EXHIBIT B

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

ST. CLAIR INTELLECTUAL PROPERTY CONSULTANTS, INC., a Michigan corporation, Plaintiff, v. MIRAGE SYSTEMS, INC., a California corporation, GEORGE J. MOUSSALLY, an individual, and KENNETH L. FORD, an individual, Defendants.	Civil Action No. 05-273 **COMPLAINT** **JURY TRIAL DEMANDED**

Plaintiff St. Clair Intellectual Property Consultants, Inc., ("St. Clair") for its complaint against Defendants Mirage Systems, Inc., George J. Moussally, and Kenneth L. Ford (collectively referred to as "the Defendants"), states and alleges as follows:

NATURE OF THE ACTION

1. This is action for judicial declaration of ownership rights and to quiet title to certain intellectual property of St. Clair and for tort damages against the Defendants for undermining St. Clair's ownership rights and interfering with its ability to license its patents: United States Patent Nos. 5,138,459 (the "'459 patent"), 5,576,757 (the "'757 patent"), 6,094,219 (the "'219 patent"), 6,233,010 (the "'010 patent"), 6,323,899 (the "'899 patent"), and 6,496,222 (the "'222 patent"), together with all divisions, continuations, applications, foreign patents and applications, and all reissues and re-examinations (collectively, the "patents-in-suit"). The invention claimed in the patents-in-suit together with all right, title and interest to the invention and patents-in-suit is the "St. Clair Intellectual Property."

THE PARTIES

2. Plaintiff St. Clair is a Michigan corporation having its principal place of business at 16845 Kercheval Avenue, Suite Number Two, Grosse Pointe, Michigan 48230-1551.

3. On information and belief, Defendant Mirage Systems, Inc. ("Mirage"), is, and at all relevant times has been, a corporation organized and incorporated under the laws of the State of California. Mirage's principal place of business is at 1031 E. Duane Street, Suite F, Sunnyvale, California 94085.

4. On information and belief, Defendant George J. Moussally, is, and at all relevant times has been, an officer of Mirage, currently residing at 33185 Lark Way, Fremont, California 94555.

5. On information and belief, Defendant Kenneth L. Ford, is, and at all relevant times has been, an officer of Mirage, currently residing at 1040 Vista Oak, San Jose, California 95132.

OTHER ENTITY

6. On information and belief, Mount and Stoelker, P.C. has its place of business at River Power Tower, Suite 1700, 333 West San Carlos, San Jose, California 95110-2740. Mount and Stoelker, P.C. is an unnamed co-conspirator as alleged in this complaint.

JURISDICTION

7 An actual controversy has arisen and now exists between St. Clair and the Defendants concerning their respective rights to the St. Clair Intellectual Property.

8 This action arises under the federal patent statute, 35 U.S.C. § 261, the Federal Declaratory Judgment Act, 28 U.S.C. §§ 2201 and 2202, and under California and Delaware

State law between diverse parties where the amount in dispute exceeds $75,000. This Court therefore has subject matter jurisdiction under 28 U.S.C. §§ 1331, 1332, 1338(a) and 2201.

9. Personal jurisdiction over Defendants comports with the United States Constitution and 10 Del. C. § 3104 because Defendants have done business in Delaware and have caused and continue to cause tortious injury to St. Clair in the State of Delaware as alleged in this complaint. In addition or in the alternative, the Defendants have submitted themselves to the jurisdiction of the U.S. District Court for the District of Delaware through several declarations filed in *St. Clair v. Canon Inc., et al.*, Civil Action No. 03-241 (JJF), and by voluntarily appearing in court, prepared to testify in the *St. Clair v. Canon Inc., et al.* trial.

VENUE

10. Venue is proper in this district under 28 U.S.C. § 1391(a) because a substantial part of the events giving rise to St. Clair's allegations occurred in the State of Delaware.

FACTUAL BACKGROUND

11. St. Clair owns the St. Clair Intellectual Property, including United States Patent Nos. 5,138,459 (the "'459 patent"), 5,576,757 (the "'757 patent"), 6,094,219 (the "'219 patent"), 6,233,010 (the "'010 patent"), 6,323,899 (the "'899 patent"), and 6,496,222 (the "'222 patent").

12. The St. Clair Intellectual Property revolutionized the digital camera industry, enabling the rapid growth and commercial success of digital cameras.

13. St. Clair has licensed its patents to many of the largest manufacturers of digital cameras in the world including: (1) Sony Corporation; (2) Nikon Corporation; (3) Minolta Co., Ltd.; (4) Olympus Optical Co., Ltd.; (5) Seiko Epson Corporation; (6) Casio Computer Co.; (7) Kyocera Corporation; (8) Pentax Corporation; and (9) Samsung Techwin Co. Ltd.

14. The named inventors on the patents-in-suit are Marc K. Roberts, Matthew K. Chikosky and Jerry A. Speasl ("the Inventors").

15. The Inventors conceived their digital camera invention no later than the holiday season in 1989. Between the conception of their digital camera invention in 1989 and the filing of their original patent application in the United States Patent and Trademark Office on November 20, 1990, the Inventors worked with their patent attorney, Paul W. Fish, to refine their patent application.

16. At the time the Inventors conceived their invention, all three of them were Mirage employees. On information and belief, Mirage was at the time a defense contractor that provided products and services to the military and intelligence communities related to radar technology.

17. During the time period in which the Inventors' digital camera invention was conceived and reduced to practice, Mirage was never involved in digital camera technology of any kind.

18. On June 29, 1987, Mirage hired Jerry A. Speasl as Director of Business Development. Mr. Speasl left Mirage's employ on August 9, 1991.

19. On March 27, 1989, Mirage hired Marc K. Roberts as Director of Business Development, C3I Systems. Mr. Roberts left Mirage's employ on January 31, 1992.

20. On August 28, 1989, Mirage hired Matthew A. Chikosky as Manager of Special Projects Engineering. Mr. Chikosky left Mirage's employ around April 1996.

21. Both prior to and after the filing their patent application for their digital camera invention, the Inventors disclosed their digital camera invention to officers of Mirage.

22. By way of example only, at a lunch meeting on or about December 1, 1992, Mr. Roberts met with Fred J. Heinzmann, Mirage's Co-Founder, Vice President of Engineering and Senior Technical Advisor, and described his digital camera invention in detail.

23. At no time during the lunch meeting or any point thereafter did Mr. Heinzmann state that he believed the Inventors' digital camera invention would be the property of Mirage.

24. The Inventors each had one or more conversations with high-ranking executives within Mirage about their digital camera invention during the period prior to the '459 patent's issuance on August 11, 1992 and shortly thereafter. At no point did any of these executives, including George J. Moussally, Fred J. Heinzmann, Daniel F. Wiener, or Phillip A. Fialer, assert or indicate that they believed that the digital camera invention was the property of Mirage.

25. The Inventors worked on their invention on their own time during nights and weekends. During the time between their conception of their digital camera invention and the filing of their original patent application, the Inventors met frequently in Mr. Speasl's basement, hotels, restaurants, and other places separate from Mirage's offices to discuss their digital camera invention.

26. The Inventors did not use any Mirage resources in the conception of their invention. In addition, the Inventors were not aware of any business or actual or demonstrably anticipated research or development of Mirage to which their invention related, and based on information available to them, their invention was not related to the business or actual or demonstrably anticipated research or development of Mirage.

27. On November 20, 1990, the Inventors filed their original patent application with the United States Patent and Trademark Office that ultimately issued on August 11, 1992 as the '459 Patent. A true and correct copy of the '459 patent is attached as Exhibit A.

28. On July 29, 1993, the Inventors filed a related patent application with United States Patent and Trademark Office that ultimately became the '757 patent, issued on November 19, 1996. A true and correct copy of the '757 patent is attached as Exhibit B.

29. On May 22, 1996, St. Clair filed a related patent application with the United States Patent and Trademark Office that ultimately became the '219 patent, issued on July 25, 2000. A true and correct copy of the '219 patent is attached as Exhibit C.

30. On February 19, 1999, St. Clair filed a related patent application with the United States Patent and Trademark Office that ultimately became the '010 patent, issued on May 15, 2001. A true and correct copy of the '010 patent is attached as Exhibit D.

31. On April 3, 2000, St. Clair filed a related patent application with the United States Patent and Trademark Office that ultimately became the '899 patent, issued on November 27, 2001. A true and correct copy of the '899 patent is attached as Exhibit E.

32. On November 27, 2000, St. Clair filed a related patent application with the United States Patent and Trademark Office that ultimately became the '222 patent, issued on December 17, 2002. A true and correct copy of the '222 patent is attached as Exhibit F.

33. On January 9, 1992, United States Patent and Trademark Office recorded the Inventors' assignment of the entire right, title and interest in their digital camera invention, including the patents-in-suit, to Personal Computer Cameras, Inc. ("PCC"). A true and correct copy of the recorded assignment is attached as Exhibit G.

34. The Inventors assigned the entire ownership rights to PCC. The assignment included not only the '459 patent, but all patents arising from the same application.

35. On the face of the '459 patent, PCC is listed as the assignee.

36. On November 1, 1995, St. Clair purchased the '459 patent and all related patents and applications together with all of the St. Clair Intellectual Property from PCC with the execution of a Patent Purchase Agreement between the two companies. A true and correct copy of the Patent Purchase Agreement is attached as Exhibit H.

37. Under the terms of the Patent Purchase Agreement, St. Clair agreed to pay PCC $60,000 up front as well as 50% of net licensing revenue related to the enforcement and licensing of the patent rights. PCC assigned "all right, title and interest in and to the [St. Clair Intellectual Property]" to St. Clair. The assignment assigned not only the '459 patent, but the invention disclosed therein and all related patents arising from the same application.

38. Under the terms of the Patent Purchase Agreement, PCC warranted that it was "the owner of all right, title and interest in and to the [St. Clair Intellectual Property]."

39. Prior to purchasing the St. Clair Intellectual Property from PCC, St. Clair diligently investigated PCC's claim of title and took title with no knowledge of any contrary claim of ownership.

40. On January 16, 1996, St. Clair duly recorded PCC's assignment of the '459 patent and all related patents to St. Clair with the United States Patent and Trademark Office. A true and correct copy of the recorded assignment is attached as Exhibit I.

41. On the face of the '757 patent, the '219 patent, the '010 patent, the '899 patent, and the '222 patent, St. Clair is listed as the assignee.

42. St. Clair has enforced its patent rights by filing the following patent infringement lawsuits in U.S. District Court for the District of Delaware: (1) *St. Clair Intellectual Property Consultants, Inc. v. Sony Corp., et al.*, Civil Case No. 01-557 (JJF), filed on August 14, 2001; (2) *St. Clair Intellectual Property Consultants, Inc. v. Canon Inc., et al.*, Civil Case No. 03-241

(JJF), filed on February 28, 2003; and (3) *St. Clair Intellectual Property Consultants, Inc. v. Samsung Electronics, et al.*, Civil Case No. 04-1436 (JJF), filed on November 9, 2004.

43. In enforcing St. Clair's patent rights, St. Clair has received the following damage awards: (1) On February 23, 2003, a unanimous jury in Civil Action No. 01-557 (JJF) in the U.S. District Court for the District of Delaware awarded damages to St. Clair in the amount of $25,000,000.00 for Sony Corporation's infringement of several of the patents-in-suit; (2) On October 8, 2004, a unanimous jury in Civil Action No. 03-241 (JJF) in the U.S. District Court for the District of Delaware awarded damages to St. Clair in the amount of $34,716,482.49 for Canon Inc.'s infringement of several of the patents-in-suit; and (3) On October 25, 2004, a majority jury verdict in Civil Action No. 03-241 (JJF) in the U.S. District Court for the District of Delaware awarded damages to St. Clair in the amount of $3,003,465.00 for Fuji Photo Film Co., Ltd.'s infringement of several of the patents-in-suit.

44. On April 12, 2005, St. Clair had substantially completed negotiations related to license agreements with several companies including, but not limited to, defendants in pending Civil Action No. 04-1436 (JJF) in U.S. District Court for the District of Delaware.

45 To allow settlement discussions to continue, St. Clair agreed to extensions of time for several defendants to answer St. Clair's patent infringement complaint.

46 Many draft agreements had been exchanged between St. Clair and prospective licensees including, but not limited to, defendants in pending Civil Action No. 01-1436 (JJF) in the U.S. District Court for the District of Delaware. License agreements were on the verge of being signed.

47 The license agreements would have led to payments of several tens of millions of dollars to St. Clair.

48. In addition, St. Clair was in active negotiations with numerous other digital camera manufacturers.

49. A license agreement with any manufacturer of digital cameras would represent a significant economic benefit for St. Clair.

50. On April 12, 2005, Defendant Mirage filed a Complaint in California State court alleging ownership of the patents-in-suit.

51. One or more of the defendants in Civil Action No. 04-1436 (JJF) in the U.S. District Court for the District of Delaware and other potential licensees have withdrawn or substantially limited their settlement offers specifically because of the allegations in Mirage's Complaint and/or other non-privileged communications by Mirage and its agents regarding ownership of the St. Clair Intellectual Property.

COUNT I
DECLARATORY JUDGMENT OF OWNERSHIP
PURSUANT TO 28 U.S.C. § 2201

52. St. Clair restates and realleges each of the allegations set forth in paragraphs 1 through 51 as if fully set forth herein.

53. An actual controversy exists between Mirage and St. Clair over ownership of the St. Clair Intellectual Property.

54. On April 30, 2004, Mirage entered into an agreement entitled "Consulting Agreement and Covenant Not to Sue" ("Consulting Agreement") with Canon U.S.A., Inc., one of the defendants in Civil Action No. 03-241 (JJF) in the U.S. District Court for the District of Delaware.

55. The agreement was signed by Defendant Kenneth L. Ford, the Vice-President of Operations for Mirage, and Seymour Liebman, the Executive Vice-President of Canon U.S.A., Inc. ("Canon").

56. The agreement called for Canon to pay Mirage $75,000 for purported rights to practice the technology claimed in the '459, '219, '010, and '899 patents.

57. Canon agreed to pay Mirage for its travel expenses, office expenses, and reimbursement for lost time incurred in cooperating with Canon to prove that Mirage owns the patents-in-suit. The agreement called for Canon to pay Mirage for lost time for any Mirage employee at the rate of $300 per hour.

58. On July 22, 2004, Canon filed its Motion to Dismiss for Lack of Standing and Subject Matter Jurisdiction in Civil Action No. 03-241 (JJF) in the U.S. District Court for the District of Delaware. The motion to dismiss alleged that St. Clair did not own the asserted patents and further alleged that Mirage was the true owner of the asserted patents.

59 Defendants George J. Moussally and Kenneth L. Ford, along with former and current Mirage employees, Fred J. Heinzmann, Phillip A. Fialer and Daniel F. Wiener, all submitted one or more declarations in support of Canon's motion to dismiss.

60. On September 30, 2004, during the middle of trial in Civil Action No. 03-241 (JJF) in the U.S. District Court for the District of Delaware, minutes before Defendant George J. Moussally was going to take the stand to testify, Canon produced for the first time a copy of the Consulting Agreement by and between Mirage and Canon to St. Clair.

61. Defendant Kenneth L. Ford was also in the courtroom at the time. If called by Canon, Mr. Ford was prepared to testify.

62. Under the Consulting Agreement with Canon, Mirage was paid for Defendants George J. Moussally's and Kenneth L. Ford's time spent in Delaware.

