

Sept. 25, 1934.

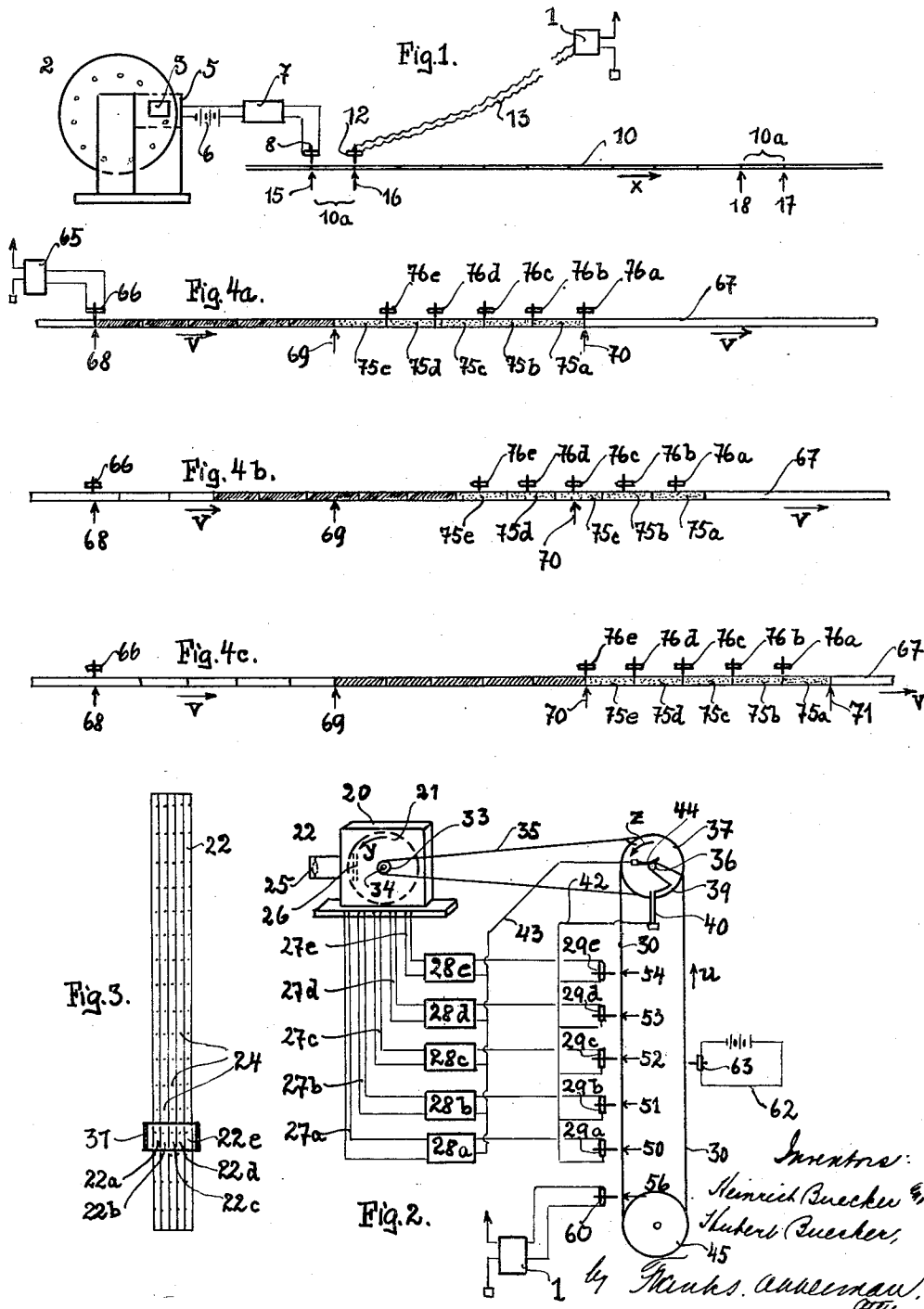
H. BUECKER ET AL

1,974,911

TELEVISION

Filed Dec. 27, 1930

2 Sheets-Sheet 1



Sept. 25, 1934.

