

Jan. 4, 1938.

W. S. LEMMON ET AL

2,104,544

IMAGE TRANSMISSION SYSTEM

Filed March 19, 1935

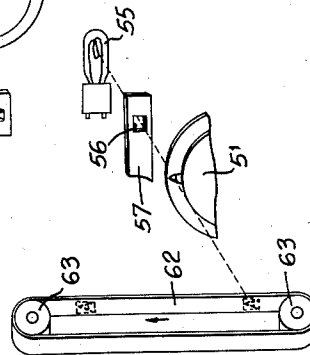
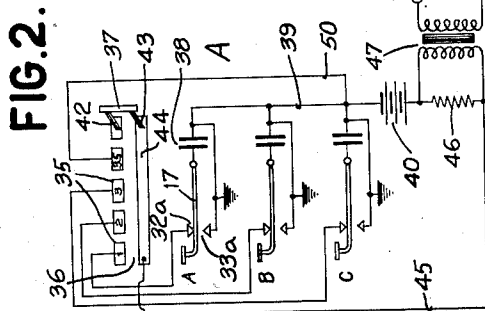
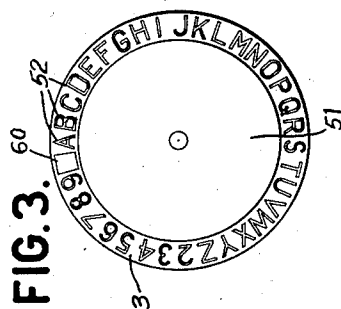
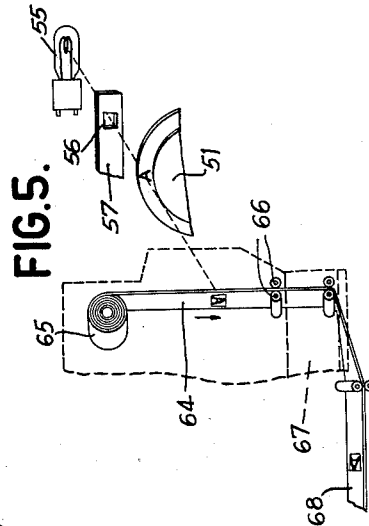
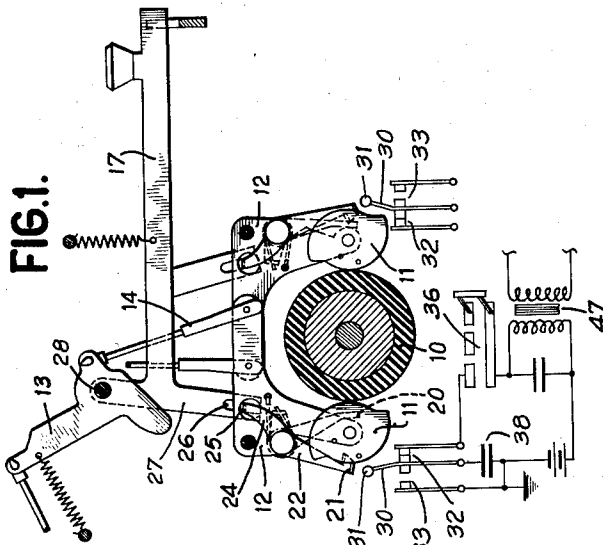


FIG. 4.
Walter S. Lemmon
Glyde G. Fitch
BY W. S. Lemmon
INVENTORS
ATTORNEY

UNITED STATES PATENT OFFICE

2,104,544

IMAGE TRANSMISSION SYSTEM

Walter S. Lemmon, New York, N. Y., and Clyde J. Fitch, Jersey City, N. J., assignors to International Business Machines Corporation, New York, N. Y., a corporation of New York

Application March 19, 1935, Serial No. 11,784

8 Claims. (Cl. 178—2)

This invention relates to novel apparatus for and methods of transmitting signals and more particularly relates to novel apparatus for and methods of visual transmission which is suitably adaptable to both radio and wire network transmission.