63. After St. Clair informed the Court of the production of the Consulting Agreement, the Court severed Canon's ownership defense from trial. The Court then initiated proceedings with a Special Master to determine whether Canon timely produced the Consulting Agreement to St. Clair and, if not, what sanctions should be recommended.

64. The Defendants have been and continue to be participants in the proceedings before the Special Master in the District of Delaware.

65 St. Clair purchased the '459 patent and all related patents together with the St. Clair Intellectual Property on November 1, 1995 from PCC for $60,000 plus one half of future net licensing revenue.

66. To date, St. Clair has paid PCC millions of dollars as a result of licensing the patents-in-suit to manufacturers of digital cameras. St. Clair's payments to PCC represent valuable consideration.

67. St. Clair duly recorded its assignment with the United States Patent and Trademark Office on January 16, 1996.

68. St. Clair purchased the '459 patent and related patents in 1995 from PCC without knowledge of any claim of ownership by Mirage or any other defendant. Under the terms of the Patent Purchase Agreement, PCC warranted that it was "the owner of all right, title and interest in and to the [St. Clair Intellectual Property]."

69. St. Clair conducted a duly diligent inquiry to determine if there were any contrary claims against the title of the '459 patent together with the St. Clair Intellectual Property owned by PCC. Despite a duly diligent inquiry, St. Clair did not uncover any claim against the title of

the '459 patent, and purchased the St. Clair Intellectual Property without notice of any claim to title by Mirage, any other defendant, or any other person or entity.

70. St. Clair is entitled to a declaratory judgment that it owns the patents-in-suit and the St. Clair Intellectual Property.

COUNT II
QUIET TITLE AND DECLARATION OF OWNERSHIP
PURSUANT TO 35 U.S.C. § 261

71. St. Clair restates and realleges each of the allegations set forth in paragraphs 1 through 70 as if fully set forth herein.

72. St. Clair has legal title to the patents-in-suit pursuant to 35 U.S.C. § 261. Section 261 requires an alleged assignee such as Mirage to record its title with the United States Patent and Trademark Office:

> An assignment, grant or conveyance shall be void as against any subsequent purchaser or mortgagee for a valuable consideration, without notice, unless it is recorded in the Patent and Trademark Office within three months from its date or prior to the date of such subsequent purchase or mortgage.

73. Mirage has never recorded an assignment, grant or conveyance of the patents-in-suit from the Inventors with the United States Patent and Trademark Office.

74. On January 9, 1992, United States Patent and Trademark Office recorded the Inventors' assignment of their interests in the their invention and all patents to PCC.

75. St. Clair purchased the '459 patent and all related patents together with the St. Clair Intellectual Property on November 1, 1995 from PCC for $60,000 plus one half of future net licensing revenue.

76. St. Clair duly recorded its assignment with the United States Patent and Trademark Office on January 16, 1996.

77. To date, St. Clair has paid PCC millions of dollars as a result of licensing the patents-in-suit to manufacturers of digital cameras. St. Clair's payments to PCC represent valuable consideration.

78. St. Clair purchased the '459 patent and related patents in 1995 from PCC without knowledge of any claim of ownership by Mirage or any other defendant. Under the terms of the Patent Purchase Agreement, PCC warranted that it was "the owner of all right, title and interest in and to the [St. Clair Intellectual Property]."

79. St. Clair conducted a duly diligent inquiry to determine if there were any contrary claims against the title of the '459 patent together with the St. Clair Intellectual Property owned by PCC. Despite a duly diligent inquiry, St. Clair did not uncover any claim against the title of the '459 patent, and purchased the St. Clair Intellectual Property without notice of any claim to title by Mirage, any other defendant, or any other person or entity.

80. St. Clair is the only owner of the patents-in-suit and the St. Clair Intellectual Property. Mirage has no rights of ownership.

COUNT III
QUIET TITLE AND DECLARATION OF OWNERSHIP
PURSUANT CAL. LABOR CODE § 2870

81. St. Clair restates and realleges each of the allegations set forth in paragraphs 1 through 80 as if fully set forth herein.

82. Each of the employment agreements entered into by the Inventors was governed by Section 2870 of the California Labor Code, which states:

> (a) Any provision in an employment agreement which provides that an employee shall assign, or offer to assign, any of his or her rights in an

> invention to his or her employer shall not apply to an invention that the employee developed entirely on his or her own time without using the employer's equipment, supplies, facilities, or trade secret information except for those inventions that either:
>
> (1) Relate at the time of conception or reduction to practice of the invention to the employer's business, or actual or demonstrably anticipated research or development of the employer; or
>
> (2) Result from any work performed by the employee for the employer.
>
> (b) To the extent a provision in an employment agreement purports to require an employee to assign an invention otherwise excluded from being required to be assigned under subdivision (a), the provision is against the public policy of this state and is unenforceable.

83. The invention conceived by Messrs. Speasl, Chikosky, and Roberts and claimed in the patents-in-suit was developed entirely on the Inventors' own time without the equipment, supplies, facilities, or trade secret information of Mirage.

84. The invention did not relate at either the time of conception or reduction to practice to Mirage's business, or actual or demonstrably anticipated research or development. The invention also did not result from work performed by the Inventors for Mirage.

85. The protections of California Labor Code § 2870 cannot be waived by the employee. Mirage cannot claim ownership over the patents-in-suit because they fall within the safe harbor created by California Labor Code § 2870.

86. The Inventors owned the patents covering their digital camera invention, duly and legally assigned the '459 patent all related patents and applications to PCC. PCC duly and legally assigned the '459 patent and all related patents and applications to St. Clair together with all of the St. Clair Intellectual Property.

87. St. Clair has legal, equitable, and all other title to the patents-in-suit together with all of the St. Clair Intellectual Property.

COUNT IV
QUIET TITLE AND DECLARATION OF OWNERSHIP
PURSUANT TO CALIFORNIA STATUTE OF LIMITATIONS

88. St. Clair restates and realleges each of the allegations set forth in paragraphs 1 through 87 as if fully set forth herein.

89. Under California Code of Civil Procedure § 337(1), Mirage must assert any claim of ownership based the Inventors' employment agreements with Mirage within four years of the alleged breach of contract.

90. Issuance of a United States patent and recordation of title in the United States Patent and Trademark Office constitute notice to the world of the patent's existence and ownership.

91. Mirage had notice of the first of the patents-in-suit when the '459 patent issued on August 11, 1992.

92. The Inventors also disclosed their digital camera invention to various officers within Mirage including Fred J. Heinzmann, George J. Moussally, Phillip A. Fialer, and Daniel F. Wiener, from at least before the '459 patent issued on August 11, 1992 and/or soon thereafter.

93. Mirage or its officials never took any of the steps to claim ownership or sought a judicial declaration of ownership within the four-year time period.

94. Any claim by Mirage to ownership of the patents-in-suit is time-barred under California law.

COUNT V
QUIET TITLE AND DECLARATION OF OWNERSHIP
PURSUANT TO LACHES AND ESTOPPEL

95. St. Clair restates and realleges each of the allegations set forth in paragraphs 1 through 94 as if fully set forth herein.

96. Issuance of a United States patent and recordation of title in the United States Patent and Trademark Office constitute notice to the world of the patent's existence and ownership.

97. Mirage had notice of the first of the patents-in-suit when the '459 patent issued on August 11, 1992.

98. The Inventors also disclosed their digital camera invention to various officers within Mirage including Fred J. Heinzmann, George J. Moussally, Phillip A. Fialer, and Daniel F. Wiener, either before the '459 patent issued on August 11, 1992 and/or soon thereafter.

99. Despite being aware of the Inventors' digital camera invention by at least 1992, neither Mirage nor any other defendant asserted any right of ownership over the Inventors' intellectual property rights.

100. Mirage and its officers by their words and conduct demonstrated an intent not to claim any ownership in the inventions of Mirage employees.

101. The Inventors, their company PCC, and St. Clair relied upon the words, actions, and silence of Mirage and the other defendants to invest in, develop, and license the technology claimed in the patents-in-suit.

102. Despite its awareness of the patents-in-suit, Mirage and the other defendants remained silent for an unreasonable period and misled the Inventors, PCC, and St. Clair into believing that Mirage either had no ownership interest or had waived or abandoned any such interest

103. PCC's and St. Clair's reliance on Mirage's and the other defendants' words, actions, and silence is and was reasonable.

104 Therefore, it would be inequitable for Mirage or any other defendant to be permitted to assert any ownership interest in patents-in-suit or any of the St Clair Intellectual Property.

COUNT VI
TORTIOUS INTERFERENCE WITH PROSPECTIVE BUSINESS RELATIONS

105. St. Clair restates and realleges each of the allegations set forth in paragraphs 1 through 104 as if fully set forth herein.

106. St. Clair has licensed the patents-in-suit to at least nine major manufacturers of digital cameras.

107. In April 2005, St. Clair had substantially completed negotiations related to additional license agreements including, but not limited to, license agreements with several defendants in the pending Civil Action No. 04-1436 (JJF) in U.S. District Court for the District of Delaware.

108. To allow settlement discussions to continue, St. Clair agreed to extensions of time for several defendants to answer St. Clair's patent infringement complaint.

109. Many draft agreements had been exchanged between St. Clair and potential licensees including, but not limited to, the defendants in the pending Civil Action No. 04-1436 (JJF) in U.S. District Court for the District of Delaware The licenses were on the verge of being signed.

110. The license agreements would have led to a payments of several tens of millions of dollars to St. Clair.

111. In addition, St. Clair was in active negotiations with numerous other digital camera manufacturers.

112. A license agreement with any manufacturer of digital cameras would represent a significant economic benefit for St. Clair.

113. The Defendants had knowledge of St. Clair's past licenses and ongoing licensing efforts of the patents-in-suit.

114. On April 12, 2005, Defendant Mirage filed a Complaint in California State court alleging ownership of the patents-in-suit.

115. On information and belief, Defendants George J. Moussally and Kenneth L. Ford conspired with Defendant Mirage to intentionally and maliciously interfere with St. Clair's business relations with potential licensees by disseminating the contents of Mirage's Complaint and by making other unfounded claims of ownership of the patents-in-suit in verbal and written communications.

116. At least one of St. Clair's potential licensees learned of the allegations in Mirage's Complaint and/or other allegations of Mirage's claim of ownership through Mirage's agent, Mount and Stoelker, P.C.

117. But for the dissemination of the allegations in Mirage's Complaint and/or other allegations of Mirage's claim of ownership, at least one or more of the defendants in Civil Action No. 04-1436 in the U.S. District Court for the District of Delaware would have settled and paid a license fee.

118. As a result, several defendants in Civil Action No. 04-1436 (JJF) in the U.S. District Court for the District of Delaware have now alleged that St. Clair does not own the patents-in-suit.

119. The delay and failure in licensing that has resulted from the Defendants' dissemination of the allegations in Mirage's Complaint and/or other allegations of Mirage's

claim of ownership has caused St. Clair substantial damages in an amount to be proven at trial. Damages include at least St. Clair's expenses and burden of continuing litigation of cases against defendants who would have settled but for the Defendants' tortious conduct together with lost licensing revenue in the tens of millions of dollars.

COUNT VII
SLANDER OF TITLE

120. St. Clair restates and realleges each of the allegations set forth in paragraphs 1 through 119 as if fully set forth herein.

121. The Defendants had knowledge of St. Clair's past licenses and ongoing licensing efforts of the patents-in-suit

122. Despite the fact that St. Clair is the record title holder of the patents-in-suit, Defendants conspired to intentionally and maliciously interfere with St. Clair's business relations with potential licensees by disseminating the contents of Mirage's Complaint and by making other unfounded claims of ownership of the patents-in-suit in verbal and written communications to disparage St. Clair's ownership of the patents-in-suit.

123. By publishing the false statements to third parties, the publications were outside the course of judicial proceedings and not privileged. The Defendants' false statements have been relied on by third parties to the detriment of St. Clair.

124. But for the disseminations of the allegations in Mirage's complaint and/or other allegations of Mirage's claim of ownership, one or more of the defendants in Civil Action No. 04-1436 in the U.S. District Court for the District of Delaware would have settled and paid a license fee.

125. The Defendants' dissemination of the allegations in Mirage's Complaint and/or other allegations of Mirage's claim of ownership has undermined the marketability of St. Clair's title to the patents-in-suit.

126. Because of Defendants' dissemination of the allegations in Mirage's Complaint and/or other allegations of Mirage's claim of ownership, St. Clair has been unable to license the technology claimed in the patents-in-suit and this delay and failure in licensing has caused St. Clair substantial damages in an amount to be proven at trial. Damages include at least St. Clair's expenses and burden of continuing litigation of cases against defendants who would have settled but for the Defendants' tortious conduct together with lost licensing revenue in the tens of millions of dollars.

COUNT VIII
UNFAIR COMPETITION AND DECEPTIVE TRADE PRACTICES

127. St. Clair restates and realleges each of the allegations set forth in paragraphs 1 through 126 as if fully set forth herein.

128. The Defendants had knowledge of St. Clair's past licenses and ongoing licensing efforts of the patents-in-suit.

129. Despite the fact that St. Clair is the record title holder of the patents-in-suit, Defendants conspired to intentionally and maliciously interfere with St. Clair's business relations with potential licensees by disseminating the allegations of Mirage's Complaint and by making other unfounded claims of ownership of the patents-in-suit in verbal and/or written communications to disparage St. Clair's ownership of the patents-in-suit.

130 The Defendants' false claims of ownership of the patents-in-suit create confusion and are misleading to St. Clair's potential licensees.

131. But for the dissemination of allegations in Mirage's complaint and/or other allegations of Mirage's claim of ownership, one or more of the defendants in Civil Action No. 04-1436 in the U.S. District Court for the District of Delaware would have settled and paid a license fee.

132. The Defendants' conduct has undermined the marketability of St. Clair's title to the patents-in-suit.

133. The Defendants, acting individually and in conspiracy with one another, have engaged in unfair competition and deceptive trade practices under 6 Del. C. § 2532, *et seq*.

134. Because of the Defendants' dissemination of the allegations in Mirage's Complaint and/or other allegations of Mirage's claim of ownership, St. Clair has been unable to license the technology claimed in the patents-in-suit and this delay and failure in licensing has caused St. Clair substantial damages in an amount to be proven at trial. Damages include at least St. Clair's expenses and burden of continuing litigation of cases against defendants who would have settled but for the Defendants' tortious conduct together with lost licensing revenue in the tens of millions of dollars.

COUNT IX
CONSPIRACY

135. St. Clair restates and realleges each of the allegations set forth in paragraphs 1 through 134 as if fully set forth herein.

136. The Defendants had knowledge of St. Clair's past licenses and ongoing licensing efforts of the patents-in-suit.

137. Defendants acted in conspiracy with one another and Mirage's agent, Mount and Stoelker, P.C., to intentionally, maliciously, and unlawfully interfere with St. Clair's business relations with potential licensees by disseminating the contents of Mirage's Complaint and by

making unfounded claims of ownership of the patents-in-suit in verbal and/or written communications to disparage St. Clair's ownership of the patents-in-suit.

138. Each defendant agreed with the other defendants and Mirage's agent, Mount and Stoelker, P.C., to disseminate the allegations in Mirage's Complaint and/or other allegations of Mirage's claim of ownership to St. Clair's potential licensees.