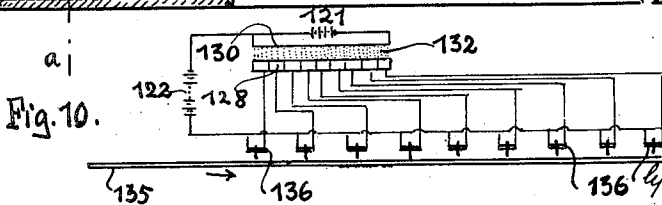
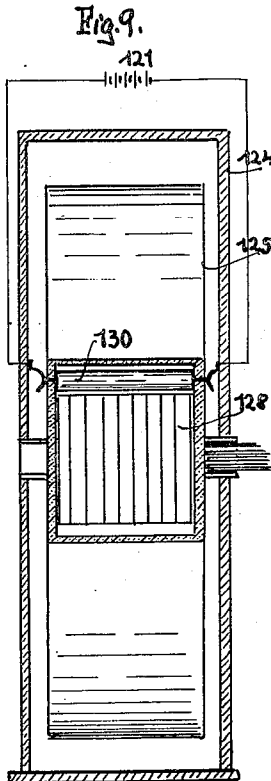
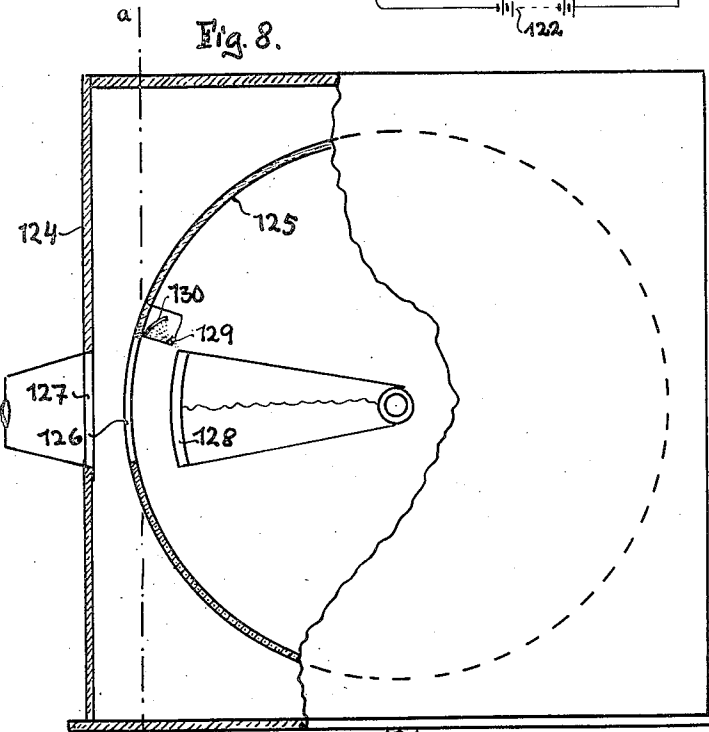
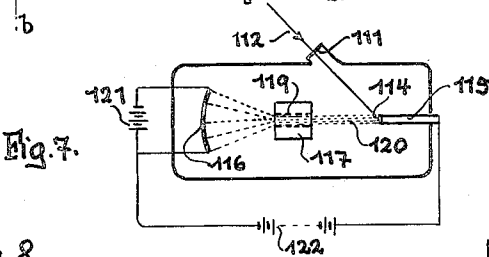
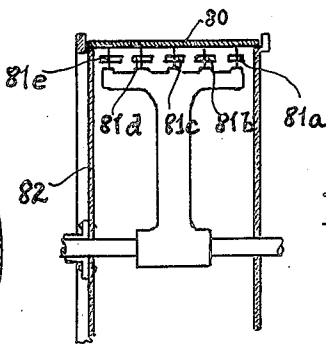
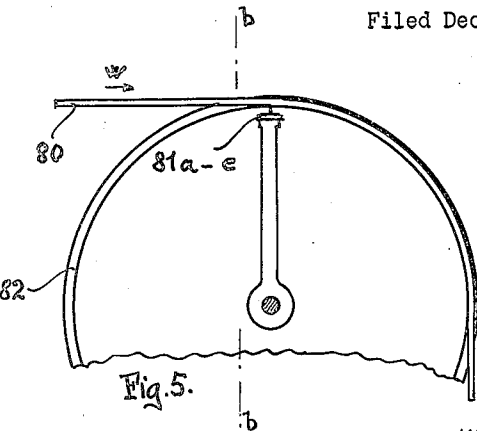
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

1,974,911

TELEVISION

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Application December 27, 1930, Serial No. 505,144
In Germany December 27, 1929

3 Claims. (Cl. 178—5)

Our following invention relates to television. With the usual type of television systems, it has been customary to use a selenium or other light sensitive electrical resistance in connection with a scanning disc or, as it is called, a Nipkow disc.

