the angular axes thereof.

1 15. The method of claims 10-14 further comprising the
2 steps of:
3 receiving lifestyle information from the user at the
4 input means;
5 preselecting a portion of the plurality of spectacles to
6 be displayed on the display in response to the lifestyle information.

1 16. A method for use with a spectacle imaging system,
2 the system comprising a processor, memory, input means, and a display,
3 the memory containing images in computer-readable form of a plurality
4 of spectacles including information indicative of the left and right lens
5 areas thereof, the system further comprising a video camera yielding a
6 video signal and positioned to view a user of the system, and conversion
7 means for converting the video signal to computer- readable form, the
8 method comprising the steps of:
9 activating the video camera to receive an image of the
10 user;
11 converting the image to computer-readable data;
12 storing the computer-readable data indicative of the
13 image in the memory;
14 receiving lifestyle information from the user at the
15 input means;
16 preselecting a portion of the plurality of spectacles to
17 be displayed on the display in response to the lifestyle information.
18 displaying the portion of the plurality of spectacles on
19 the display;
20 receiving inputs from the user at the input means
21 indicative of the user's choice of a one of the plurality of spectacles;
22 manipulating the computer-readable data indicative of
23 the image of the user and the computer-readable data indicative of the
24 image of the said one of the plurality of spectacles so as to superpose the
25 image of the said one of the plurality of spectacles over the image of the
26 user; and

27 displaying the superposed image on the display.

1 17. The method of claims 10-16 further comprising the
2 steps of:
3 deriving physiognomy data from the data indicative of
4 the image of the user; and
5 preselecting a portion of the plurality of spectacles to
6 be displayed on the display in response to the physiognomy data.

1 18. A method for use with a spectacle imaging system,
2 the system comprising a processor, memory, input means, and a display,
3 the memory containing images in computer-readable form of a plurality
4 of spectacles including information indicative of the left and right lens
5 areas thereof, the system further comprising a video camera yielding a
6 video signal and positioned to view a user of the system, and conversion
7 means for converting the video signal to computer-readable form, the
8 method comprising the steps of:
9 activating the video camera to receive an image of the
10 user;
11 converting the image to computer-readable data;
12 storing the computer-readable data indicative of the
13 image in the memory;
14 deriving physiognomy data from the data indicative of
15 the image of the user; and
16 preselecting a portion of the plurality of spectacles to
17 be displayed on the display in response to the physiognomy data.
18 displaying the portion of the plurality of spectacles on
19 the display;
20 receiving inputs from the user at the input means
21 indicative of the user's choice of a one of the plurality of spectacles;
22 manipulating the computer-readable data indicative of
23 the image of the user and the computer-readable data indicative of the

24 image of the said one of the plurality of spectacles so as to superpose the
25 image of the said one of the plurality of spectacles over the image of the
26 user; and
27 displaying the superposed image on the display.