139. At least one of St. Clair's potential licensees learned of the allegations in Mirage's Complaint and/or other allegations of Mirage's claim of ownership through Mirage's agent, Mount and Stoelker, P.C.

140. But for the dissemination of the allegations in Mirage's complaint, at least one or more of the defendants in Civil Action No. 04-1436 in the U.S. District Court for the District of Delaware would have settled and paid a license fee.

141. The delay and failure in licensing that has resulted from the Defendants' conspiracy to disseminate the allegations in Mirage's complaint and/or other allegations of Mirage's claim of ownership has caused St. Clair substantial damages in an amount to be proven at trial. Damages include at least St. Clair's expenses and burden of continuing litigation of cases against defendants who would have settled but for the Defendants' tortious conduct together with lost licensing revenue in the tens of millions of dollars.

DEMAND FOR JURY TRIAL

142. Pursuant to Fed. R. Civ. P 38(a), St. Clair demands a trial by jury on all issues so triable.

REQUEST FOR RELIEF

WHEREFORE St. Clair requests the following relief against the Defendants:

A. A declaration that St. Clair owns full legal and equitable title to the patents-in-suit together with the St Clair Intellectual Property.

B. A declaration that Defendants are liable to St. Clair for tortious interference with prospective business relations and damages in an amount greater than $75,000 sufficient to compensate St. Clair for its damages.

C. A declaration that Defendants are liable to St. Clair for slander of title and damages in an amount greater than $75,000 sufficient to compensate St. Clair for its damages.

D. A declaration that Defendants are liable to St. Clair for unfair competition and deceptive trade practices pursuant to 6 Del. C. § 2532, *et seq.*, an injunction, and damages in amount greater than $75,000 to compensate St. Clair for its damages

E. A declaration that Defendants are liable to St. Clair for conspiracy and damages in an amount greater than $75,000 sufficient to compensate St. Clair for its damages.

F. An award of prejudgment interest, costs and disbursements, and attorney fees.

G. Granting such other and further relief as the Court may deem just and appropriate

Date: May 6, 2005

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PROPERTY CONSULTANTS, INC.

EXHIBIT A

US005138459A

United States Patent [19]

Roberts et al.

[11] Patent Number: 5,138,459

[45] Date of Patent: Aug. 11, 1992

[54] ELECTRONIC STILL VIDEO CAMERA WITH DIRECT PERSONAL COMPUTER(PC) COMPATIBLE DIGITAL FORMAT OUTPUT

[75] Inventors: Marc K. Roberts, Burke; Matthew A. Chikosky, Springfield; Jerry A. Speasl, Vienna, all of Va.

[73] Assignee: Personal Computer Cameras, Inc., McLean, Va

[21] Appl No.: 615,848

[22] Filed: Nov. 20, 1990

[51] Int. Cl.[5] H04N 5/30

[52] U.S. Cl. 358/209; 358/140; 358/93; 358/903

[58] Field of Search 358/903, 909, 209, 217; 364/521, 900, 200; 340/723, 724; 382/56

[56] References Cited

U.S. PATENT DOCUMENTS

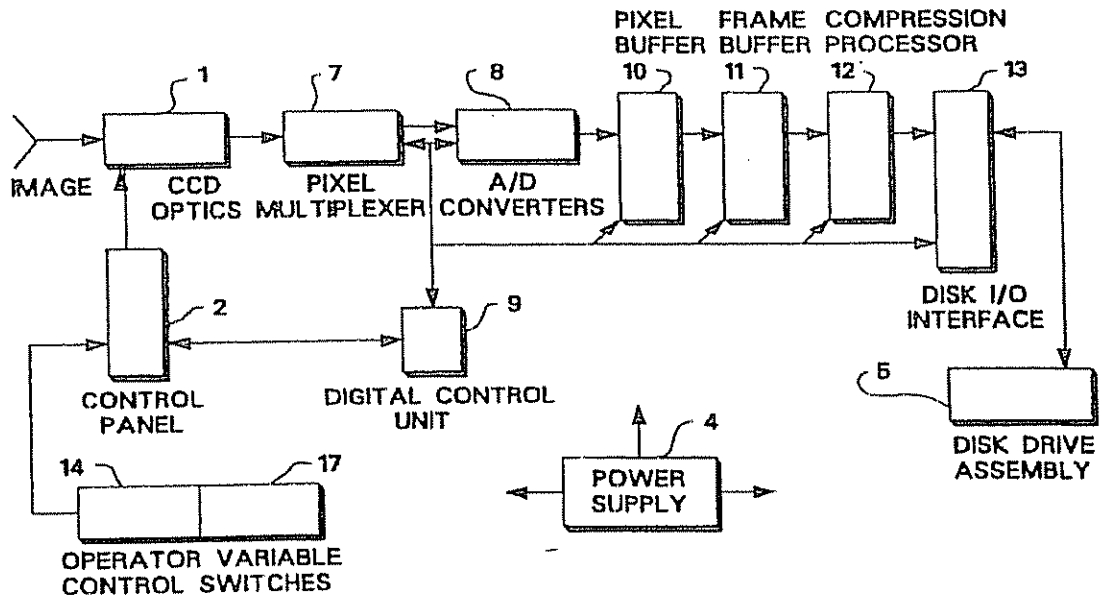
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4,903,132	2/1990	Yamawaki	358/209
4,905,092	2/1990	Koshiishi	358/296
4,963,986	10/1990	Fukutama et al.	358/228
4,972,266	11/1990	Tani	358/213.19

Primary Examiner—David K. Moore
Assistant Examiner—Tuan V Ho
Attorney, Agent, or Firm—Paul W Fish

[57] ABSTRACT

An electronic still camera comprising a lens, shutter, and exposure control system, a focus and range control circuit, a solid state imaging device incorporating a Charge Couple Device (CCD) through which an image is focused, a digital control unit through which timing and control of an image for electronic processing is accomplished, an Analog-to-Digital (A/D) converter circuit to convert the analog picture signals into their digital equivalents, a pixel buffer for collecting a complete row of an image's digital equivalent, a frame buffer for collecting all rows of an image's digital equivalent, and a selectively adjustable digital image compression and decompression algorithm that compresses the size of a digital image and selectively formats the compressed digital image to a compatible format for either the IBM Personal Computer and related architectures or the Apple Macintosh PC architecture as selected by the operator so that the digital image can be directly read into most word processing, desktop publishing, and data base software packages including means for executing the appropriate selected decompression algorithm; and a memory input/output interface that provides both temporary storage of the digital image and controls the transmission and interface with a standard Personal Computer (PC) memory storage device such as a digital diskette. The digital diskette is removable inserted into the housing of the camera prior top use in recording digital image data

18 Claims, 11 Drawing Sheets



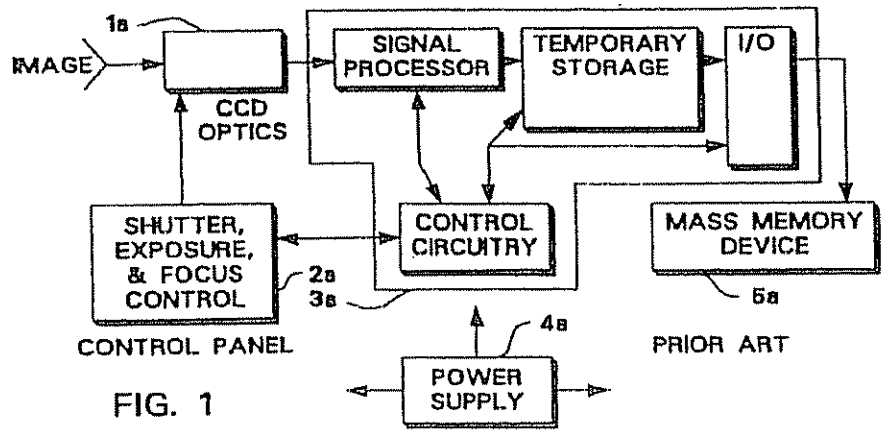

1a
IMAGE
CCD OPTICS
SIGNAL PROCESSOR
TEMPORARY STORAGE
I/O
SHUTTER, EXPOSURE, & FOCUS CONTROL
2a
3a
CONTROL CIRCUITRY
MASS MEMORY DEVICE
5a
CONTROL PANEL
4a
POWER SUPPLY
PRIOR ART

FIG. 1

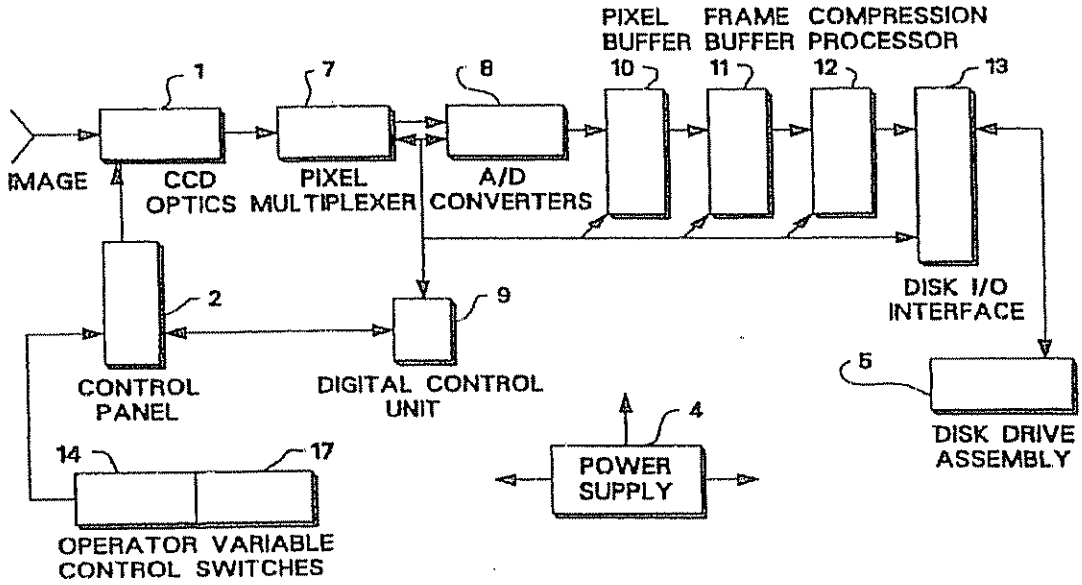

PIXEL BUFFER
FRAME BUFFER
COMPRESSION PROCESSOR
1
7
8
10
11
12
13
IMAGE
CCD OPTICS
PIXEL MULTIPLEXER
A/D CONVERTERS
DISK I/O INTERFACE
2
9
5
CONTROL PANEL
DIGITAL CONTROL UNIT
DISK DRIVE ASSEMBLY
4
14
17
POWER SUPPLY
OPERATOR VARIABLE CONTROL SWITCHES

FIG. 2

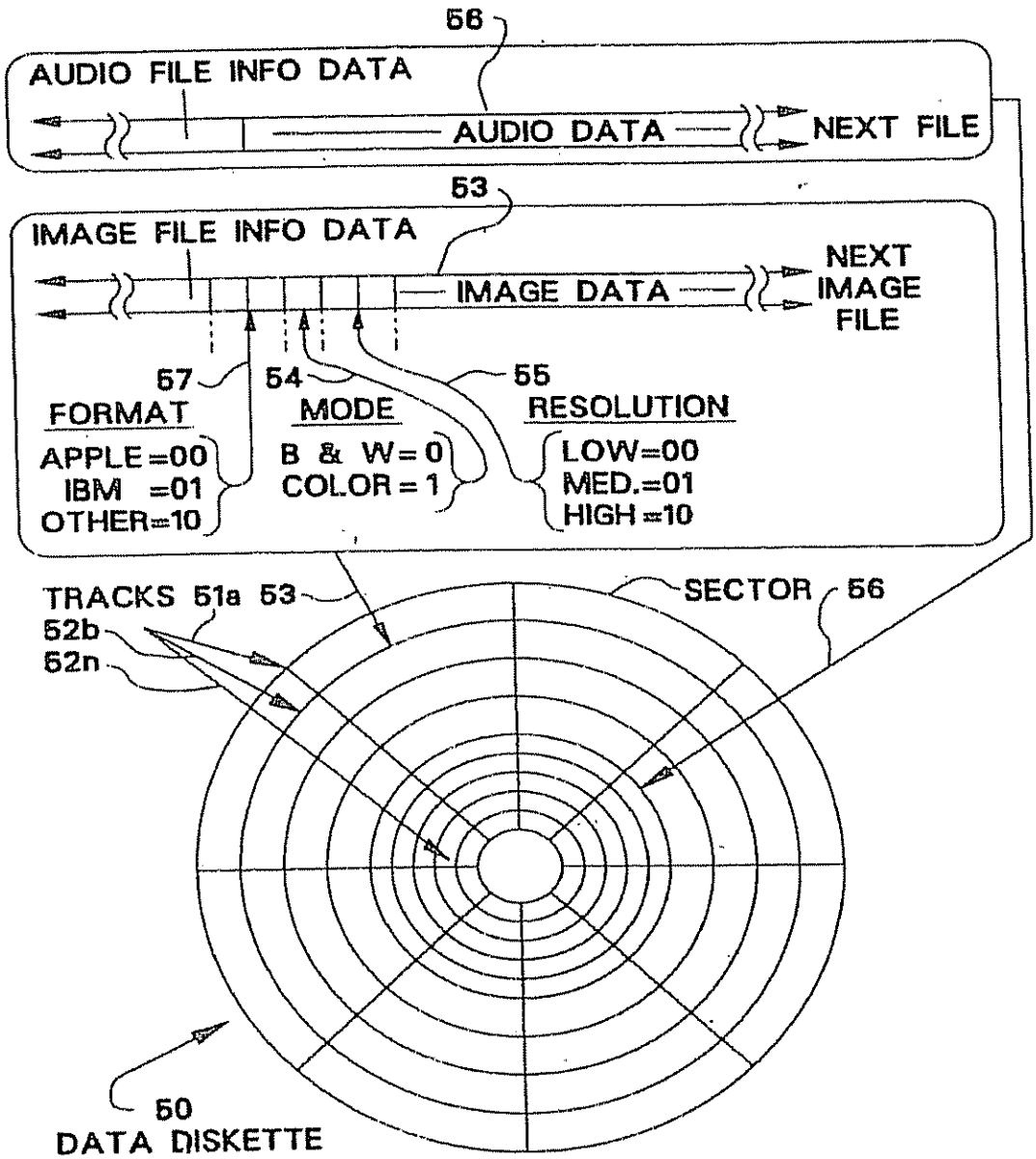

56
AUDIO FILE INFO DATA
AUDIO DATA
NEXT FILE
53
IMAGE FILE INFO DATA
IMAGE DATA
NEXT IMAGE FILE
57
54
55
FORMAT
MODE
RESOLUTION
APPLE=00
IBM =01
OTHER=10
B & W=0
COLOR=1
LOW=00
MED.=01
HIGH=10
TRACKS 51a
52b
52n
53
SECTOR
56
50
DATA DISKETTE