Such a disc consists of a thin flat sheet having a series of perforations equally spaced along a spiral line and is revolved very rapidly between the object or objects the image of which is to be reproduced and the light sensitive resistance, so that the current flowing through the resistance varies with the intensity of the light emitted or reflected from the object. Poulsen, in his U. S. Patent No. 783,728, has shown that such variable currents may be caused to magnetize a moving wire or band with the strength of the magnetic effect proportioned to the current strength and that such a variably magnetized wire or strip may be caused to effect reproducing of the primary cause through suitable apparatus. Also Ritchouloff, in U. S. Patent No. 1,771,820 shows that the so-called "Poulsen effect" may be utilized in television. It will be noted that in Ritchouloff an electro-magnet is used to produce the Poulsen effect and that a second electro-magnet is used to transform the magnetic action of the wire into current impulses which are arranged to affect the illumination of a screen or photographic plate or film.

Heretofore, however, the timing of the magnetic impulses for producing the image has been synchronized with the timing of the current impulses magnetizing the wire. That is to say, the wire is moved relatively to the second magnet at the same speed at which it moves past the first magnet. Now the speed with which the scanning disc revolves is necessarily so rapid that the magnetic effects on the wire, even when amplified by suitable means, are quite weak and consequently the image produced is dim and is not usually sufficiently brilliant for proper photographic reproduction or even for direct vision, especially when the objects in front of the scanning disc are moving. This dimness of the image produced is caused by the rapidity of the changes in the current strength. We have discovered that prolonging the effect of the magnetized wire on the second or reproducing magnet greatly clarifies and brightens the image so that such image is well suited for photographing and for direct vision.

The principal object of the present invention is therefore to provide an improved method and apparatus for the production of images by tele-

vision wherein the action of the Poulsen effect produced in a wire will be greatly prolonged in producing the image.

With the above and other objects in view, the invention consists in general of an improved method for this purpose and of certain novel details of construction and combinations of parts hereinafter fully described, illustrated in the accompanying drawings and specifically claimed.

In the accompanying drawings, like characters of reference indicate like parts in the several views, and:—

The several views show in a schematic way several embodiments of the invention.

Figure 1 shows the basis-scheme, the apparatus being provided with only one scanning device on the side of the sender.

Figure 2 shows the scheme for a receiving-device wherein the image is subdivided into several partial images.

Figure 3 shows the image window of the casing with the surface of the dividing drum developed from the showing in Figure 2.

Figures 4a to 4c show the schematic diagram for using the steel band in the receiver, when the sender has the arrangement shown in Figure 2.

Figure 5 shows the scheme of another magnet-arrangement with a wide steel band.

Figure 6 is showing a partial cross section, approximately on the line b—b of Figure 5.

Figure 7 illustrates the basis-principle for utilizing a selenium-anode scanned by an electronic stream.

Figure 8 shows the arrangement of a selenium-anode in a dividing drum, subdivided into single strips.

Figure 9 shows a section, substantially on the line a—a of Figure 8.

Figure 10 shows the method of adjustment in an apparatus with several single magnets cooperating with the steel band.

Figure 1 illustrates in a schematic way the basic principle of the present invention, we, having omitted details which are unessential with respect to the invention. The sending apparatus is indicated in general at 1, 2 indicates a scanning device (Nipkow's disc) for the image to be sent, which will be projected on the image window 3 of the Nipkow's disc 2. Behind the image window 3 there is a light sensitive resistance cell 5 (photo-cell or selenium cell) inserted in a circuit consisting of battery 6, an amplifier 7 and the winding of a stationary magnet 8. The magnet 8 cooperates with a steel wire 10 or the like, moved with constant speed in the direction of the arrow x,

whereupon according to Poulsen's method the fluctuating impulses of current caused by the varying exposure to light of the photo-cell 5 will successively effect magnetization of the steel wire.