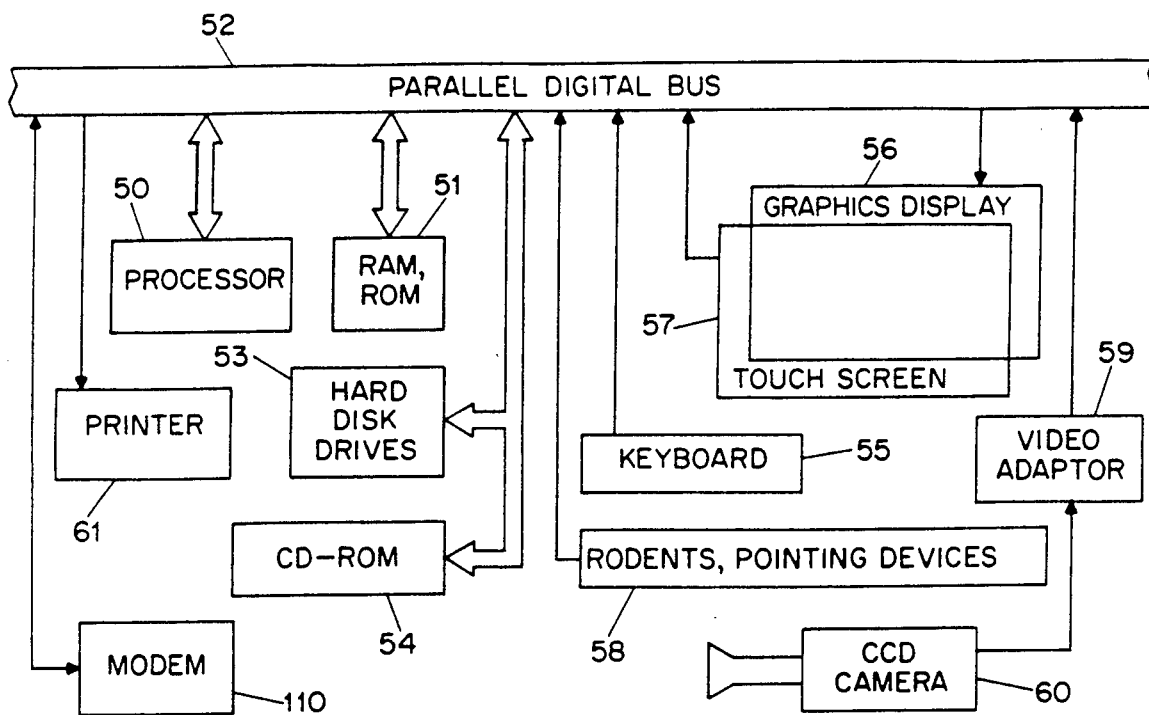


FIG. 1

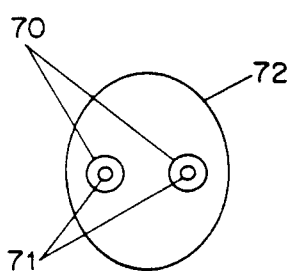


FIG. 2a

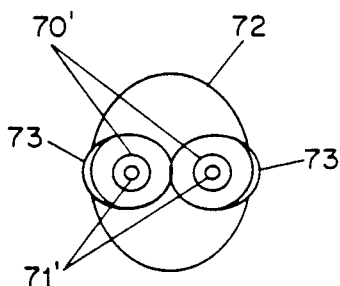


FIG. 2b

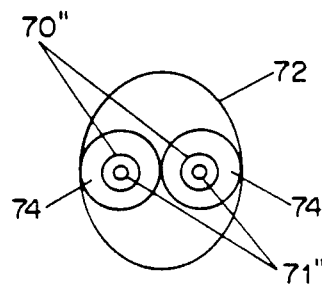


FIG. 2c

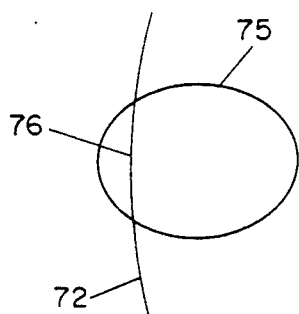


FIG. 3a

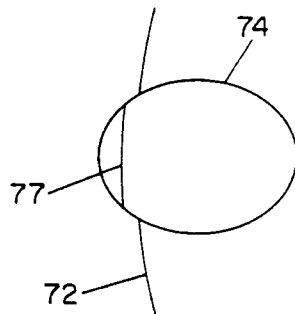


FIG. 3b

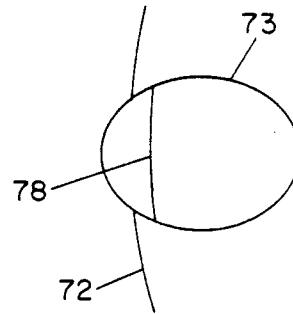


FIG. 3c

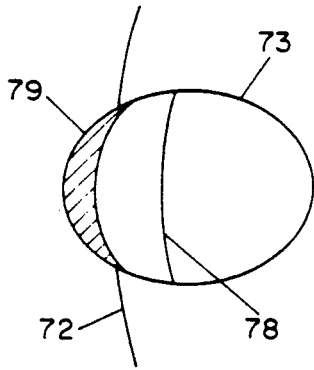


FIG. 4a

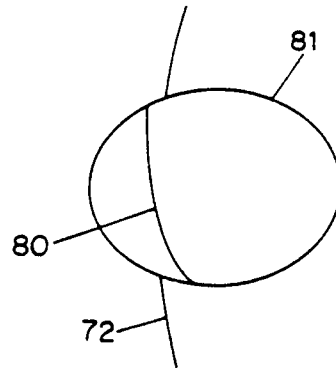


FIG. 4b

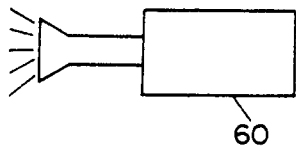
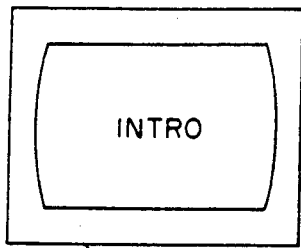