FIG. 2A

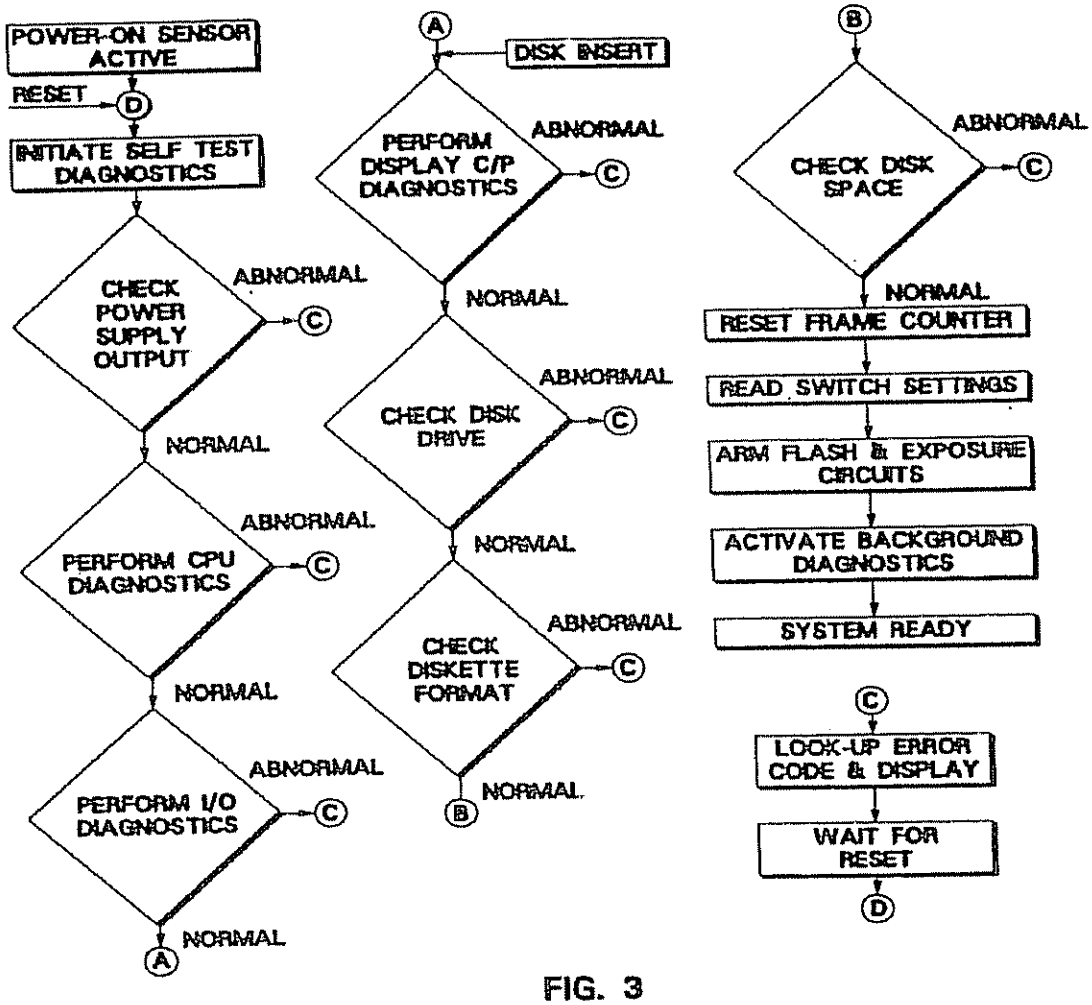
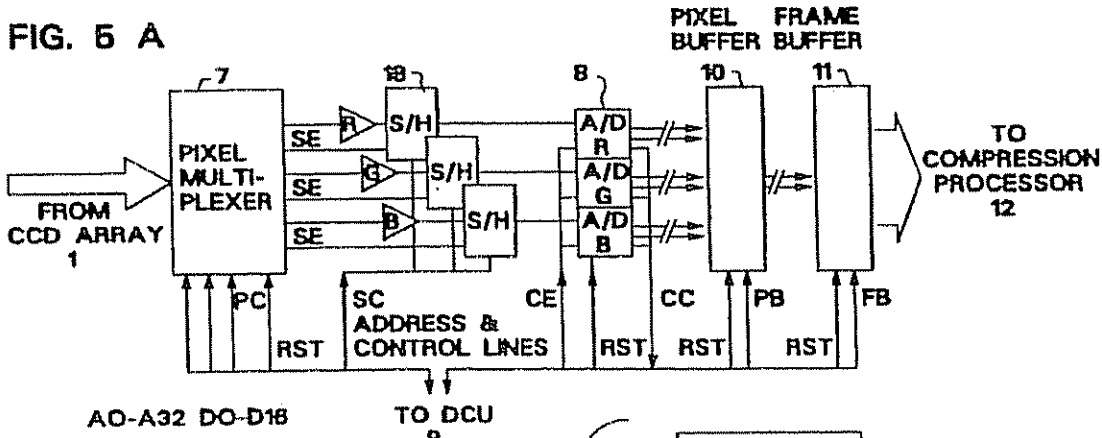

POWER-ON SENSOR ACTIVE
RESET
D
INITIATE SELF TEST DIAGNOSTICS
CHECK POWER SUPPLY OUTPUT
ABNORMAL
C
NORMAL
PERFORM CPU DIAGNOSTICS
ABNORMAL
C
NORMAL
PERFORM I/O DIAGNOSTICS
ABNORMAL
C
NORMAL
A
A
DISK INSERT
PERFORM DISPLAY C/P DIAGNOSTICS
ABNORMAL
C
NORMAL
CHECK DISK DRIVE
ABNORMAL
C
NORMAL
CHECK DISKETTE FORMAT
ABNORMAL
C
NORMAL
B
B
CHECK DISK SPACE
ABNORMAL
C
NORMAL
RESET FRAME COUNTER
READ SWITCH SETTINGS
ARM FLASH & EXPOSURE CIRCUITS
ACTIVATE BACKGROUND DIAGNOSTICS
SYSTEM READY
C
LOOK-UP ERROR CODE & DISPLAY
WAIT FOR RESET
D

FIG. 3

FIG. 5 A



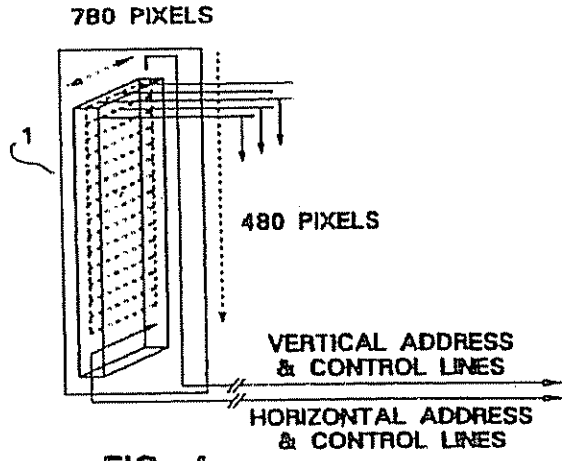


FIG. 4

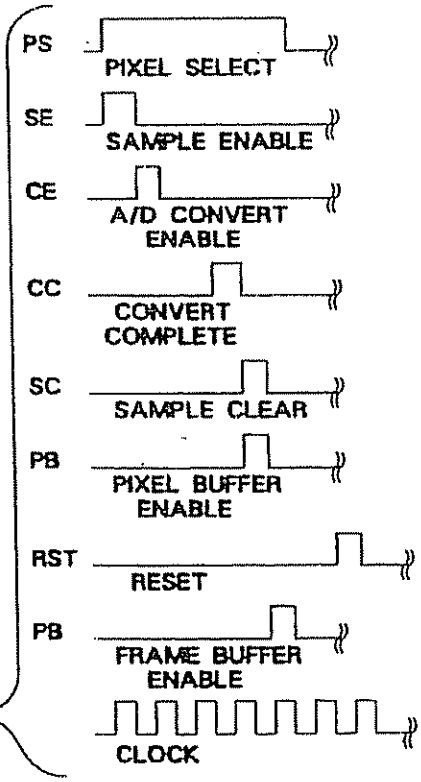


FIG. 5B

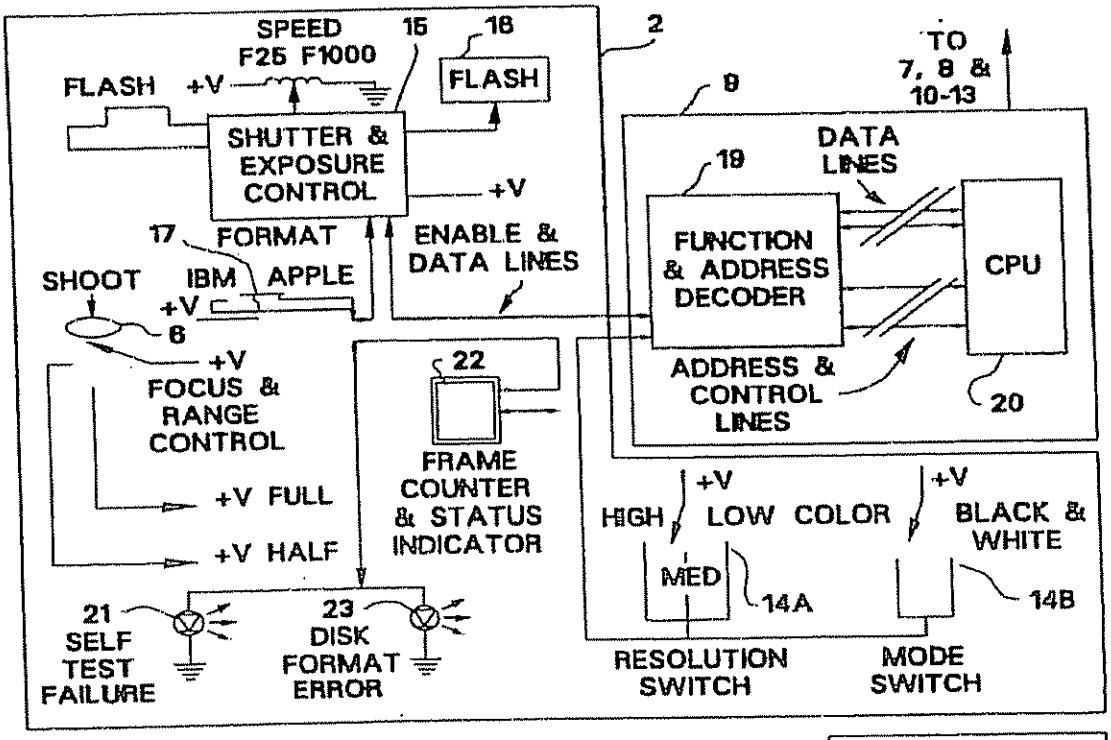


FIG. 6

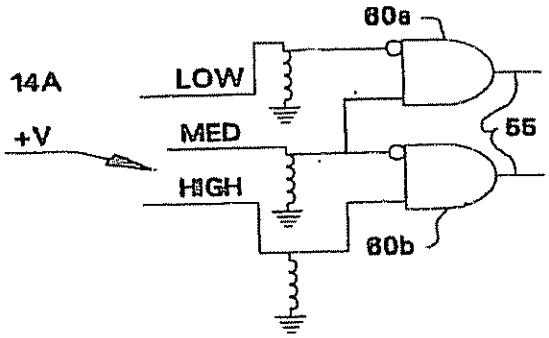


FIG. 6A

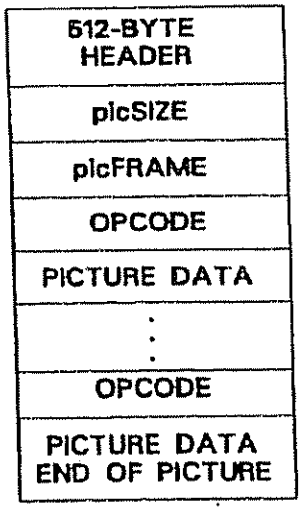


FIG.6B

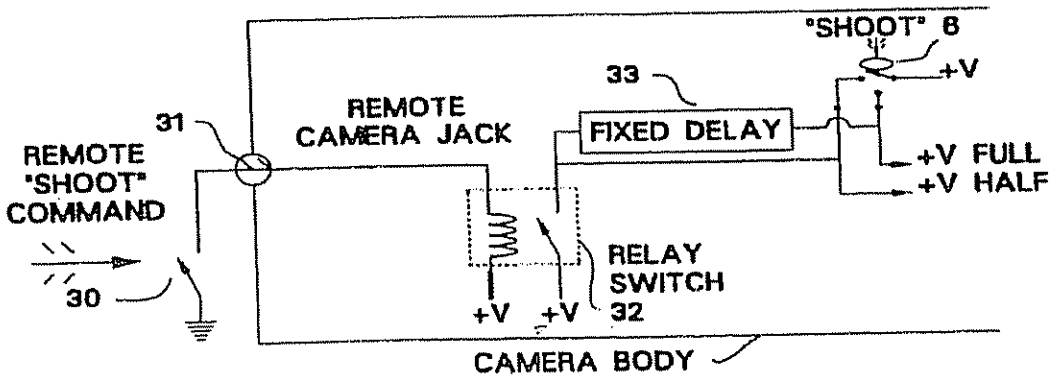

"SHOOT" 6
+V
33
31
REMOTE CAMERA JACK
FIXED DELAY
REMOTE "SHOOT" COMMAND
+V FULL
+V HALF
RELAY SWITCH
30
+V +V
32
CAMERA BODY

FIG. 6C

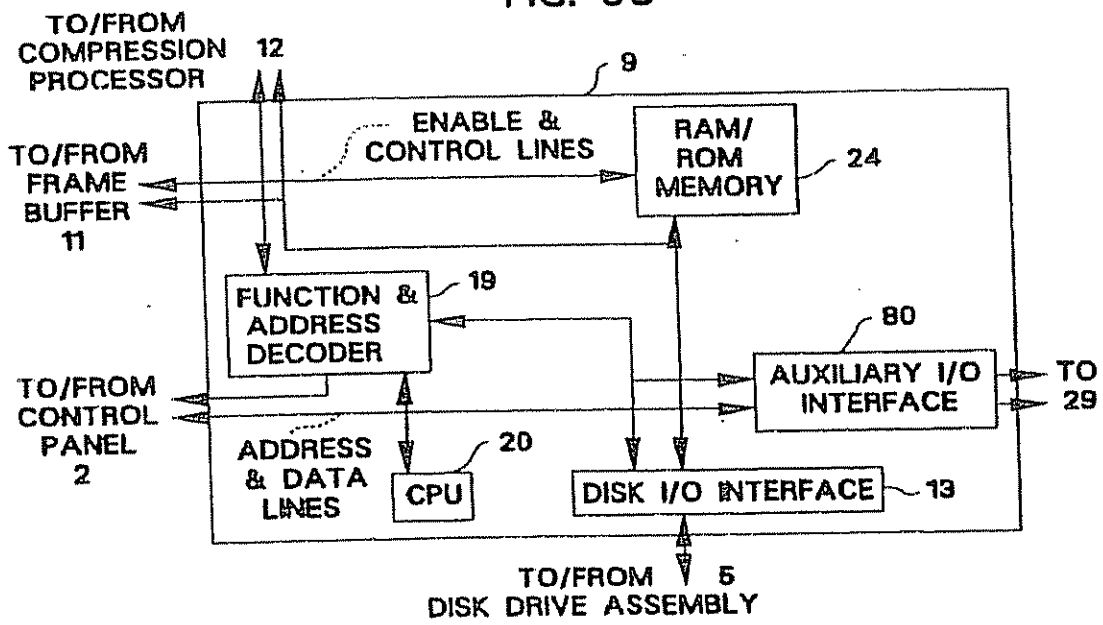

TO/FROM COMPRESSION PROCESSOR
12
9
ENABLE & CONTROL LINES
RAM/ ROM MEMORY
24
TO/FROM FRAME BUFFER 11
FUNCTION & ADDRESS DECODER
19
80
AUXILIARY I/O INTERFACE
TO 29
TO/FROM CONTROL PANEL 2
ADDRESS & DATA LINES
20
CPU
DISK I/O INTERFACE
13
TO/FROM 5
DISK DRIVE ASSEMBLY