- 5 In order to reproduce the effect of the current impulses applied, there is a second magnet 12, movable in a path adjacent to and parallel with the steel wire 10 in its longitudinal direction and moving with a speed differing from that of the steel wire. The magnet 12 is connected in a suitable way over the conductor 13 to the sender 1, so that the fluctuations in current caused by induction of the current impulses by the steel wire 10, will be delivered to the sender for the purpose of
10 modulating the effects produced by the sender.

The basic principle acts in the following way:

- Let it be supposed that the resolution of the image by means of Nipkow's disc 2 or a similar device is made within $1/100$ of a second. The current fluctuations thereby caused in the magnet winding will correspondingly cause fluctuations of magnetism and the Poulsen wire, which is moving at constant speed in the direction of the arrow x , will be magnetized by induction in accordance with the "Poulsen effect." The wire moves under the stationary electro-magnet 8, placed in the circuit of the light-sensitive cell 5. If now the image be resolved in $1/100$ of a second and at the beginning of this operation the point 16 of the wire 10 lies opposite the electro-magnet 8 and after the period of resolution is over, the point 15 is opposite to magnet 8 then the wire will have moved a distance corresponding to the distance between points 15 and 16 in $1/100$
35 of a second. During the period of $1/100$ of a second, the electro-magnet 8 in the known way has been varied in its magnetism by the fluctuations of current due to variations in resistance in the cell 5 produced by the light effects of the object, and thereby accordingly has cross-magnetized the part 10a of the steel band 10 between the points 15 and 16. When the point 15 is opposite magnet 8, the point 16 will be opposite magnet 12 and at this instant 12 will start moving directly by the side of the steel band in its running direction. The speed of the magnet 12 is a lower one than that of the steel band 10, so that the taking-off-magnet 12 will only be at point 18, when the beginning of the magnetized portion of the wire
50 previously at 16 will have reached point 17. Let us take the point 17 as being distant from point 16 ten times more and point 18 nine times more than the length of the section 10a. Thus it takes $\frac{1}{10}$ of a second, until the point 16 will have reached 17. In the same time the magnetized portion 10a will have moved past the magnet 12. Thus the magnetic effects produced in $1/100$ of a second on the wire in turn produce effects in the sender lasting ten times as long, or $\frac{1}{10}$ of a second.

- A suitable regulator (not shown) is provided so arranged that after a complete revolution of the scanning disc and the magnetization of a portion 10a of the band or wire 10 the circuit through the magnet 8 will be broken until the beginning of the magnetized portion 10a has reached the point 18, whereupon it will again be closed. Thus the circuit through magnet 8 will be alternately closed and opened and, in the example above given, each closed period lasts $1/100$ of a second while each open period lasts $9/100$ of a second.

A second magnet 12 (not shown) may be employed working in alternation with the first magnet 12 so as to permit continuous operation of the device.

- 75 In a modified form of the invention, the ob-

ject is arranged to be scanned in a series of strips or sections, the scanning of the sections taking place simultaneously and each section affecting an individual light-sensitive resistance. This arrangement enables a better reproduction because of the ability of such an apparatus to more minutely scan the object.

The form has been shown schematically by the Figures 2 and 3, wherefrom have been omitted all structural details of no importance to the invention. In place of a scanning disc, there will be used a drum 21 revolvably mounted in a casing 20, the periphery 22 of the said drum being divided into several strips, for instance 5 parallel ones, from 22a to 22e, these strips having holes 24 arranged in spirally spaced relation around the drum. The image received by an objective lens 25 will be scanned by the holes 24 of the drum 21 as it rotates, and this in several image strips, placed parallelly one by the other. Inside of the drum 21 there is a light-sensitive resistance device 26, which, according to our invention, is subdivided into several individual cells, insulated one from the other, the number of which corresponds to that of the single image strips. Each of these single cells which thus will only receive a partial strip of the whole image, is connected by a respective conductor 27a to 27e, with a respective amplifier 28a to 28e and controls a respective magnet 29a to 29e, which for their part are stationary disposed one after the other at certain intervals, longitudinally of a steel band 30. Further structural particulars being of some importance with respect to comprehensive explanation of the proceeding, will be referred to in the following description of the operation.