FIG. 5a

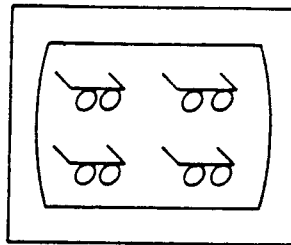


FIG. 5b

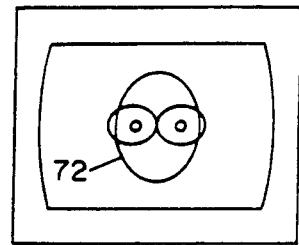


FIG. 5c

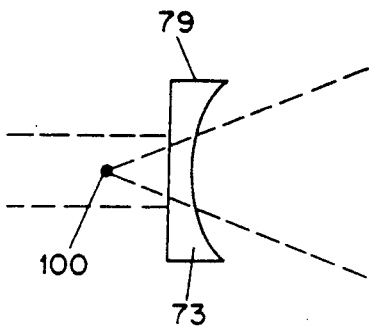


FIG. 7a

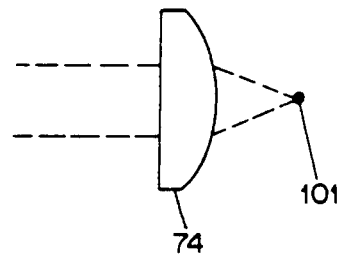


FIG. 7b

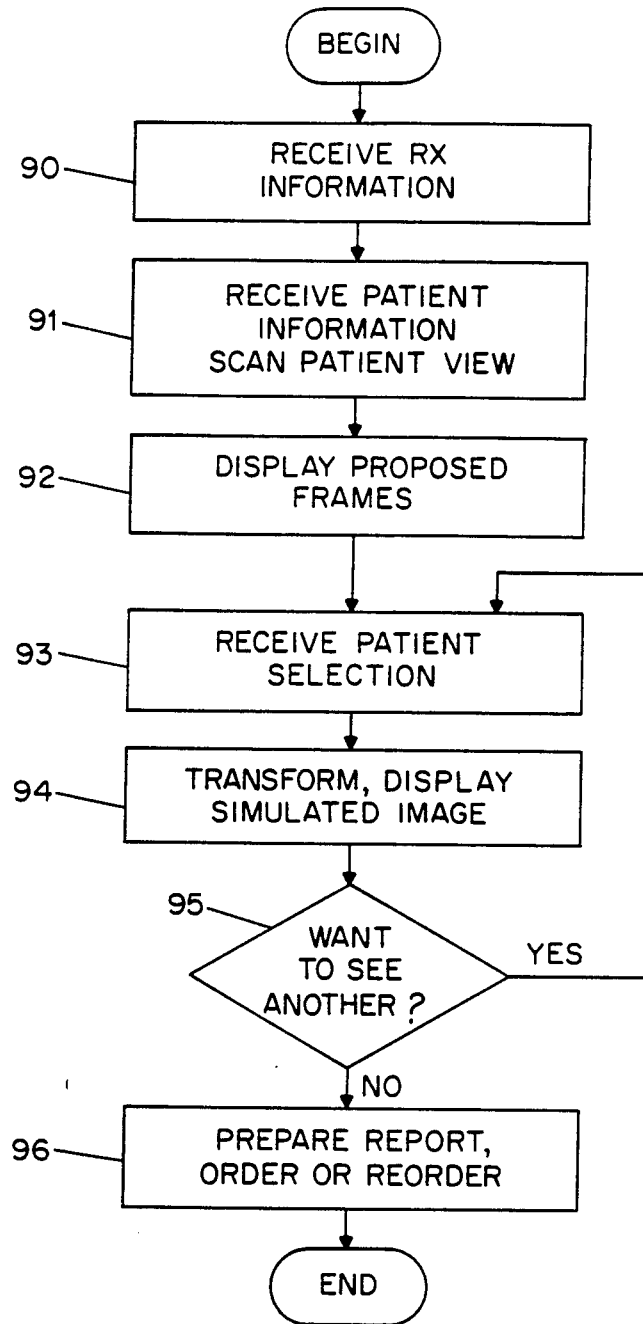


FIG. 6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US93/08519

A. CLASSIFICATION OF SUBJECT MATTER

IPC(5) :G06F 15/00
US CL :395/135

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 395/135, 139; 364/400, 401, 413.01, 413.02; 382/ 47

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

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

APS

search terms: spectacle, prescription, superpose or superimpose, lifestyle, clothing, frames, physiognomy

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US, A, 4,517,654 (Carmean) 14 MAY 1985 col. 7, lines 1-8	1 - 3 , 7 , 9 - 12,16,18
X,Y	US, A, 4,730,260 (Mori et al.) 08 MARCH 1988 col. 2, lines 8-24; col. 2, lines 37-43; col. 5, lines 39-45; col. 8, lines 14-21; col. 12, lines 8-15	1 - 3 , 7 , 9 - 12,16,18
A	US, A, 4,731,743 (Blancato) 15 MARCH 1988	1 - 3 , 7 , 9 - 12,16,18
Y	US, A, 4,845,641 (Ninomiya et al.) 04 JULY 1989 Abstract; col. 3, lines 33-44; Figs. 2 and 3	1 - 3 , 7 , 9 - 1 2 , 16,18
A	US, A, 5,060,171 (Steir et al.) 22 OCTOBER 1991	1 - 3 , 7 , 9 - 12,16,18

Further documents are listed in the continuation of Box C. See patent family annex.

<p>* Special categories of cited documents:</p> <p>*A* document defining the general state of the art which is not considered to be part of particular relevance</p> <p>*E* earlier document published on or after the international filing date</p> <p>*L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>*O* document referring to an oral disclosure, use, exhibition or other means</p> <p>*P* document published prior to the international filing date but later than the priority date claimed</p>	<p>*T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>*X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</p> <p>*Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</p> <p>* & * document member of the same patent family</p>
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Date of the actual completion of the international search

29 October 1993

Date of mailing of the international search report

18 JAN 1994

Name and mailing address of the ISA/US
Commissioner of Patents and Trademarks
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Telephone No. (703) 305-3800

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US93/08519

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This international report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. Claims Nos.: 4-6, 8, 13-15, 17
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- The additional search fees were accompanied by the applicant's protest.
 No protest accompanied the payment of additional search fees.