FIG. 7

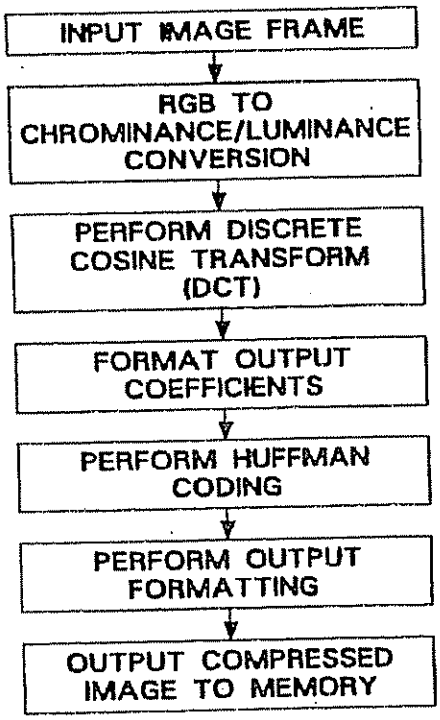


FIG. 8

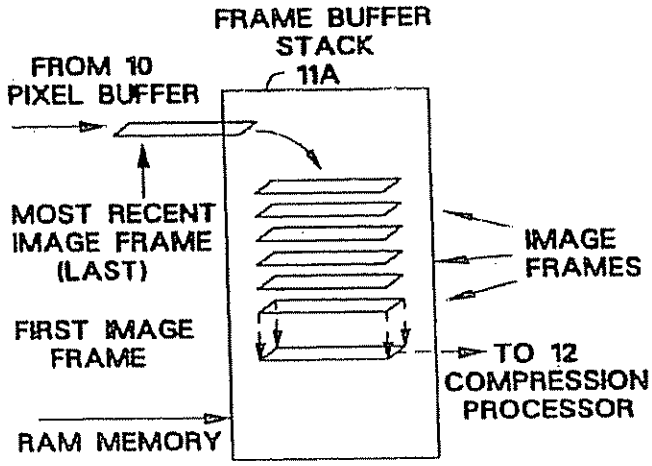


FIG. 13

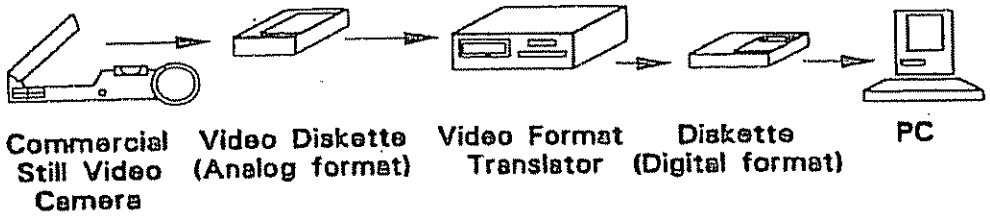


FIG. 10

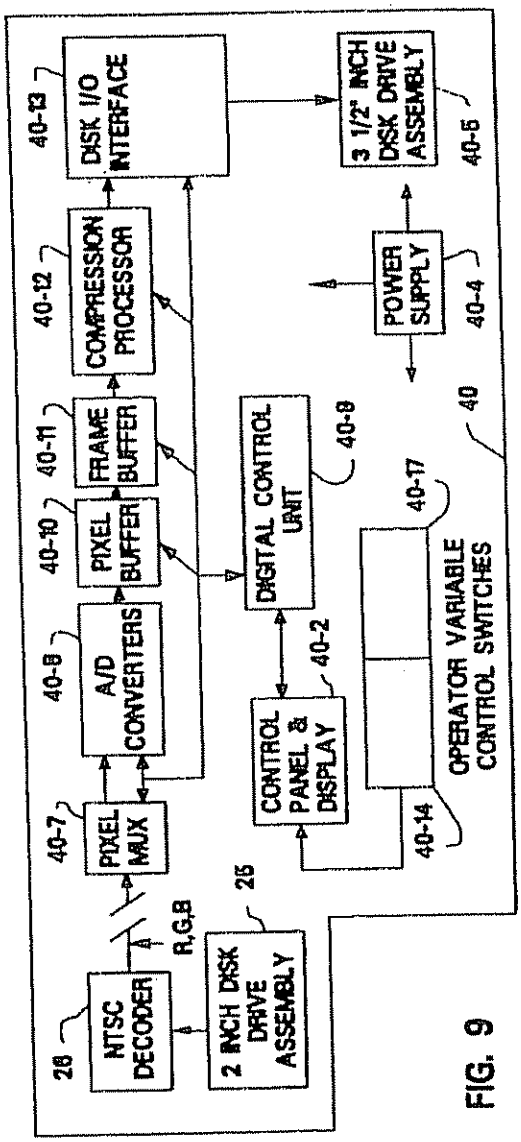

28
NTSC DECODER
R,G,B
25
2 INCH DISK DRIVE ASSEMBLY
40-7
PIXEL MUX
40-8
A/D CONVERTERS
40-10
PIXEL BUFFER
40-11
FRAME BUFFER
40-12
COMPRESSION PROCESSOR
40-13
DISK I/O INTERFACE
40-2
CONTROL PANEL & DISPLAY
40-9
DIGITAL CONTROL UNIT
40-17
OPERATOR VARIABLE CONTROL SWITCHES
40-14
40
POWER SUPPLY
40-4
3 1/2" INCH DISK DRIVE ASSEMBLY
40-5

FIG. 9

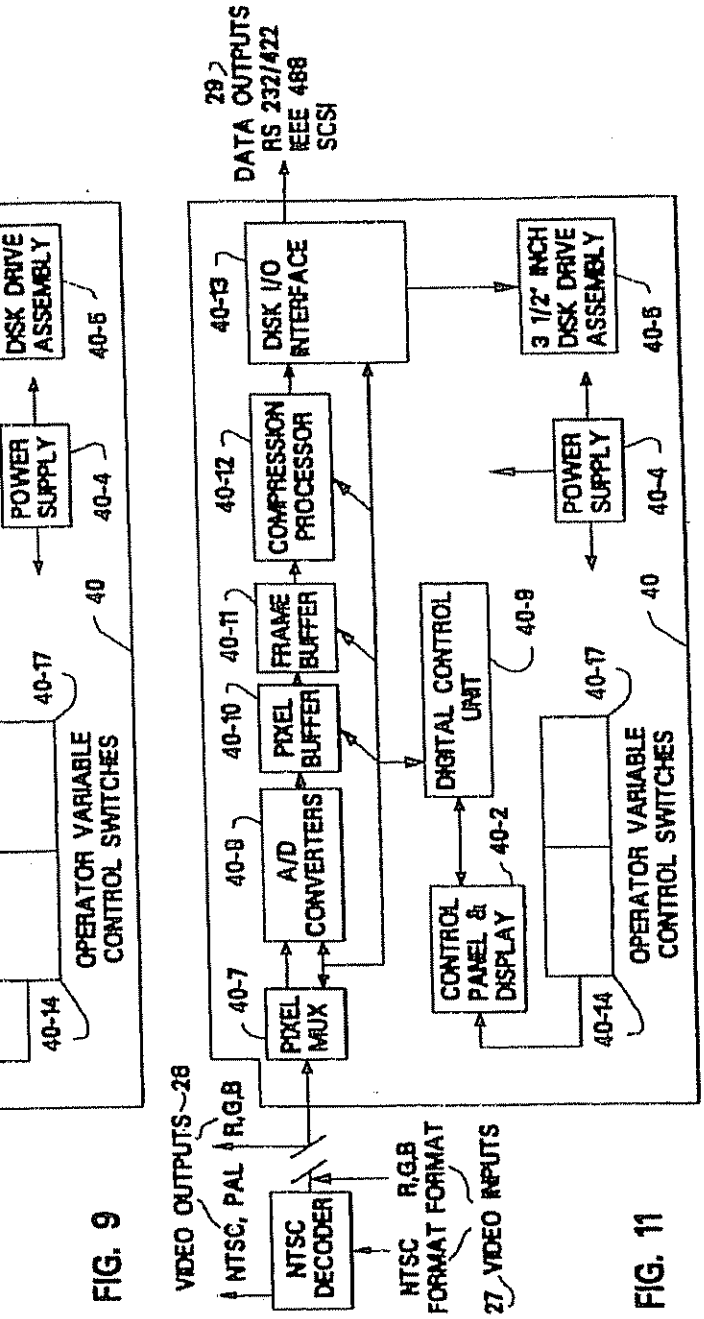

29
DATA OUTPUTS RS 232/422 IEEE 488 SCSI
VIDEO OUTPUTS
28
NTSC, PAL
R,G,B
NTSC DECODER
NTSC R,G,B FORMAT
27 VIDEO INPUTS
40-7
PIXEL MUX
40-8
A/D CONVERTERS
40-10
PIXEL BUFFER
40-11
FRAME BUFFER
40-12
COMPRESSION PROCESSOR
40-13
DISK I/O INTERFACE
40-2
CONTROL PANEL & DISPLAY
40-9
DIGITAL CONTROL UNIT
40-17
OPERATOR VARIABLE CONTROL SWITCHES
40-14
40
POWER SUPPLY
40-4
3 1/2" INCH DISK DRIVE ASSEMBLY
40-5

FIG. 11

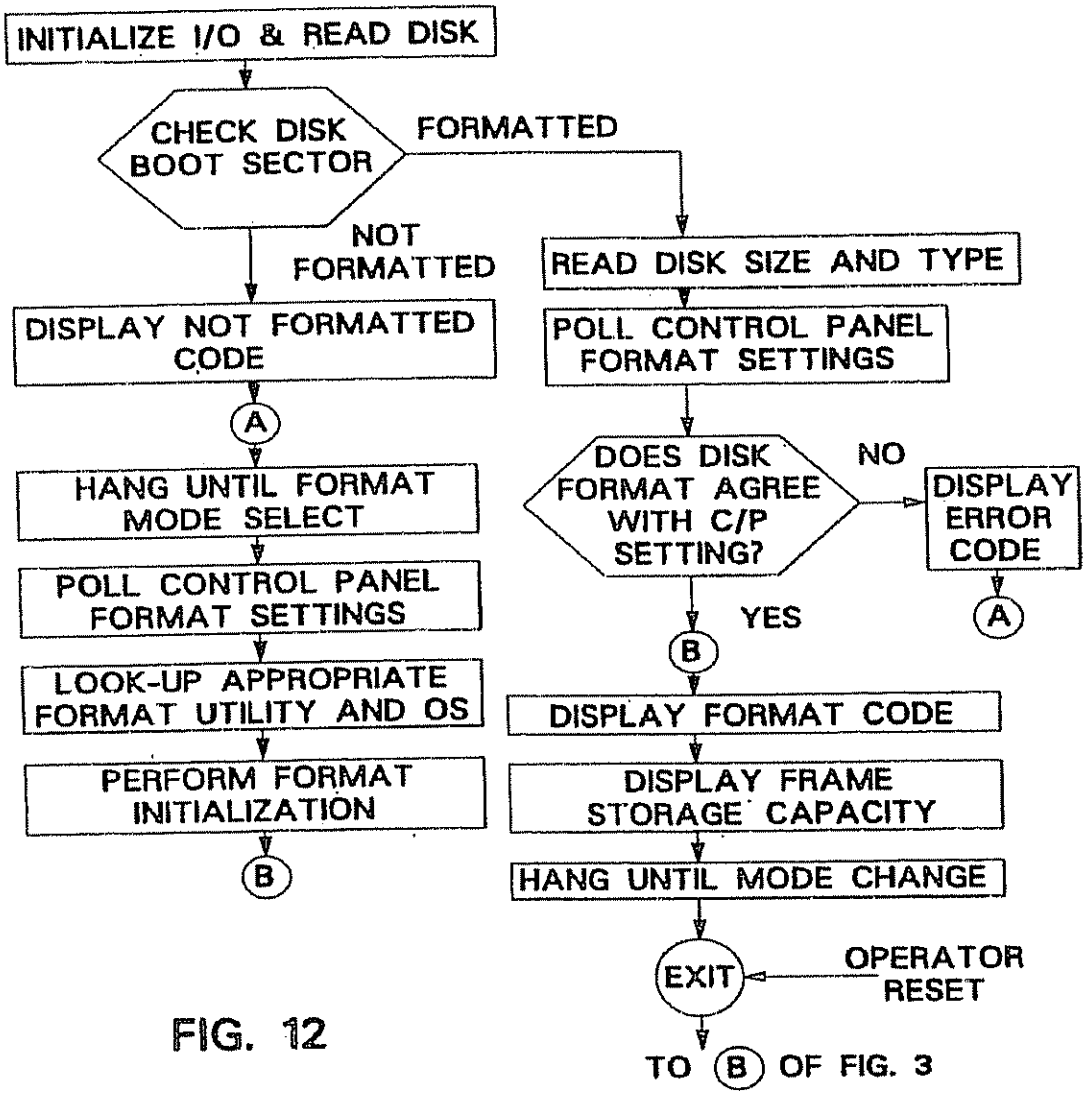

INITIALIZE I/O & READ DISK
CHECK DISK BOOT SECTOR
FORMATTED
NOT FORMATTED
DISPLAY NOT FORMATTED CODE
A
HANG UNTIL FORMAT MODE SELECT
POLL CONTROL PANEL FORMAT SETTINGS
LOOK-UP APPROPRIATE FORMAT UTILITY AND OS
PERFORM FORMAT INITIALIZATION
B
READ DISK SIZE AND TYPE
POLL CONTROL PANEL FORMAT SETTINGS
DOES DISK FORMAT AGREE WITH C/P SETTING?
NO
DISPLAY ERROR CODE
A
YES
B
DISPLAY FORMAT CODE
DISPLAY FRAME STORAGE CAPACITY
HANG UNTIL MODE CHANGE
EXIT
OPERATOR RESET
TO B OF FIG. 3