Insofar as its fundamental features are concerned the methods herein disclosed are applicable to various forms of devices such as stationary or mobile image receivers for automobiles, buses, airplanes, sea vessels, etc. In addition thereto, this invention is characterized by the provision of a permanent record of the message received to render it to be practical for mobile and other purposes.

The present invention will be explained in conjunction with a single impulse synchronous transmission system in which the different characterizations to be transmitted and received are represented by single impulse signals which are definitely allocated during particular timed intervals.

In one embodiment of the invention, illustrating its use in visual transmission systems, the transmitting station or unit is provided with a power operated typewriter adapted so that upon selection of character keys corresponding circuits are conditioned to represent the mentioned selections and arranged to transmit the corresponding character signal at a predetermined timed interval by connecting the conditioned circuits at representative time periods by a circuit control or distributor device. Operating in synchronism with the transmitting equipment is a disk provided with an opaque band or section with transparent characters disposed thereon and arranged in a manner to correspond to the transmitting apparatus, so that the transmission of a signal at a particular timed interval energizes a suitable light source disposed to the rear of the character disk, causing the illuminated sector of the disk to produce an image of the selected character on a suitable screen.

Records may be made of the transmitted messages by causing, for example, a moving film to travel at a fixed rate of speed and suitably disposed near the screen so that each picture frame may represent a characterization, the automatic development of which renders a practical record of the word images when necessary.

It is therefore an object of the present invention to provide an improved image transmission system in which characterization impulses, distinguished in respect to time, are utilized to select the desired characterizations.

Various other objects and advantages of the invention will be obvious from the following particular description of one form of mechanism embodying the invention or from an inspection of the accompanying drawing; and the invention also constitutes certain new and useful features of construction and combination of parts hereinafter set forth and claimed.

In the drawing:

Fig. 1 shows a transverse sectional view of so much of one type of tele-printing machine as is necessary to illustrate a preferred embodiment of the invention.

Fig. 2 shows diagrammatically a circuit arrangement embodying the invention.

Fig. 3 shows a detail view of the character disk.

Fig. 4 shows diagrammatically one type of screen that may be embodied in the invention.

Fig. 5 shows diagrammatically one method of recording the received character image.

Transmitting unit

For illustrative purposes, this invention is shown as embodying one well known form of translating unit and of the type disclosed in the copending application Serial No. 676,654, filed June 20, 1933, and hence requires only the following brief description.

Referring to the drawing, and in particular to Fig. 1, in the embodiment illustrated in the drawing, well known means are provided for actuating the type bars (not shown) by power operated devices comprising a power driven roller 10.

A cam 11 is pivoted on one arm of a bell crank lever 12 pivoted in the frame, the other arm of which is operatively connected with one arm of a bell crank lever 13 by means of link 14. The other arm of lever 13 is connected to the type bars (not shown) in a well known manner and fully disclosed in the aforesaid application.

The lever 12 is actuated by the cam 11 when the latter engages the driven roller 10 to be operated thereby. The engagement of the cam 11 with the power roller is controlled by means of the key lever 17 in a manner which will now be described.

The cam 11 is resiliently engaged by a spring-pressed arm 20 which tends to turn it into engagement with the power driven roller or stop 21 on a lever 22 pivoted on the bell crank 12 and normally arranged in the path of a lug on the cam. When the lever 22 swings to move its stop out of the path of the lug, the arm 20 swings the cam into engagement with the power roller

to be actuated thereby to swing the bell crank 12 to actuate its connected mechanism.

The lever 22 has an arm 24 which is provided with an offset projection 25 at its end which projects laterally through an opening in the bell crank 12 and engages the bifurcated lower end 26 of an arm 27 of a key lever 17 pivoted on the common rod 28.

It is obvious then that depression of a key lever 17 releases the revolubly mounted cam 11 to engage and be actuated by power roller 10 in turn operating bell crank 12 and its attached links to cause the associated mechanism, such as the key bars and other operating mechanisms, to be operated.