When the drum 21 is moving in the direction of the arrow y , the image window 31 (see Figure 3) will be divided into five partial images 22a to 22e placed parallelly side by side, by means of the scanning openings 24 arranged to form a set of Nipkow's discs. The performance of the scanning operation by means of a drum of course is only to be understood as typical of any suitable arrangement for this purpose. By means of the 5 light sensitive cells inside the drum 21, independent one from the other, an image may be resolved within about $1/50$ of a second, the drum 21 in the same time making a rotation. On the drum shaft 33 there is fitted a pulley 34 which, by means of a belt 35 drives a disc pulley 37 mounted on a shaft 36. On account of the transmission ratio $n=1:5$ the disc 32 will move one-fifth as fast as the drum 21. At the insulated periphery of the disc 37 a contact strip 39 is fitted and has an arcuate extent of only $\frac{1}{5}$ of the periphery of the disc 37.

The contact strip 39 cooperates with a stationary brush-collector 40, which is included in the circuit 42, 43 of the influencing magnets 29a to 29e. The contact strip has been arranged in such a way that a closing of the circuit only occurs in the moment of the image having been fully resolved by the drum 21.

The brush-collector 40 thereby is connected over a common line 42 with one pole of each magnet 29, while the contact strip 39 on the disc 37 is connected over the shaft 36 and a stationary brush-collector 44 cooperating with it, over a common conduct 43 leading to the amplifiers 28a to 28e. Before and after the resolution of the image the circuit leading to the magnets 29a to 29e is interrupted by the collector 40 riding on the insulated part of the periphery of the disc 37.

As already stated, the contact strip 39 will be in contact with the brush-collector 40 at the beginning of the resolution of the image. Thereby the circuit 42, 43 will be closed, and the light-sensitive cells are able to affect the electro-magnets 29a to 29e. By rotating of the disc 37 the steel band 30, arranged as an endless one and led over a second disc 45 will be moved. The electromagnets 29a to 29e mounted at one side of the steel band 30 are as distant one from the other as the contact strip 39 of the disc 37 is long. Thus the distance between magnets is $\frac{1}{5}$ of the periphery of the disc 37. By reason of this, at starting of the resolution of the image and of the steel band 30 moving in direction of the arrow *u* the various points 50 to 56 will be in the positions shown in Figure 2 relative to the magnets. After $\frac{1}{50}$ of second of decomposing work, the point 50 previously opposite magnet 29a will move to the position of point 56, point 51 previously opposite magnet 29b will move to the position of point 50, the points 52 will then be at 51, 53 at 52, 54 at 53. During the resolving time taking $\frac{1}{50}$ of a second, each light-sensitive cell influenced the electro-magnet connected with. The image-current-impulse of the first partial image and respectively of the light-sensitive cell and thus the whole image after completion of the scanning operation have now effected magnetization of that portion of the wire starting at point 56 under the taking-off-magnet 60, where the taking-off-magnet 60, connected with the sender 1 and in this case stationary, is located. Behind the part of the wire magnetized by the action of the first cell the part of the wire magnetized by the action of the second cell is located, behind the second cell the part of the wire magnetized by the action of the third cell, and so on. As each of the electro-magnets 29a to 29e magnetizes a portion of the wire or band 30 the length of which is equal to $\frac{1}{5}$ of the periphery of the disc 37, the length of the total magnetized portion of the band 30 is equal to the periphery of the disc 37 for the five cells provided.

At the beginning of the second rotation of the dividing drum 21, the contact strip 39 passes from under the brush-collector 40, whereby the circuit will be interrupted. Thus the electro-magnets 29a to 29e are dead, and the steel band 30 magnetized as above set forth, now is able to move in the direction of arrow *u*, without further magnetization. The magnetized portion of the wire on passing the taking-off-magnet 60, produces induction currents which will be transmitted to the wave-transmitter 1 in order to modulate the emitted carrier waves.

When the drum 21, after its first revolution, during which the image has been resolved, has made four more rotations, the contact strip 39 again contacts with the contact spring 40, as shown by Figure 2. Thereby the end of the magnetized portion of the band is exactly under the electro-magnet 29a. Further revolution of the drum causes a second resolution of the image in the same manner as before so that one magnetized portion of the wire joins to the next without interruption. After this second resolution has taken place, the transmitting of the first image made within $\frac{1}{50}$ of a second, has been also finished and the start of the magnetized portion of the band corresponding to the second image rests under the taking-off-magnet 60. Then the second image will be transmitted, and so on. The

arrangement thus permits a continuous working.