FIG. 12

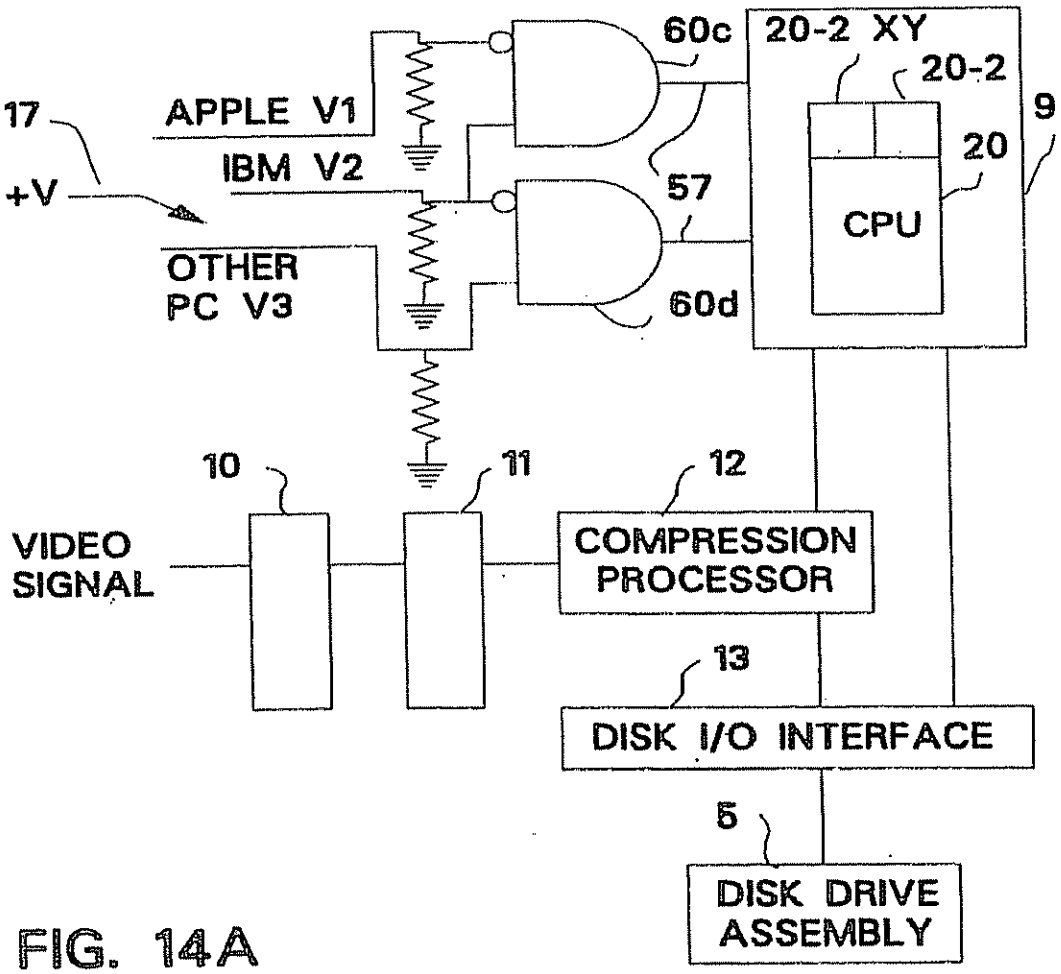

17
+V
APPLE V1
IBM V2
OTHER PC V3
60c
57
60d
20-2 XY
20-2
20
CPU
9
10
11
12
VIDEO SIGNAL
COMPRESSION PROCESSOR
13
DISK I/O INTERFACE
5
DISK DRIVE ASSEMBLY

FIG. 14A

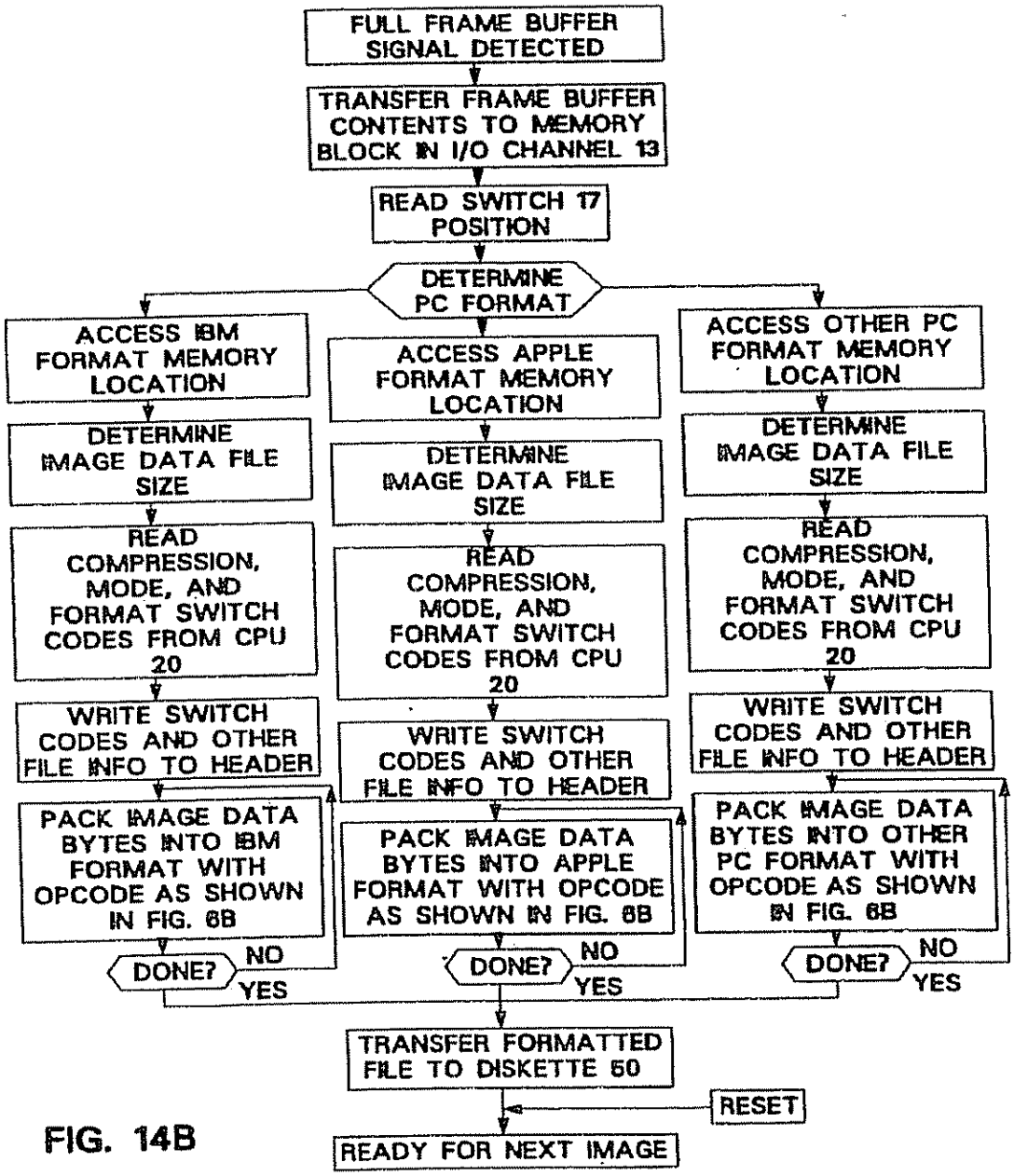

FULL FRAME BUFFER SIGNAL DETECTED
TRANSFER FRAME BUFFER CONTENTS TO MEMORY BLOCK IN I/O CHANNEL 13
READ SWITCH 17 POSITION
DETERMINE PC FORMAT
ACCESS IBM FORMAT MEMORY LOCATION
ACCESS APPLE FORMAT MEMORY LOCATION
ACCESS OTHER PC FORMAT MEMORY LOCATION
DETERMINE IMAGE DATA FILE SIZE
DETERMINE IMAGE DATA FILE SIZE
DETERMINE IMAGE DATA FILE SIZE
READ COMPRESSION, MODE, AND FORMAT SWITCH CODES FROM CPU 20
READ COMPRESSION, MODE, AND FORMAT SWITCH CODES FROM CPU 20
READ COMPRESSION, MODE, AND FORMAT SWITCH CODES FROM CPU 20
WRITE SWITCH CODES AND OTHER FILE INFO TO HEADER
WRITE SWITCH CODES AND OTHER FILE INFO TO HEADER
WRITE SWITCH CODES AND OTHER FILE INFO TO HEADER
PACK IMAGE DATA BYTES INTO IBM FORMAT WITH OPCODE AS SHOWN IN FIG. 6B
PACK IMAGE DATA BYTES INTO APPLE FORMAT WITH OPCODE AS SHOWN IN FIG. 6B
PACK IMAGE DATA BYTES INTO OTHER PC FORMAT WITH OPCODE AS SHOWN IN FIG. 6B
DONE?
NO
YES
DONE?
NO
YES
DONE?
NO
YES
TRANSFER FORMATTED FILE TO DISKETTE 50
RESET
READY FOR NEXT IMAGE

FIG. 14B

ELECTRONIC STILL VIDEO CAMERA WITH DIRECT PERSONAL COMPUTER(PC) COMPATIBLE DIGITAL FORMAT OUTPUT

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention generally relates to an electronic still video camera and in particular to an improved electronic still camera which converts a still picture of an object or scene into an operator selectable compressed digital signal format for storage utilizing a compression/decompression algorithm, such as the Joint Photographic Experts Group (JPEG) algorithm standard for example, formatted into Personal Computer (PC) compatible format retaining the images' color information, and stored on a PC compatible memory diskette. For example, the diskette can be a three and a half (3½) inch digital diskette. The digital diskette is removeable from the electronic camera for direct insertion into a PC which contains the previously loaded corresponding decompression algorithm whereby the digital image is in a format compatible for immediate use with word processing, desk top publishing, data base, and multimedia applications.

2. Description of the Prior Art

FIG. 1 is a schematic block diagram showing structure of a conventional prior art electronic still camera system, in which a CCD image sensor element **1***a* converts a still image of an object into an analog color video signal when the shutter control circuitry 2*a* is activated. The output color video signal of the image sensor element is then routed to the signal processing subsystem 3*a* where the signal is converted to National Television System Committee (NTSC) or other composite video formats (such as the European video standard Phase Alternating Line-PAL) and logged in analog format onto a mass memory storage device such as an analog video floppy disk, Electrically Erasable Programmable Read Only Memory (EEPROM), analog audio cassette, bubble memory, or other storage device 5*a*. Power is supplied by a rechargeable/removable battery system 4*a*.

An electronic camera that converts an image into electronic image signals and transferred to a memory storage device is disclosed in the following: U.S. Pat. No. 4,131,919; U.S. Pat. No. 4,456,931; U.S. Pat. No. 4,758,883; U.S. Pat. No. 4,803,554; and U.S. Pat. No. 4,837,628.

Conventional prior art electronic still cameras, for example of the types disclosed in the aforementioned references, produce an electronic signal corresponding to a desired image in analog format such as the National Television System Committee (NTSC) or similar on magnetic or electronic storage media for either permanent or temporary storage to facilitate viewing on a television or video monitor. With the current state of the art, it is expensive and time consuming to convert the analog image equivalent to a digital format for direct utilization with PC software applications. Currently, to convert an image captured on an electronic still camera to a PC compatible format one must convert the signal back to either a composite NTSC or RGB video signal and use a conversion device such as a "frame grabber" (a digital circuit board installed into PCs that convert video images into PC compatible formats) of the type sold commercially by Aapps Corporation, Orange Micro, RasterOps, and others or convert the image to a hard-copy print (a photograph) and utilize an electronic "scanner", a piece of equipment that connects to a PC, which converts an image into a digital format. The later technique is employed extensively within the desktop publishing industry.

SUMMARY OF THE INVENTION

It is the object of this invention to provide an improved electronic still camera with operator selectable picture compression in one of a plurality of operator selectable digital data formats recordable on a standard removeable magnetic diskette common to personal computers.

It is a further object of this invention to provide an improved electronic still camera that provides digital image files for immediate and direct incorporation into popular word processing, desktop publishing, and other software programs on PCs.

It is another object of this invention is to provide an improved electronic still camera that, under user selection, can record and store still images selectively compressed in a directly insertable digital memory storage device into a PC in either color or black and white formats thus facilitating storage of a large number of images with the signal flag indicating the degree of compression selected by the operator as well as the color/black and white mode selection being stored as digital values on the digital memory storage device with each image frame.

An additional object of this invention to provide an electronic still camera device that can rapidly capture a series of images automatically as well as singularly. Also, this camera provides multiple outputs in both video format for monitor and display of images and digital formats to facilitate data transmission, additional processing, or storage to a variety of storage media.

It is still another object of this invention is to provide a more efficient electronic still camera that can take a still picture with operator selectable high, medium, or low resolution in either color or black and white by electronic shutter and exposure control by utilizing a variety of electro-optical sensors including Charge Coupled Devices (CCD), Infrared (IR), and Ultra Violet (UV) which can be directly or remotely controlled by analog, digital, or radio frequency (RF) control signals.

A further object of this invention is to provide a programmable video picture translator device for efficiently converting electronic still images in analog composite video format into digital data format readable by a PC. This translator device also provides additional video inputs and outputs for capturing video images, monitoring video images on monitors and displays, and can transmit either compressed or unprocessed digital image data through a variety of output I/O channels in various formats such as serial, parallel, etc. Also, this invention can incorporate sound/voice with images thru additional interface circuitry and audio digitizers.

Finally, it is the object of this invention to provide an electronic still camera that is efficient in design and permits extended periods of portable operation and which provides the user with operational status through the use of continuous internal self-test software routines and operator displays.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic block diagram of a conventional prior art electronic still camera

FIG. 2 is a schematic block diagram of the overall structure of an electronic still camera embodying the present invention

FIG. 2A is an illustration showing one embodiment of an audio data file, data format flag, compression level, and color/black and white mode selection values stored on a digital memory diskette storage device.

FIG 3 is a flowchart showing the power-up and continuous self-test sequence in accordance with one aspect of the present invention

FIG. 4 is an example of a ½" CCD array utilizable in accordance with one aspect of the present invention.

FIG. 5A is a schematic block diagram showing the image signal to digital signal conversion logic in accordance with one aspect of the present invention.

FIG 5B is a logic and timing diagram for the image signal to digital signal conversion logic in accordance with one aspect of the present invention.

FIG 6 is an example of the control panel logic in accordance with one aspect of the present invention.

FIG. 6A is an example of one embodiment of switch logic of the control panel switches and controls utilizable in accordance with one aspect of the present invention.

FIG 6B is an example of the PICT image file format based upon the published standard provided by Apple Computer, Inc.

FIG 6C is an alternate embodiment of the current invention embodying remote operation

FIG. 7 is a simplified block diagram of the digital control unit in accordance with one aspect of the present invention.

FIG. 8 is a flowchart showing the steps of the image compression algorithm in accordance with one aspect of the present invention

FIG 9 is a block diagram of a video format translator device in accordance with one aspect of the present invention.

FIG 10 is a block diagram illustrating the operation of a translator device in accordance with one aspect of the present invention

FIG. 11 is an alternative embodiment of the video format translator in accordance with another aspect of the present invention showing additional video inputs and data outputs

FIG. 12 is an alternate embodiment of the invention showing an optional diskette format utility flowchart

FIG. 13 is an alternate embodiment of a frame buffer utilizable in accordance with another aspect of the present invention showing a frame buffer stack permitting multiple shot mode

FIG. 14A is a block diagram of an embodiment of the format select logic in accordance with one aspect of the present invention.

FIG 14B is a flow diagram illustrating the steps of the format selection logic operations

DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. 2 is a schematic block diagram of the preferred embodiment of an electronic still camera in accordance with the principals of the invention. Referring to FIG. 2, an image optical pick-up element 1, which for example could be a Charge Coupled Device (CCD) (or an Infrared (IR) or Ultraviolet (UV) sensor), converts a still image of an object into an electric signal when a picture "shoot" command is initiated by the operator via control panel 2. When taking a picture, focusing and shutter speed are controlled by a lens system and shutter speed selection mechanism under control of the digital control unit 9 The camera, like other still video cameras, employs an electronic shutter system that controls a charge storage time in a CCD array onto which an image of an object is focused through the lens system

When the "shoot" control 6 is half depressed (see FIG 6), a power supply voltage is supplied from the rechargeable batteries 4 to the electronic circuits and digital control unit 9, control panel 2, and the disk drive assembly 5 The exposure control circuitry not shown generates appropriate horizontal and vertical transfer pulses as well as field shift pulses under control of the reference clock timing and control signals provided by the digital control unit 9 type for driving the CCD device and pre-processing circuitry. This design may be of any type well known in the art for example those cited in U.S Pat Nos. 4,131,919 and 4,456,931 and any similar designs well known in the prior art.