In addition to actuating the several type bars and connected mechanisms, the revolubly mounted cams are adapted to make and break circuits which may be employed in the transmitting units, the purpose of which will be understood as the description progresses. Upon release of the cam 11 the ensuing operation thereof causes the contact spring blade 30 by virtue of its attached cam follower roller 31 adapted to engage the cam during its partial revolution, to be urged away from the power roller 10 to open the contacts 32 and close the contacts 33. Since the cam turns exactly one half of a revolution before being arrested, the spring blade 30 returns to its normal position as shown in the drawing by virtue of its own resiliency, thereby restoring the contacts to their normal position, that is, contacts 32 closed and contacts 33 open.

It will be understood that the usual number of key bars and power devices with their associated mechanisms are provided, but only one of them is shown for the sake of clearness.

General description

Referring now to Fig. 2, A represents a teleprinter unit which may be of the type described or any well known type having a series of character pivoted key bars 17 and adapted to initiate a character impulse when one of the character keys is depressed. The transmitting contacts may be positioned as explained hereinbefore so as to open one set of contacts and close another by the operating cams 11, or the contacts may be positioned directly in contact with the key bars 17 as shown in the figure.

A separate contact 32a is associated with each individual key bar 17 and connected to segments 35 of the distributor 36, a portion of the development of which is shown and further disclosure deemed unnecessary since their use is well known in the art. Rotary arm 37 driven by any suitable means such as a motor is adapted to engage the segments in rather rapid succession to cause the transmission of the character pulses. One method of setting up the character signals is by the use of condensers, and as shown an individual condenser 38 is associated with each key bar 17, the said condensers associated with the key bars are connected by a common conductor 39 to the negative side of battery 40. It is to be noted that all the contacts 32a, that is the normally closed contacts, are associated with separate conducting segments 35 of the distributor 36.

Disposed beneath or associated with the key bars 17 and normally open are the contacts 33a connected to one side of the condensers 38. These are provided so that when a character key is depressed the condenser 38 normally

charged will be discharged by shorting the condenser through contact 33a to ground.

Supposing the key bar corresponding to character A was depressed to discharge its corresponding condenser, upon return of the key bar the contact 32a would be closed to connect the circuit from the negative side of battery 40 through condenser 38, and the closed contact 32a to its corresponding segment 35—1, so that when the rotary arm 37 with its conducting brushes 42 engages contact 1, a circuit is completed through its other brush 43, solid and common conducting distributor ring 44, conductor 45 and the connected parallel circuit consisting of resistors 46 and the primary winding of transformer 47, to the positive terminal of battery 40. Therefore, it is seen that upon completion of this circuit just described, by the rotating arm 37 engaging the segment 35—1 of the distributor, the corresponding condenser conditioned upon depression of the A character key by being discharged is now charged through the parallel circuit arrangement 46 and 47 to energize the secondary winding of transformer 47 and its connected circuit which may be a wire or radio transmission network.

Assuming that the rotary brush 37 of the distributor 36 is rotated at the rate of 900 revolutions per minute, and that the values of the condenser 38 and transformer 47 are so chosen that a number of revolutions of the brush 37 are required to fully charge the condenser, it is seen that if any one key is depressed for a short time interval a series of timed character impulses at the rate fifteen per second energize the connected transmission circuit, the purpose of which will be understood as the description progresses.

In addition to the character key bar circuits, just explained, a circuit is completed for each revolution of the brush 37 to energize the transmission circuit as follows: conductor 50 connects the negative terminal of battery 40 to a conducting segment 35—35 of the distributor, hereinafter referred to as the "framing segment" so that upon engagement by the brushes 42, a circuit is completed by brush 43, conductor ring 44, conductor 45, resistor 46 and primary winding of transformer 47 to the positive terminal of battery 40, to transmit a "framing impulse" at the rate of fifteen per second, irrespective of the rate of transmission of the character impulses, and, similarly as the character impulses, the "framing impulses" are transmitted at definite timed intervals so that each signal impulse is differentiated by the time of transmission. The purpose of the "framing impulse" will be explained in conjunction with the receiving circuit and will be presently disclosed.

