March 17, 1970 J. T. RUSSELL 3,501,586

ANALOG TO DIGITAL TO OPTICAL PHOTOGRAPHIC RECORDING AND PLAYBACK SYSTEM

Filed Sept. 1, 1966 3 Sheets-Sheet 1

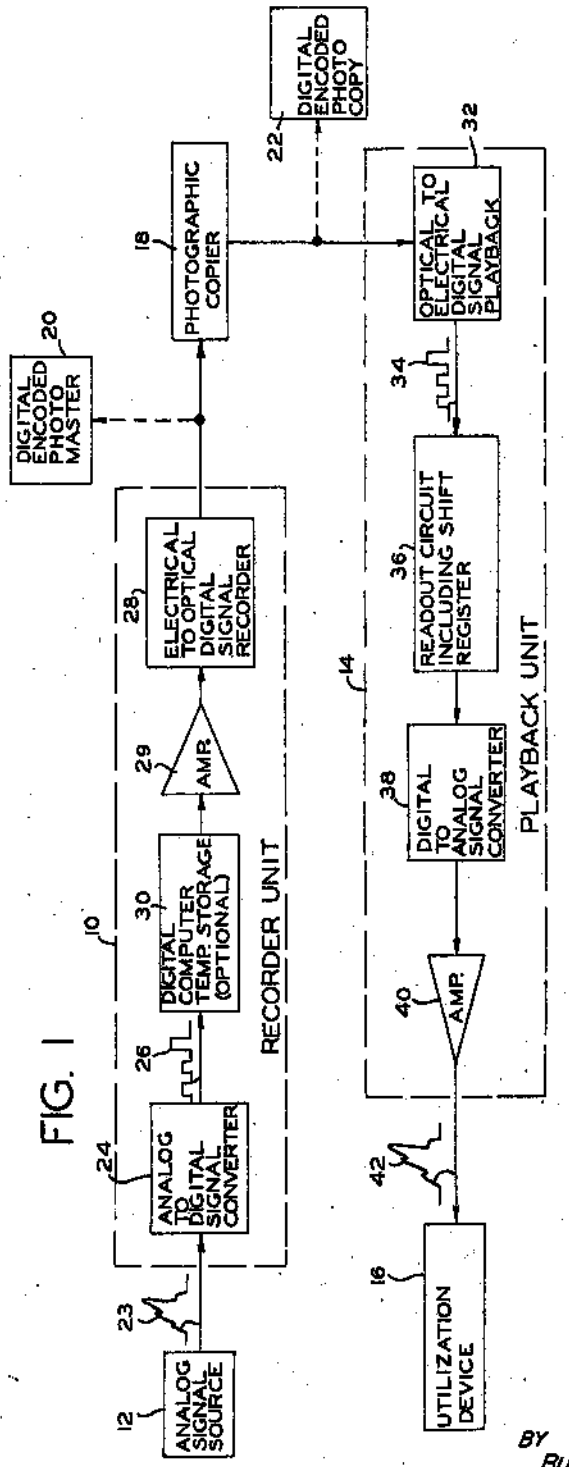

FIG. 1

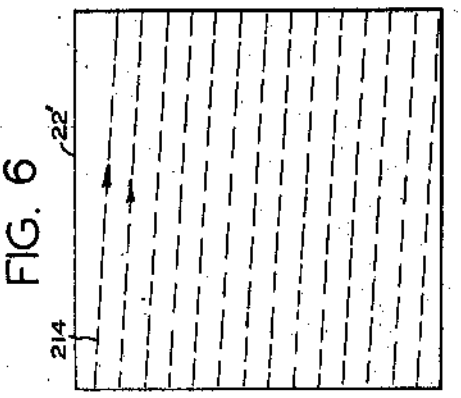

FIG. 6

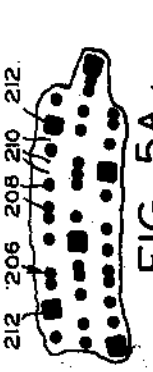

FIG. 5A

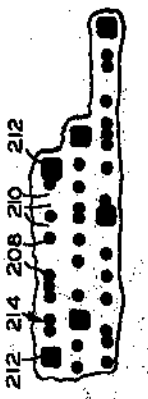

FIG. 6A

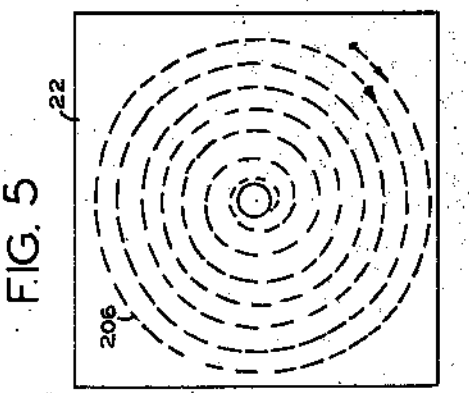

FIG. 5

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United States Patent

[11] 3,624,284

[72] Inventor James T. Russell
Richland, Wash.

[21] Appl. No. 857,474
[22] Filed Sept. 12, 1969
[45] Patented Nov. 30, 1971
[73] Assignee The Battelle Development Corporation
Columbus, Ohio