In the form shown in Figures 2 and 3 an endless steel band is provided as the magnetizable element. Thus it will be necessary to demagnetize the wire current impulses of image, in order to allow continuous working. For that purpose, at one side of the steel band 30, in a circuit 62, an electro-magnet 63 may be disposed co-operating with the steel band 30 and arranged to demagnetize the band, in order to prepare the steel band for the reception of further magnetization.

The first form of sender as shown in Figure 1 works with the speed of the steel band in combination to slow moving magnets; the second form shown in Figure 2 operates with stationary magnets arranged one after the other. But a large number of further forms of the invention are possible for instance with forerunning, opposite running magnets, etc. which will be of the same effect. Obviously, the second form of the device, as above described, can also be used at the receiver. So the received images, subdividing into image elements by respective reproducing cells operating independently one from the other, by using Poulsen's steel wire or the like, will be obtained in such manner that a whole image consisting of several partial images will simultaneously appear in the receiver. Figure 4 (in its sections 4a, 4b and 4c) diagrammatically illustrates the action of this form of the device when used in the receiver and this arrangement for sake of clearness is shown in three consecutive phases and demonstrations. According to the Figures 4a to 4e the electro-magnet 66 receiving current impulses from the receiving apparatus or receiver 65 effects magnetization of the steel band 67 running in the direction of the arrow *v*. As soon as the start of the magnetized portion of the wire corresponding to a complete image will have reached point 69 (Figure 4a) the transmitting of this image is finished. Therefore between the point 68, beneath the magnet 66 and the point 69 there will be, if for instance, the image transmitted is to be divided into five image sections, all the magnetized portion of the band (marked by hatching) corresponding to all the individual image strips. The previously received total image however is between the points 69 and 70, (marked by pointing.)

With the magnetized portion of the band positioned between the points 69 and 70 (Figure 4a) consisting in adjacent magnetized sections 75a to 75e of the band corresponding to the five partial images, the controlling of the reproducer cells (not shown) for the several image sections begins. Each of the parts 75a to 75e comes into operation for controlling a respective reproducer cell. Opposite point 70 in this position of the magnetized portion of the band there is a taking-off-magnet 76a, located in the circuit of a reproducer cell which reproduces a part of the total image. At the beginning of the remaining magnetized sections of the band there are the taking-off-magnets 76b to 76e.

As the steel band 67 (Figure 4a) continues to move in the direction of arrow *v*, the taking-off-magnets 76a to 76e also move in the same direction, but with delayed velocity. After the half of the movement of the band being over, that is after $\frac{1}{2}$ of a second, this magnetized portion of the band has, with the taking-off-magnets 76a to 76e the position shown by Figure 4b. From this it will be seen that the taking-off-magnets

76a to 76e have moved in the running direction u of the steel band 67, but their original position compared with steel band 67 has been displaced and delayed. After the total $\frac{1}{2}$ of a second being over, the taking-off-magnets 76a to 76e relative to the magnetized portion of the steel band 67 will take the position shown by Figure 4c. From this we learn that, owing to the delaying of the taking-off-magnet 76a, the magnetized section 75a completely passes it, so that the image magnetizing the section will influence the magnet 76a inductively. In the same manner the magnetized sections 75b to 75e have acted.

By the fact that, at the period of reproduction of about $\frac{1}{2}$ of a second, each of the taking-off-magnets 76a to 76e have been retarded sufficiently to cover their respective lengths of magnetized band, the united action of these magnets effects simultaneous reproduction of the several sections of the image.

In order to provide for continuous working, it is preferred to make the steel band roll in form of a semicircle over a drum, wherein the magnets are located, one beside the other, at the periphery of a drum arranged concentrically in the first drum, the drums being driven at different speeds. Another and more convenient method of appliance is shown by the Figures 5 and 6. Here the steel band 80 is of a relatively considerable width, whereon the individual magnetized sections of the steel band will not be arranged one after, but one by the other. Thereby the band will influence magnets 81a to 81e, disposed transversely to the moving direction w of the steel band 80 the magnets moving in circular paths inside the drum 82 bearing the steel band 80. Thereby these magnets 81a to 81e can be moved at high or low speed and even in reverse direction. The magnets may, as an alternative arrangement, be located at the periphery of the drum like the spokes of a wheel. Then the single magnetized sections of the band may be somewhat displaced, relative to each other.