It was mentioned that the condensers 38 were assumed to be normally charged, therefore, in order to insure correct operation of the transmitting system upon starting, the normally closed switch 49 included in the input circuit of the signal transmitter is opened until the individual condensers, which may have been discharged are charged by having all the distributor segments 35 engaged successively by the rotary arm 37 in a manner just described, and in this manner prevent erroneous operations of the receiving system which will now be explained.

Referring now to the receiver shown schematically in Fig. 2, the character disk 51, adapted to have disposed thereon a series of transparent characters 52 on an opaque section 53 of the

disk 51 (Fig. 3) is continuously rotated by a synchronous motor 54 or by other suitable means driven by the source of alternating current tied into the system supplying power to the motor operating the rotary arm 37 so that the disk 51 and the arm 37 are rotated in synchronism. In this manner, a character impulse, for example the character A, transmitted energizes the light source 55 connected to the receiving apparatus or line amplifier or similar equipment as the case may be, the light from which is directed through the aperture 56 of plate 57 interposed between the light source and the rotating disk to cause the character A to be projected on the magnifying lens or screen 58.

It was mentioned in conjunction with the transmitting circuits that a "framing impulse" was transmitted each revolution of the rotary arm 37, this impulse energizes the light source 55 at the receiver when the frame characteristic 60 on the opaque section 53 is opposite the light source so as to be projected on the screen or lens 58, in addition thereto, it was assumed that this "framing impulse" was transmitted fifteen times per second and in this manner projecting the frame on the screen fifteen times each second causing the frame to appear stationary due to the stroboscopic action.

It was also stated hereinbefore that the character key circuit characteristics were such that when a key bar 17 is depressed several revolutions of the brush arm 37 are required to fully charge the corresponding condenser 38 so as to send out a series of character impulses at the rate of fifteen per second.

It, therefore, will be understood that these conditions then will cause an image of the letter or character to be projected on the screen or lens so as to appear within the frame when the constantly rotating disk 51 and the rotary distributor arm 37 are operated synchronously. The image of the character is retained at the receiving end for a relatively long time since a series of the corresponding character impulses are transmitted for the particular representations at the rate assumed, namely, fifteen impulses per second.

It is evident that the positioning of the contacts 32 and 33 with respect to the cams 11 can be adjusted so that the released cams 11 maintain the contacts 33 closed for different intervals of time depending on their proximity to the cams 11. Therefore the contacts 33 can be positioned so that upon the depression of its corresponding key bar 17 the revolvably mounted cams 11 close the contacts 33 for a timed interval to permit the rotary arm 37 to complete several revolutions to send out a series of character pulses as described hereinbefore.

In case the disk 51 and rotary arm 37 are not rotated in synchronism and in phase, the character images, as is evident, would not appear within the frame, for such conditions a differential mechanism 61 is used to adjust the phase position of the disk 51 so as to re-align the said disk and rotary arm to establish synchronous operation.

It may be desired to retain the separate character images for a longer period so that the groups of words represented may be viewed instead of the separate characters, therefore a revolving screen 62 with fluorescent properties may be disposed near the constantly rotating character disk 51 (Fig. 4), the feed rollers 63

for this screen may be rotated in synchronism with the rotary disk 51 by a suitable gearing and motor 54, and in this manner retain the images projected for a period longer than the interval of time obtained by the series of transmitted character impulses.

Also, if desired, a suitable record may be obtained of the characters transmitted and the character images received, by passing a moving film 64 (Fig. 5) in front of the light source and rotating disk 20 as to impress the flashing characters set up thereon. The apparatus illustrated in the drawing comprises a film storage reel from which a motion picture film 64 is withdrawn by the feed wheels 66. Neither motive power for the storage reel nor various incidental elements of the device, such as a guiding tube through which the film passes, lens system, etc. are illustrated and are not deemed necessary. The film 64 then may be passed through an automatic developer compartment 67 and adapted to eject the developed film 68 which may be used as a permanent record of the received image messages.