An alternate embodiment of the present invention that provides remote operation of the camera is shown in FIG 6C. When remote "Shoot" control 30 is activated by any means for example manually, or by radiant, or electronic energy, a control signal is generated and routed through the external jack 31, located on the external camera body. The external control 30 is electrically connected to the external jack 31 by a twisted-pair conductive cable assembly that is familiar to those skilled in the art. Upon receipt of the externally generated "shoot" command, the relay switch 32 is activated and provides internal switch closure This closure of switch 32 then initiates the process previously described and provides the half V+ voltage previously described. The full V+ is provided via the fixed delay 33, the value chosen to allow the diskette drive assembly 5 (FIG. 2) and associated control circuitry to initialize prior to receiving image data

When the "shoot" control is fully depressed in either embodiment, the shutter controller 15 (FIG. 6) generates a shutter pulse that generates control signals for the A/D converters 8 allowing the image/picture data signal in the sample and hold circuitry of the pixel multiplexer 7 to be converted into a digital signal. Control and address instructions of the type well known in the art are generated from the digital control unit 9 to facilitate the storage of the digital image data within the pixel buffer 10 and frame buffer 11. Upon completion of image conversion, the contents of the frame buffer are transferred to the compression processor 12 which for example may be of the many versions currently offered commercially such as C-Cube's (San Jose, Calif.) four chip Application Specific Integrated Circuit (ASIC) set. In the compression processor 12, the Joint Photographic Experts Group (JPEG), a part of the International Standards Organization (ISO) which is a subset of the International Telegraph and Telephone Committee (CCITT), image compression algorithm fully described in Report # JTC1/SC2/WG8 dated 1985 is performed under control of the digital control unit 9 to compress the size of the image. A variable selectable compression ratio of up to 50:1 is performed on the digital image frame Other compression ratios are operator selectable via the control panel 2 switches 14A and 14B (FIG. 6). The compressed digital frame is then formatted into

either an IBM PC/Clone (such as GIFF) or Apple Macintosh (such as PICT II) image file format depending on the setting selected by the operator for a user switch 17 (FIG. 6) position on the control panel 2. After formatting, the file is written into a temporary memory buffer within the disk input/output (I/O) interface circuit 13 which, under the command of the digital control unit 9, controls the high density (1.4 Mbyte storage capacity) disk drive unit 5. Following file transfer to the diskette e.g., the frame counter display 22 on the control panel 2 is updated by appropriate control signals and the camera is ready to undergo the same procedure for the next image. Power to the electronic circuits and disk drive system is terminated following release of the "shoot" control switch 6.

In accordance with the preferred embodiment of this invention, it is permissible for the user to select various resolution quality image recording levels with the higher levels being at the expense of memory diskette storage capacity. The position of switches 14A and 14B for example could represent a unique digital mark or word that denotes the respective switch position and is sensed during initial power application and periodically during operation. FIG. 6A illustrates typical logic AND gate circuits 60*a* and 60*b* utilizable in conjunction with switches 14A and 14B or switch 17 to generate appropriate signals to designate respective switch positions and generate appropriate control signals from. The switch positioned in the High position for high resolution allows only four to five images to be stored, while Med. switch position for medium resolution allows approximately twenty five images to be stored, and Low for low resolution allows up to fifty images to be stored on a single diskette. Also, by selecting black and white mode instead of color via switch 14B, the operator may select additional storage capacity since storage is increased by a factor greater than three (one element per pixel versus three for color). Various image resolution combinations are permissible because the operator can select a different resolution and mode setting for each image prior to image signal capture. This is accomplished by marking or "tagging" each image frame data information signal with the resolution and mode of each image as it is written onto the memory diskette in any suitable manner, for example as shown in FIG. 2A. With reference to FIG. 2A, diskette 50 has tracks 51*a*, 52*b*, . . . 52*n*. With reference to track 52*b* there is shown a representative portion of segment 53 depicting a typical image file information format having digital bit 54 depicting color mode, and digital bits 55 representing compression resolution level markings or tags. With reference to color mode tag 54 it can be seen that if switch 14B is in the color position tag 54 is recorded as a logical "one" or true-conversely if bit 54 is recorded as a logical "zero" it corresponds to the black and white position of switch 14B. Similarly as shown switch 14A would record in memory position 55 a binary "zero" for low resolution, a binary "one" for medium resolution and a binary "two" for high resolution selections by the operator. By incorporating this "tagging" approach, it is possible for the decompression algorithm, loaded into any PC prior to use or written onto the memory storage diskette along with the image data, to automatically determine the appropriate level of compression associated with image file and execute decompression efficiently.

Still another alternate embodiment in accordance with this invention incorporates an acoustic digitizer circuit which digitizes sound. There are several digitizers commercially available such as the Apple Computer Inc. Musical Instrument Data Interface (MIDI) adaptor. The output of this digitizer may be selectively connected to the CPU 20 (FIG. 7) via an additional I/O interface similar to the auxiliary I/O interface 80. The sound or audio associated with each image can be recorded, digitized, and stored on the diskette device on available tracks in an identical manner previously described (FIG. 2A). An image file in accordance with this embodiment would be appropriately marked or tagged with the corresponding digitized audio file 56 (FIG. 2A). Upon playback on a sound configured PC, both the image and the corresponding audio would then be viewed and heard simultaneously.

It should be noted that a major advantage a camera in accordance with the present invention has over conventional still video cameras is that a camera according to this invention is capable of storing multiple digital images in semiconductor memory temporarily at a rapid rate while, simultaneously, the image compression processor 12, file formatter software algorithm, and disk I/O interface 13 that stores formatted files continue to function in concert together at a slower rate. This efficient design coupled with VLSI low power, high speed semiconductor memory devices (10 and 11 FIG. 5A and 24 FIG. 7) allows this operational capability.

Like most other still video and conventional film cameras, when the "shoot" control 6 (FIG. 6) is fully depressed, a control signal is generated from the digital control unit 9 that generates a trigger signal on the control panel 2 to cause a flash unit 16 (FIG. 6) to irradiate a flash of light onto the subject image.

During initial camera operation, the user first inserts a diskette such as a standard three and a half inch or similar storage medium. Various memory diskette sizes and formats are suitable for the invention. However, for the preferred embodiment either a double-density (800 Kbytes of storage) or a high-density (1.4 Mbytes of storage) diskette in a three and a half inch format which are readily available from various commercial sources such as Sony, Maxell, and Verbatim. The user must then select the desired PC format (IBM PC/Clone or Apple Macintosh, etc.) via switch 17 (FIG. 6) on the control panel 2. As shown in FIG. 3; after turning on the power switch or inserting a diskette 50, the digital control unit 9 performs a self test of all internal circuitry, battery, disk drive unit, and control panel. Should any failures be detected, an appropriate error indicator is illuminated on the control panel. During the power-on sequence (see FIG. 3 and FIG. 12), the inserted diskette 50 is automatically checked for formatting consistencies in accordance with the format selected by the format switch 17 on the control panel 2 (IBM/Apple/etc.) and for available storage space by checking the boot block on the diskette, a technique that will be familiar to those skilled in the art. Should any inconsistencies be detected, an error indicator is illuminated on the control panel (ie, disk full, unformatted, etc.). The operator frame counter display 22 (FIG. 6) is then updated to show the maximum number of pictures available based upon indicated operator selections (color/black and white), diskette type (double versus high density), and capacity (partially full versus empty diskette). During operation, the operator can selectively erase a frame and record over it if desired by selecting the erase mode of operation from the control panel and toggling the forward/reverse control.

The optics for the preferred embodiment of the invention is a commercially available one-half inch (½") color CCD device having a pixel grid array of 780×488 as pictorially depicted in FIG. 4. This results in 380,640 pixel elements which results in a commercially acceptable quality resolution image as will be understood by those skilled in the art. In a color imaging device (CCD array) photoelectric elements, such as photodiodes, are arranged in a two dimensional array with optical filters for R (red), G (green), and B (blue). Various arrangements of optical filters are well known and the arrangement of optical filters is not limited to a particular one with this invention. During operation each pixel stores a charge corresponding to the amount of incident light. The RGB components of each pixel's charge is sequentially read out via a horizontal/vertical addressing scheme that will be familiar to those skilled in the art.

As shown in FIG. 5A; each charge, when addressed, is amplified and processed in a sample and hold (S/H) circuit 18. The analog voltage in each S/H circuit is digitized by an associated analog to digital (A/D) converter 8. The digital values are routed and collected in the pixel buffer 10. Following completion of discrete pixel element conversion and subsequent formatting in the pixel buffer which is under Control Processor Unit (CPU) 20 software control, the output of the full pixel buffer is routed to the frame buffer 11 by digital control unit 9. This process continues until a complete frame is collected within the frame buffer. The general digital logic and timing and control signals for this circuitry is shown in FIG. 5B. The timing is provided by a master clock that is an integral part of the CPU microprocessor. For example, the MOTOROLA 68040 microprocessor has a clock speed of approximately 40 Megahertz (MHZ) which results in a clock period of 25 nanoseconds (nsec.). This clock pulse is used by the function and address decoder 19 (FIG. 6) to generate the address and control signals shown in FIG. 5B as would be understood by those skilled in the art. The circuit of the present invention may be designed by one skilled in the art to function with a variety of microprocessor architectures and is not limited to any one in particular. One can see from the timing chart that the S/H circuit is allowed (via the SE command) to charge to a voltage level indicative of the analog voltage impinging upon the pixel element (via the PS command). After a fixed time period, the A/D converters are enabled (via the CE command) to begin conversion of the analog voltage value on the S/H. Upon completion of conversion, a conversion completion signal (CC) is generated by the A/D and routed back to the S/H circuit (via the SC command which is generated by the function and address controller 19) to discharge the stored analog voltage in anticipation of the next pixel element conversion process. Next, the output of the A/D converter 8 is clocked into the pixel buffer 10 (via the PB command). When the pixel buffer 10 is full, the output is clocked out to the frame buffer 11 (via the FB command) and the pixel multiplexer address circuitry selects the next pixel for conversion. Reset signals (RST) are sent to all circuit elements to allow these devices to reset prior to receiving the next analog value.

Another novel concept of the present invention as illustrated in FIG. 5A and 5B utilizes a technique of paralleling the S/H and A/D devices for each pixel element thus accelerating the image signal analog-to-digital conversion process. This is accomplished by eliminating the serial S/H and A/D path typical of prior art still video camera designs. In addition, high-speed, low-power devices available from Sony, Burr-Brown, Datel, Analog Devices, and others facilitate the increased conversion throughput of the S/H and A/D circuits with pixel conversion times of less than 150 nanoseconds (nsec.). For example, Sony's video A/D converter Device part number CXA1016P/K performs up to 50 million samples per second or 20 nsec. per conversion. This device, or similar, may be used in the preferred embodiment of the present invention. As explained previously, prior art still video camera designs multiplex each signal component into a common/singular A/D path to reduce the number of components and power consumption. However, in accordance with another aspect of the present invention components such as C-MOS and ECL devices coupled with miniaturized packaging techniques such as surface mount devices (SMD) and ASIC technology make it feasible to incorporate these devices in a parallel design in order to realize a substantial increase in conversion speed with no appreciable increase in power consumption. Therefore, this design approach provides significant conversion throughput increases over previous designs.

The extremely high conversion speed in accordance with another concept of the present invention makes multiple high-speed camera operation possible in an alternate embodiment. For example, total conversion time required for the aforementioned CCD array utilizing the circuit of the present invention (FIG. 5A) requires approximately 380,640×150 nsec. or 38 milliseconds (msec.). Additional time (approximately 5 msec.) is required for timing and control signal latency. Thus, total conversion time for a complete image frame prior to compression processing and logging to the memory storage diskette 50 is less than fifty msec. This allows for approximately 20 images to be captured in a one second period. By adding additional RAM 11A (FIG. 13) or other forms of commercially available random access memory to the frame buffer 11, image frames could be "pushed" onto a semiconductor memory stack for temporary storage allowing the compression processor and data interface circuitry to perform their respective functions at a slower rate. As shown in FIG. 13, each unprocessed image frame would be recorded or "pulled" from the stack on a "First-In, First-Out" (FIFO) manner until all images in the stack queue were processed and written to the storage diskette via the disk I/O circuitry 13.

As shown in FIG. 6, control panel settings are monitored by the CPU 20, a microprocessor, thus allowing the appropriate timing, control, and signal processing to be effected properly. The microprocessor 20 may be of the type 68040 manufactured by MOTOROLA, Intel's 80386 series, or equivalent microprocessors which specifications are commercially available and are incorporated herein by reference. The microprocessor utilization of this invention, which is in the digital control unit 9, transmits commands and status to specific controls, functions, and displays in the control panel as well as receiving both circuit status/control data and operator commands through polling the operator switch settings 14A, 14B, and 17 via the bidirectional function and address decoder 19. This approach allows the user to know immediately how much storage capacity remains in the image storage diskette 50 as well as the camera's overall operational and functional status through the use of status displays 21, 22, and 23 and ongoing software self-tests running in the background as depicted in

FIG 3. An example of this would be a low battery situation. First, the digital control unit 9 would detect a failure in the self-test mode. Next, the self-test light emitting diode 21 (FIG. 6) would be illuminated and an appropriate error display would be illuminated in the status display 22 thus providing the user with an exact indication of the error. Another example illustrating the operation of this embedded microprocessor type of control approach is the format switch 17 (FIG. 6). The position of the format switch 17 is sensed upon power application. Following diskette insertion, the boot block on the diskette is compared with the format switch 17 setting (IBM/clone or Apple) and if the format does not match or if the disk 50 is unformatted, the disk format status light emitting diode 23 would be illuminated and an appropriate error display would be illuminated in the status display 22 thus prompting the user to take appropriate corrective measures.

An alternate embodiment of the present invention involves adding an auxiliary I/O interface circuit or port to the digital control unit 9. As shown if FIG. 7, the auxiliary I/O port 80 connects in a manner similar to the Disk I/O interface 13. This additional I/O channel provides for external control and monitor of all timing and control signals internal to the camera. In addition, it allows for the image data to be routed past or around the compression processor out to any additional internal or external device such as an optical disk storage device, digital analyzer, or other data processors that might be desired.

FIG. 7 shows the digital control unit 9. The microprocessor 20 architecture here is typical to one familiar with the art. The frame buffer 11 (FIG. 5A) receives and stores the outputs of the pixel buffer 10 until a complete frame of image data is received. Then, the CPU 20, under software control, issues a control signal to the optics logic in the shutter and control circuitry 15 (FIG. 6) thus resetting those functions for future image recording. The full frame buffer 11, upon command from the CPU 20, transfers it's data into the compression processor 12 (FIG. 2) which performs thousands of levels of parallel pipeline processing on the image data. The compressed image frame is then written out to the mass memory RAM (Random Access Memory) 24 where it is temporarily stored until transferred to the disk drive assembly 5 via the disk I/O interface circuitry 13.