This arrangement too can be used for the so-called televising film, whereby the images are made immediately visible, without any copying or developing.

In order to synchronize the transmitting and receiving devices, the steel band conveniently too can be used in the manner that a partial strip of the magnetized portion of the band will serve to disclose the magnetized points, insuring the synchronized run, which on the receiver side will be transmitted to the steel band and there detected by a suitable device.

In a similar way the new device may be used to transmit coloured images. In such case fluctuating current impulses governed by light rays, sent through a red, blue or yellow filter, are used to control the magnetizing of the band.

The Figures 7 to 10 disclose a form of the invention adapted to obtain especially strong light-electrical effects, even in cases of shortest exposure to light. This form is of special importance, if naturally happening events have to be reproduced. As already explained in the introduction, the fundamental idea of the proceeding is, to scan a selenium layer, as thin as possible, by means of an electronic ray. As we will learn later on, this form of the invention has the advantage of avoiding the discomposition of an image by a perforated disc, drum, or the like, used heretofore.

In Figure 7, illustrating the fundamental idea, 110 indicates an evacuated tube. By a lateral small window 111 the light ray 112 may fall

upon the anode 114, which is provided with a thin layer of sensitized selenium, 115. The kathode 116 can be curved in form of an arc or have the form of a hemisphere. As the electronic streams or rays emitted by the incandescent kathode (marked by hatching) move in converging straight lines, they will, in this form of the kathode, meet each other in the bore 118 of a metal sleeve of molybdenum 117 being then compelled to travel in a straight line in the direction of arrow r through a slot aluminium window 119, serving for mantling the incandescent kathode 116, to the anode 114, covered by a thin layer of selenium 115. It is known that by means of the molybdenum sleeve 117 or too by magnetic or static deflection the electronic ray can be given any form and direction desired, so that it may be used to scan a large or a subdivided selenium-anode 115. If no molybdenum-sleeve 117 is desired to be used, the selenium anode 115, according to size of its surface, should be positioned at a larger or smaller distance from the focus of the incandescent anode 116. If in this case the front surface 115 of the selenium anode 114 forms a circular surface, a hemispheric kathode 116 should be used. On a square or hexagon form of the selenium anode this can be made by flat kathode 116 curved in the form of an arc.

The action of the new selenium-electron-cell will be the following one:

By the known way the kathode 116 will be made to glow by means of a heating battery 121. The selenium-anode 114 is located at the positive pole of an anode-battery 122—other connections can be made too—the negative pole of which will be connected with the same pole of the heating battery 121. The electrons coming out from the glowing kathode 116 travel through the molybdenum sleeve 117, whereby they will become formed into a ray 120. After the electrons have passed over the mantling window 119, they travel to the anode 114, having in their passage to penetrate the selenium layer 115. Under these conditions, the anode circuit acts as if it included a reinforcing tube. If the lateral small window 111 is mantled, the selenium anode 115 will be in the dark and a uniform current flows through the anode circuit. If now a light ray 112, the effect of light of which is fluctuating, falls through the small window 111, then, according to the intensity of light, the selenium layer 115 will change its ohmic resistance, whereby the anode circuit will correspondingly fluctuate.

The light-electrical effect obtained with this form of the invention has a relatively high value, compared with other light-sensitive cells having the same surface exposed to light rays. The reason of this is, that, the selenium-electron-cell operates with the changing of the line power of selenium, whereas in alkali-cells, etc., the effect will be obtained by electronic emission of metals.

The selenium-electron-cell constructed in the prescribed way, besides its use in television, for which it is principally preferred, can be used for other purposes, where one is operating with light-electrical effect, as for sound-films, etc.

If, however, the selenium-electron-tube is to be used in television, some structural variations have to be made. The fundamental ideas of these variations are shown by the Figures 8 and 9, illustrating as an example the use of the electron tube for television, without mentioning unessential details.