It is to be understood that the expressions character image and image message used in the present description and claims refer to electro-optical effects to differentiate from other forms of effecting and producing representations such as recording on a tape or paper form. Therefore, an expression as means to produce the character image at the receiver must be interpreted accordingly in view of the aforementioned limitations, and which obviously means a device at the receiving point to produce from the received signals electro-optical effects representative of the characterizations transmitted.

While there has been shown and described and pointed out the fundamental novel features of the invention as applied to a single modification, it will be understood that various omissions and substitutions and changes in the form and details of the device illustrated and in its operation may be made by those skilled in the art without departing from the spirit of the invention. It is the intention therefore to be limited only as indicated by the scope of the following claims.

What is claimed is as follows:

1. A system of the character described, comprising a character transmitting unit including a plurality of operating instrumentalities, means associated with the said instrumentalities adapted to be conditioned and maintain the selection of the selected and operated instrumentality, means controlled by the said conditioned means to initiate character impulses in accordance with the selection, means to transmit the character impulses, means to transmit periodic framing impulses, means to receive the transmitted impulses, a continuously rotating character wheel with character representations disposed thereon, means responsive to the framing impulses and character impulses and cooperating with the said character wheel to produce a frame image and character images respectively, and means whereby said character images are positioned within the said frame image.

2. In a system of the character described, means to transmit character impulses including means to initiate different timed impulses representing different characters, and means cooperating therewith to select the time to initiate the differently timed impulses, means to transmit

- periodic framing impulses, means to receive the transmitted impulses, a continuously rotating character wheel with character representations disposed thereon, means responsive to the framing images and character images and cooperating with the said character wheel to produce a frame image and character images respectively, and means whereby said character images are positioned within said frame image.
3. In a system of the character described, means to transmit character impulses including means to initiate different timed impulses representing different characters, each by a single impulse, and means cooperating therewith to select the time to initiate the differently timed impulse, means to transmit periodic framing impulses, means to receive the said impulses, a continuously rotating character wheel with character representations disposed thereon, means responsive to the framing images and character images and cooperating with the said character wheel to produce a frame image and character images respectively, and means whereby said character images are positioned within said frame image.
4. In a system of the character described, means for transmitting character impulses including cyclically operable mechanism for initiating current impulses at different times to represent different characters, each by a differently timed impulse and controlling means cooperating therewith to select the times at which the single character impulses are initiated, means to transmit periodic framing impulses, means to receive the said transmitted impulses, a continuously rotating character wheel with character representations disposed thereon, means to control the operation of said wheel so as to be in timed relation with that of the said cyclically operable mechanism, means responsive to the framing impulses to produce a frame image, and means responsive to the said character impulses to produce character images at the receiver, and means whereby said character images are positioned within the said frame image.
5. In a system of the character described, means to transmit character impulses including means to initiate differently timed impulses representing different characters, and means cooper-

ating therewith to select the time to initiate the differently timed impulses, means to transmit periodic framing impulses, means to receive the transmitted impulses, a continuously rotating character wheel with character representations disposed thereon, means responsive to the framing images and character images and cooperating with the said character wheel to produce a frame image and character images respectively, and means whereby said character images are positioned within said frame image, and means to effect the recording of the character and frame images produced.

6. In a system of the character described, means to transmit differently timed character impulses, means to control the said transmitting means so as to cause a series of similar impulses to be transmitted for each character, means to receive the said impulses, a continuously rotating character wheel with character representations disposed thereon, and means energized by the series of character impulses received and cooperating with the said character wheel to cause the production of the character images at the receiver for a relatively long period of time.

7. In a system of the character described, means to transmit character impulses, and means to transmit periodic framing impulses, means to receive the said impulses, means responsive to the framing impulses to produce a frame image, and means responsive to the character impulses to produce character images, and means whereby said character images are positioned within the said frame image.

8. In a system of the character described, means to transmit character impulses, means to receive said impulses, a continuously rotating character wheel with character representations disposed thereon, a movable fluorescent screen disposed near said character wheel, and means energized by said character impulses and cooperating with the said character wheel to produce character images at the receiver, and means whereby said images energize said fluorescent screen.

WALTER S. LEMMON.
CLYDE J. FITCH.