Referring to FIG. 8, a flowchart shows the steps involved in the image compression process performed by the image compression processor 12 (FIG. 2) in accordance with the preferred embodiment of the present invention. The output of the frame buffer 11 is transferred into the input of the image compression processor 12 under the control of the digital control unit 9. As previously described, the setting of switch 14A (FIG. 6) is read by the CPU 20 (FIG. 7) to determine the image resolution quality desired. Depending on the operator selected setting of switch 14A, the unique digital word generated by the AND gate 60*a-b* (FIG. 6A) which is activated by the selected position of switch 14A is routed to image compression processor 12 via CPU 20 (FIG. 7) which selects for example a predetermined digital memory location containing the appropriate corresponding compression ratio parameters under program control. The compression processor uses this command value for example to establish the size of the covariance matrix and a threshold for acceptance for the variances produced by the Discrete Cosine Transformation (DCT) transform coefficients. Next, the digital image signals are converted from the RGB format previously discussed in connection with FIGS. 2, 5, and 6 into luminance and chrominance signals. The luminance and chrominance signals subsequently undergo a DCT. The cosine transformed signals are then quantized and are then processed for Huffman coding. The Huffman coded image signals are then formatted into a form that facilitates format processing into various PC compatible formats (GIFF, PICT2, etc.). For a more complete understanding of the image compression process reference may be made to I.E.E.E. Catalog No. EH0231-1, Library of Congress No. 85-60384 published by the I.E.E.E. Society dated 1985 and incorporated herein by reference.

Of the two traditional classes of image compression techniques, spatial coding and transform coding, transform coding techniques lend themselves well for this application due to computational simplicity. Transform coding techniques that provide good visual fidelity include: Karhunen-Loeve transform (KLT), Fourier, cosine, sine, and Hadamard. The KLT algorithm offers the best visual fidelity but suffers from serious computational complications due to extremely large matrix size. Several alternate algorithms that offer reasonable visual fidelity that are computationally feasible for this invention include the Fast Fourier Transform (FFT), Discrete Cosine Transform (DCT), and Discete Sine Transform (DST). The DCT was adopted by the JPEG as the preferred algorithm due to computational simplicity and performance.

It should be noted that the Joint Photographic Experts Group (JPEG) (composed of experts from many companies including IBM, AT&T, Digital Equipment Corp, and INTEL) compression/decompression standard was developed in 1985 in response to the lack of interoperability between image and processing equipment due to numerous proprietary standards held by each manufacturer. The JPEG standard provides image compression effectively up to 75 times or greater depending on the visual fidelity desired. The JPEG standard is widely used in industry as an alternative to proprietary algorithms such as Intel's own proprietary standard called DVI which was initially developed by RCA before being sold to INTEL, the integrated Circuit manufacturer. INTEL offers it's own firmware compression processor incorporating their DVI standard delivering compression ratios in excessive of 100:1. However, a new international standard called MPEG is due to be announced in the 1991 time frame from the JPEG and should offer compression ratios of 275:1 and greater. In the preferred embodiment of the present invention, the JPEG standard is the preferred algorithm chosen with the incorporation of the the MPEG standard or other similar standard in the future when available commercially. An alternate embodiment of the present invention would be the incorporation of various proprietary compression algorithm standards such as DVI.

The compression/decompression algorithm firmware implementation of the JPEG algorithm is available commercially from various sources including C-Cube, Electronics for Imaging, Storm Technology, Burr-Brown, Spectral Innovations Inc., INTEL, and others. The implementation of this algorithm for the present invention may incorporate the integrated circuit set commercially available from C-Cube. Their four chip ASIC JPEG algorithm implementation is performed in

three basic steps: first, the image is divided into 8-by-8 pixel squares and applies a discrete cosine transform (DCT) to each square resulting in 64 frequency values; second, these frequencies are put through a quantization algorithm to eliminate unimportant frequencies; third, the remaining values are run through a Huffman coding scheme to encode the most frequently occurring values using the fewest bits. A compatible software implementation of the JPEG algorithm is available commercially from Aladdin Systems, Radius Inc., Kodak, and others.

Those skilled in the art will be familiar with the process and the commercially available software and firmware chipsets that are currently available on the market. The present invention incorporates both available firmware chipsets in the camera and software for use in the PC for decompression. The decompression algorithm can be written onto the camera's diskette 50 prior to any image data recording. This allows the PC user to take the diskette 50 to a PC and directly incorporate the image data because the image file selected by the user is automatically decompressed transparent to the user. The algorithm can be written onto an unused track 52 or sector combination on the diskette as shown on FIG. 2A. Alternatively, the decompression algorithm can be loaded onto a PC before inserting a diskette 50 containing compressed image data. In the latter embodiment the resolution and mode values 54 and 55 (FIG. 2A.) for each representative image would be read from diskette 50 in order to appropriately control the selection and activation of the appropriate corresponding decompression algorithm.

As shown in FIG. 7, the output of the image compression processor 12 is routed to the RAM memory 24 where the compressed image is formatted for either the PICT II or GIFF format depending on the setting of format switch 17 (FIG. 6). It should be noted that a large number of image formats for PCs exist. PICT and GIFF are the most common for the Apple and IBM PC's and are therefore the preferred formats for the present invention although other formats can be easily incorporated into the design by changing the software format routines. These software image formats are commercially available from many sources most notably Apple computers for PICT and IBM for GIFF. An example of the PICT format is pictorially shown in FIG. 6B as will be familiar to those skilled in the computer arts. Once formatting is complete, the formatted image data is transferred to the disk I/O interface 13 for transfer to the magnetic recording diskette 50.

FIG. 9 and FIG. 10 illustrate the preferred embodiment of the video format translator device in accordance with another aspect of this invention that converts other still video camera formats for example on two inch video diskette to this invention's selectable PC compatible digital format. The general concept of operation is shown in FIG. 10. In FIG. 9 correspond parts and subassemblies in translator 40 are shown with like numbers corresponding to FIGS. 2 and 6 having a 40 hyphenation prefix designation and such parts and subassemblies perform similar functions to those described above with reference to FIGS. 2 and 6. Referring again to FIG. 9, the translator 40 incorporates the same components utilized in the digital circuit card assembly which houses both the digital control unit 9 and optics processing circuits (pixel multiplexer 7, A/D 8, etc. 10-13). The major difference is that the CCD array 1 is replaced with an input disk drive 25, for example a two inch (2") video disk drive assembly, and an NTSC video format decoder 26 which converts the composite video signal to an RGB format for processing as described previously.

FIG. 11 displays an alternate embodiment of the video format translator device 40 of the present invention that shows optional inputs 27 and outputs 28 and 29. The exact same circuitry is utilized that was used for the translator device 40 as shown in FIG. 9 except that inputs 27 for either an NTSC/PAL format or RGB format video signal is provided. This allows video signals from other sources such as a cable TV, CAMCORDER, or other video signal source to be digitized and archived in a PC compatible format. Also, provisions for video output jacks 28 are made to allow either viewing of the image/video source prior to or during image recording. Finally, provisions are made to provide a data output 29 to allow connection to other PC peripherals such as a communications modem, larger/smaller disk drive assembly, optical disk, specialty display or signal processor/analyzer. Either a standard serial, parallel, or Small Computer Standard Interface (SCSI) data port can be readily connected to the auxiliary I/O interface 80.

FIG. 12 depicts an alternate feature of an embodiment of the present invention that shows how an inserted diskette 50 that is either unformatted or formatted for a undesired (e.g., not corresponding to the setting of switch 17—FIG. 6) PC configuration would be automatically properly formatted for use with a camera in accordance with another aspect of this invention. This capability allows the user of this invention to forego the requirement to pre-format the storage medium (diskette) on a PC prior to using it in the camera operated in accordance with the present invention. With reference to FIG. 3 the power-on sequence process would result in an abnormal diskette format error if the format of an inserted diskette 50 did not correspond to the operator selected format switch 17 (FIG. 6). In accordance with the automatic diskette format option, CPU 20 of digital control unit 9 in response to the abnormal diskette format error would initiate the diskette format process illustrated in FIG. 12. Upon completion of the diskette format process illustrated in FIG. 12, the power-on sequence illustrated in FIG. 3 would continue from step B.

Referring now to FIG. 14A, there is shown a schematic block diagram of the format selection logic in accordance with another aspect of the present invention. During the power-on sequence as described in connection with FIGS. 3 and 12, processor 20 of control unit 9 initiates a format selection switch sample and test routine as more fully described in the flow diagram illustrated in FIG. 14B. Switch 17 is illustrated in FIG. 14A in the Apple PC position and logic level v1 is applied as inputs to logic gates 60*c* and 60*d*. As illustrated in FIG. 2A, the format signals 57 for the Apple PC format is a logic "zero" and conversely the format signal or tag 57 if the format switch 17 were in the IBM PC or other computer type position would be a logic "one" and "two" respectively. In response to the logic "zero" indicating Apple PC format, processor 20 accesses a unique memory location XY of format memory 20-2 which for example may comprise any random access memory with two megabytes storage capacity. The data format for the operator selectable predetermined number of computer architectures, similar in content and arrangement to those illustrated in FIG. 6B for an Apple PC would be stored in memory 20-2 which

would be addressed in response to the other operator selectable position of switch 17 to generate the other unique codes 57 as shown in FIG. 2A. Processor 20 in response to a stored format subroutine more particularly shown in FIG. 14B contains the allocation of data memory addresses in disk input/output interface unit 13 in accordance with the picture image file format as illustrated in FIG. 6B. Thus the digital video data information signals generated by compression processor 12 are appropriately formatted and stored in memory storage disk drive 5 to insure compatibility with the format selected by the operator by selectively positioning switch 17.

Those skilled in the art will recognize the many alterations, additions or changes of the preferred embodiment may be made without departing from the scope of the following claims

What is claimed is:

1. In an electronic still image camera comprising:

an optical lens,

a shutter mechanism operably associated with said lens,

an array of discrete light sensing pixel elements, each pixel element being responsive when said shutter mechanism is operated to incident illumination from a subject image radiating through said lens and shutter mechanism to generate an analog picture information signal corresponding to said subject image,

pixel multiplexing means responsive to each array of pixel elements for separating an output from each pixel element into its primary color components,

analog to digital converter means responsive to the outputs of said pixel multiplexing means for converting said analog picture information signal into corresponding digital data information signals,

removably mounted memory means for storing said digital data information signals,

the improvement comprising output data control means for selecting one of a plurality of different output data format codes prerecorded in said camera to be associated with each said digital data information signals where each of said plurality of output data format codes corresponds respectively to one of a like plurality of different data formats for different types of computer apparatus, and

logic means responsive to said output data control means for determining the output data format of said digital data information signals in accordance with a selected one of said plurality of different output data format codes

2. The improved electronic still camera of claim 1 further comprising picture image resolution determining means and digital data compression means for selectively determining which of a plurality of compression algorithm parameters are to be applied to said digital data information signals in response to an operator activated switch means.

3. The improved electronic still image camera of claim 2 wherein said removably mounted memory means comprises digital diskette means having thereon a plurality of selectively addressable magnetic sector and track sections for recording said digital data information signals

4. The improved electronic still image camera of claim 3 hwerein said digital compression algorithm of said digital data compression means is also recorded in its entirety on said diskette means and further comprising record marking means for recording a digital coded mark for indicating the compression alogorithm parameters utilized in compressing each said digital data information signals

5. The improved electronic still image camera of claim 2 further comprising record marking means for recording a unique digital mark indicating the compression alogorithm parameters utilized in compressing each said digital data information signals.

6. The improved electronic still camera of claim 2 further comprising record marking means for generating and recording with each said digital data information signals a coded mark indicating the compression algorithm parameters utilized in compressing said digital data information signals

7. The improved electronic still image camera of claim 1 further comprising memory formatting means operable during the camera power-up routine to automatically format said memory means in accordance with one of a plurality of output data formats.

8. The improved electronic still image camera of claim 1 further comprising audio recording means for simultaneously recording digital audio signals associated with each subject image and memory file correlation means for associating in said memory means the respective storage locations of said audio signals with its associated image signals.

9. The improved electronic still image camera of claim 1 further comprising switch activated control means for improving the image signal storage efficiency by selectively determining the amount of storage of said removably mounted memory means to be associated with storage of each picture image.

10. An electronic still image camera comprising:

an optical lens,

a shutter mechanism operably associated with said lens,

an array of discrete light sensing pixel elements, each pixel element being responsive when said shutter mechanism is operated to incident illumination from a subject image radiating through said lens to generate an analog picture information signal corresponding to said subject image,

pixel multiplexing means responsive to said array of pixel elements for separating an output from each pixel element into its primary color components,

analog to digital converter means responsive to the output of said pixel multiplexing means for converting said analog picture information signal into corresponding digital data information signals,

removably mounted memory means for temporarily storing said digital data information signals,

output data format control means for storing in said camera at least one of a plurality of different output data format codes where each of said plurality of output data format codes corresponds respectively to one of a like plurality of different data formats for different types of computer apparatus, and

logic means responsive to said format control means for selectively controlling the formatting of said digital data information signals in accordance with a selected one of said plurality of different output data codes.

11. The electronic still image camera of claim 10 further comprising memory formatting means operable to automatically format said removably mounted memory means in accordance with one of a plurality of operator selectable data storage formats.

12 The electronic still image camera of claim 10 further comprising image resolution determining means for selectively determining which of a plurality of compression algorithm parameters are to be applied to said digital data information signals

13 The electronic still image camera of claim 12 further comprising record marking means for indicating which one of said plurality of compression alogorithm parameters were utilized to compress said digital data information signals

14 The electronic still image camera of claim 10 wherein said removably mounted memory means comprises digital data diskette means and further comprising selectable diskette formatting means for automatically formatting diskette means in accordance with one of a plurality of operator selectable data formats.

15 The electronic still image camera of claim 10 further comprising remote activation means for selectively activating said camera and logic means responsive to said remote activation means for initiating an output data format check of said removably mounted memory means

16 A process for storing an electronically sensed video image comprising the steps of:

generating an analog image signal corresponding to the imagewise pattern of radiant light incident on a plurality of light sensing pixel elements,

converting the analog image signals into digital electronic information signals wherein a distinct digital electronic signal corresponds to the analog image signals corresponding to the intensity of radiant light falling on the light sensing pixel elements,

temporarily storing the digital electronic information signals,

recording in selectable addressible memory means at least one of a plurality of different digital output data format codes where each of said plurality of output data format codes corresponds respectively to one of a like plurality of different data formats for different types of computer apparatus,

selecting from said selectable addressible memory means one of said different digital output data format codes to be associated with each said digital electronic information signals, and

storing said digital electronic information signals in a digital memory in accordance with said selected output data format code

17 The process of claim 16 further including steps of:

detecting the presence at an electronic still camera of a remotely generated activating signal, and

activating said generating of said analog signal in response to the detecting of said activating signal

18 An electronic video image signal output data format translator comprising:

input means for receiving image signals corresponding to sensed picture information,

converter means for converting said image signals to digital image signals,

buffer storage means for temporarily storing said digital image signals,

output data format selection means for selecting one of a plurality of different data format codes stored in the translator to be associated with each said digital image signals where each of said plurality of different data format codes corresponds respectively to one of a like plurality of different data formats for different types of computer apparatus, and

output memory means for storing said digital image signals formatted in accordance with said selected data format code

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