To Figures 8 and 9 the image resolving drum 125 rotating in direction of arrow *p* is an exhausted hollow body of glass, or the like, which, except for a window 126 provided in the wall, is opaquely covered. The drum window 126 has the same surface area as the window 127 of a casing 124 surrounding the drum 125 and is arranged to expose to light rays the total surface of the selenium anode 128, it too having the same surface area as the window 127, through the windows 126 and 127, when these windows 126 and 127 are opposite one to the other. At the upper edge of the drum window 126 there is an arrangement according to Figure 8, where- at the glowing cathode 130 made from suitable materials is curved in form of an arc. The glowing cathode 130 extends over the total width of the drum i. e. closely above the upper edge of the drum window 126. If a molybdenum sleeve 129 is used, it has a length corresponding to the width of window. But, as already told above, it is not absolutely necessary to use a molybdenum-sleeve, as the electron-ray may be given a convenient form and direction by suitable means. It is essential to provide a uniform flat electron ray, corresponding to the upper edge of drum window 126, to be emitted from the cathode 130, on producing an anode-circuit. This anode circuit will be produced by suitable connection just in the moment when the upper edge of the drum window 126 and of the selenium-anode 128 register. The selenium anode 128 suitably can be constructed by several strips electrically insulated one from the other. (See Figure 9). Now the uniform electron ray, when meeting the selenium anode 128, as will be seen from the schematic wiring diagram, which view is taken from above, will be divided into special circuits owing to the insulation. In this diagram the pointed lines are representing the electron ray 132, extending over the width of the drum. These individual circuits can be influenced, independently one from the other, by the respective strip elements of the total surface of the anode. According to the foregoing, each of these circuits is connected to the transmitter and their fluctuations are recorded, by means of magnets 136 acting on a moved steel band 135.

If, in the foregoing manner, movable events should be taken within 1/100 of a second, then the drum 125 with the window 126 is given one tenth of a full rotation in $\frac{1}{10}$ of a second. Thereby the light coming in by the image window 127 is able to act on every point of the total surface of anode 128 for 1/100 of a second. Substantially when 1/100 of a second of exposure by light rays of any point has elapsed, or even on full exposure to light rays, the selenium anode surface 128 will be met by the electronic ray passing as a flat ray over the total width of the drum on its rotating. So every particle of the thin selenium layer 128 has nearly 1/100 of a second to transform itself from the dimming resistance to the resistance belonging to its intensity of light. The arrangement thus operates without inertia.

In the event of creeping currents arising, the single strips of the selenium anode 128 conveniently will be subdivided in such a way that each strip will be made from individual metal rods, insulated one from the other, but these rods will be electrically connected on the lower side of the strip. A leaking of the currents to the sides in the event of an undivided anode will happen very rarely, as the thin layer of selenium offers a very great resistance due to its small cross section.

For those cells where the scanning electronic ray 132 continuously will meet the same layer of selenium 128 it will be advisable to use a transparent lining-mass, as for instance, a thin transparent platinum mirror, in order to protect the layer of selenium. This arrangement will be suitable in cases where scanning is done by means of a fine mercury-ray or any other electrically conductive means, instead of an electronic-ray, when the object is to scan a metal sheet covered with selenium.

The scanning of the image by using the selenium electronic cell can also be performed by using for that operation magnetic or static fields or any other deviating possibilities for the electronic-ray.

What we claim is:

1. The method of transmitting images which includes scanning an object to produce a series of light rays, producing current variations by light rays, inducing magnetism by the current along a magnetizable strip and at a predetermined time rate, utilizing the induced magnetism to induce a second current varying in correspondence to the variations in the first current but at a time rate slower than the first time rate, thereby modulating a carrier wave, utilizing the modulated carrier wave to induce modulated magnetism in a second magnetizable strip, utilizing the magnetism of the second strip to induce a receiving current at a rate slower than that at which the magnetism is induced in the second strip, and utilizing the receiving current for the production of an image.

2. In a device for transmitting images, a travelling band of magnetizable material, a circuit including an electro-magnet fixed adjacent to said band and a light sensitive cell, a scanning device arranged between said cell and an object the image of which is to be transmitted, a second electro-magnet adjacent said band and travelling therewith but slower than the band, and a sender in circuit with the second magnet.

3. In a device for transmitting images, a receiving apparatus including a travelling band of magnetizable material, a fixed electro-magnet having its strength controlled by modulated waves and positioned to magnetize the band, a second electro-magnet in inductive relation to and travelling with said band but slower than the band, and an image producing apparatus in circuit with and controlled by said second electro-magnet.

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