Original application Sept. 1, 1966, Ser. No. 576,580, now Patent No. 3,501,586.
Divided and this application Sept. 12, 1969, Ser. No. 857,474

[54] PHOTOGRAPHIC RECORD OF DIGITAL INFORMATION AND PLAYBACK SYSTEM INCLUDING OPTICAL SCANNER
18 Claims, 8 Drawing Figs.

[52] U.S. Cl. ..... 178/6.7 A, 178/7.6, 179/100.3 D, 235/61.11 E, 250/219 D, 250/219 DD, 350/285, 340/173 LM
[51] Int. Cl. G02f 2/00, G06k 7/016, G11b 7/00
[50] Field of Search ..... 178/6.7, 6.7 A, 7.6; 179/100.3 D; 340/173 LM; 235/61.115; 250/219 Q, 219 D, 219 F; 350/285

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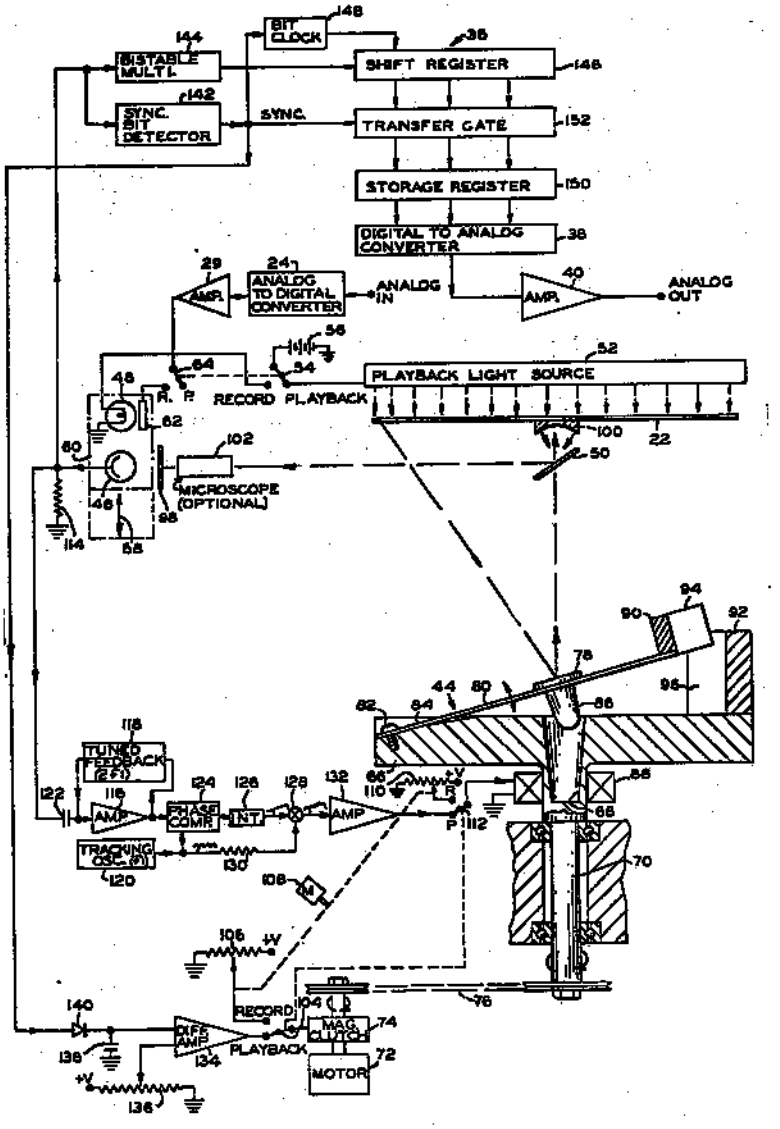
Primary Examiner—Terrell W. Fears
Assistant Examiner—Howard W. Britton
Attorney—Buckhorn, Blore, Klarquist and Sparkman

