

May 28, 1929.

E. WILDHABER
SENDER FOR PICTURE TRANSMISSION AND METHOD
OF SENDING PICTURES AND THE LIKE
Filed May 7, 1925

1,714,705

2 Sheets-Sheet 1

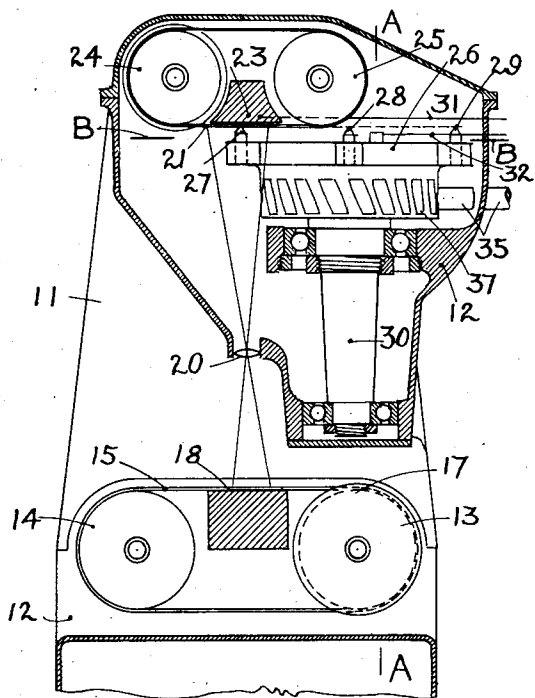


FIG. 1

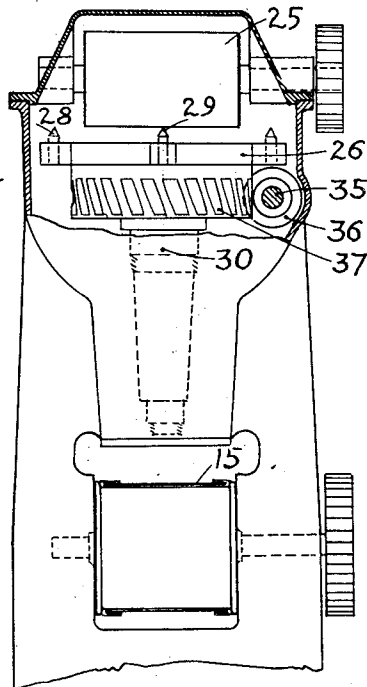


FIG. 2

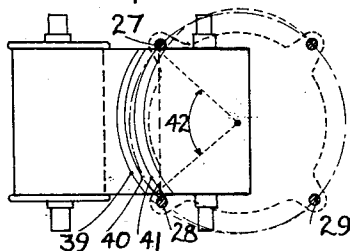


FIG. 3

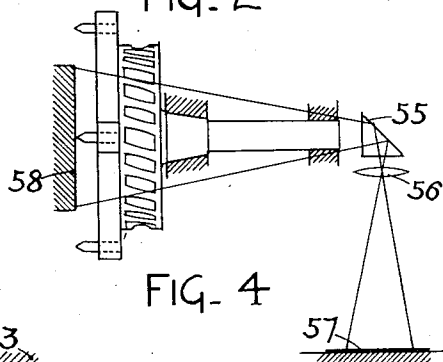


FIG. 4

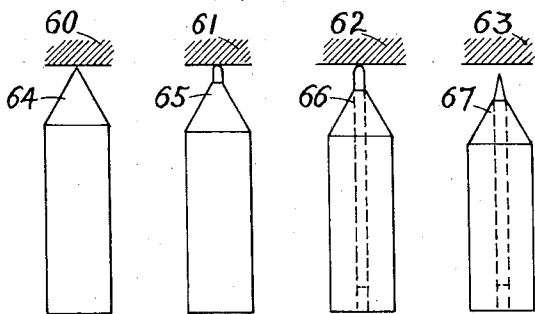


FIG. 5

FIG. 6

FIG. 7

FIG. 8

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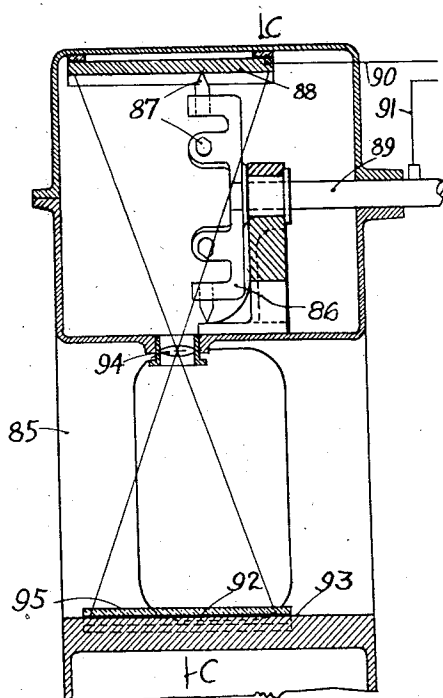