ABSTRACT: An electrical signal-recording and playback system is described in which an analog input signal is converted to a digital signal that pulses a light source to form a single, series-recorded track of binary coded digital information including information spots arranged in groups separated by synchronizing spots recorded on a photographic film which is played back in a similar manner. The photographic film is a compact, permanent record of long, useful lifetime which may be photographically copied to provide a plurality of inexpensive copies. A spiral track photographic record is used in one embodiment which can be employed to provide a music system of high quality.



United States Patent [19]

Russell

[11] **3,885,094**

[45] **May 20, 1975**

[54] **OPTICAL SCANNER**

[75] Inventor: **James T. Russell**, Richland, Wash.

[73] Assignee: **Battelle Development Corporation**, Columbus, Ohio

[22] Filed: **Oct. 12, 1973**

[21] Appl. No.: **405,770**

Related U.S. Application Data

[60] Division of Ser. No. 202,471, Nov. 26, 1971, Pat. No. 3,806,643, which is a continuation-in-part of Ser. No. 857,474, Sept. 12, 1969, Pat. No. 3,624,284, which is a division of Ser. No. 576,580, Sept. 1, 1966, Pat. No. 3,501,586.

[52] **U.S. Cl.** **178/7.6**

[51] **Int. Cl.** **H04n 1/24**

[58] **Field of Search** ..... 178/7.6, 6.7 R, 6.7 A

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3,501,586	3/1970	Russell	178/6.7
3,624,284	11/1971	Russell	178/6.7

Primary Examiner—Howard W. Britton
Assistant Examiner—Michael A. Masinick
Attorney, Agent, or Firm—Klarquist, Sparkman, Campbell, Leigh, Hall & Whinston

[57] **ABSTRACT**

An electrical signal recording and playback system is described in which an analog input signal is converted to a digital signal that pulses a light source to form a single, series-recorded track of binary coded digital information including information spots arranged in groups separated by synchronizing spots recorded on a photographic film which is played back in a similar manner. The photographic film is a compact, permanent record of long, useful lifetime which may be photographically copied to provide a plurality of inexpensive copies. A spiral track photographic record is used in one embodiment which can be employed to provide a music system of high quality. In one embodiment, a photographic record having bits arranged in lines or columns is held in a fixed position and a fan-shaped laser beam is moved horizontally over the record in a primary scan, and a row of microlenses focus line segments of the columns in seriatim on a row of photocells, the microlenses being stepped vertically from line to line in a vertical secondary scanning. In another embodiment, a laser beam is scanned horizontally and vertically to illuminate pages of information on a photographic element one after another, and, during the illumination of the pages, a matrix of lenslets, each covering one page, is scanned vertically over the height of a page, to transmit the lines of the illuminated pages seriatim to a row of photocells.

5 Claims, 13 Drawing Figures