FIG. 11

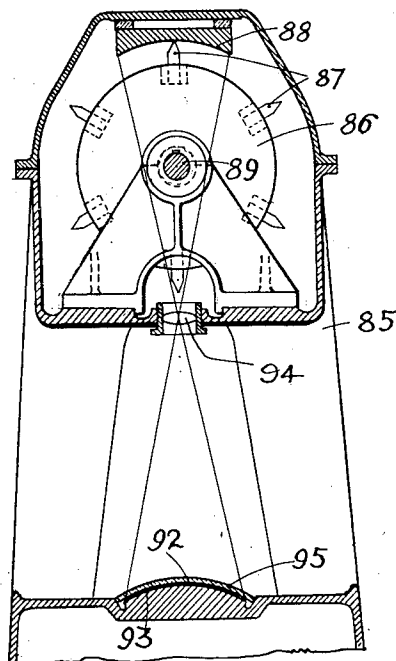


FIG. 12

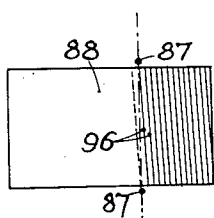


FIG. 13

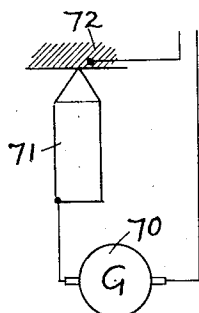


FIG. 9

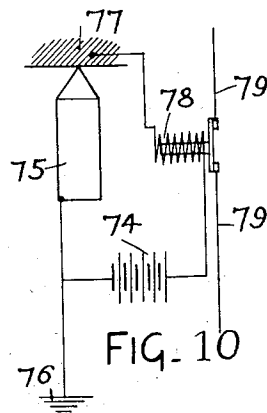


FIG. 10

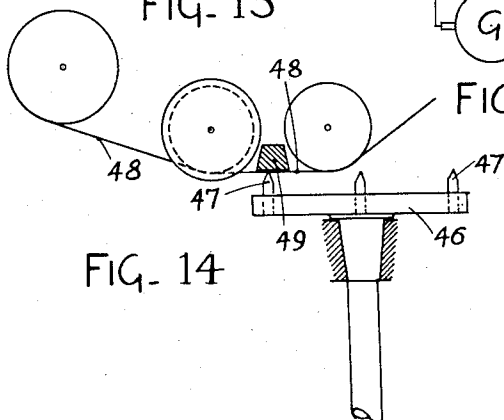


FIG. 14

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SENDER FOR PICTURE TRANSMISSION AND METHOD OF SENDING PICTURES AND THE LIKE.

Application filed May 7, 1925. Serial No. 28,631.

My invention relates to the transmission of pictures, telegrams, and the like by electricity, and is equally well applicable to transmission by wire, and to transmission by wireless telegraphy.

One object of my invention is to provide a method and means to send pictures and the like in a most direct manner and with high speed.

A further object is to provide a method and means for sending telegrams directly from a customer's original, without intermediate steps being taken. In other words, a copying transmission of telegrams is aimed at, excluding the human element, to avoid errors, while reducing cost by dispensing with intermediate steps.

A still further purpose is to provide means for picture transmission, that shall have no inertia.

Another object is to project a picture to be transmitted to a light sensitive surface, while successively applying voltage to the different points of the projected picture.

Other objects will appear in the course of the specification and in the appended claims.

Embodiments of my invention are shown in the accompanying drawings, in which

Fig. 1 is a schematic front view and section of a sender constructed according to my invention.

Fig. 2 is a side view, and partly a section along lines A—A of Fig. 1.

Fig. 3 is a section along lines B—B of Fig. 1, and partly a view, looking upwards.

Fig. 4 is a view of a modified detail of a sender.

Fig. 5 to Fig. 8 are views of electric contacts, such as may be used in senders made according to my invention.

Fig. 9 and Fig. 10 are schematic outlines of electric connections.

Fig. 11 is a front view and section of a sender, illustrating a further embodiment of my invention.

Fig. 12 is a side view, and a section along lines C—C of Fig. 11.

Fig. 13 is a diagrammatic view, illustrating the path of electric contacts and corresponding to Fig. 11.

Fig. 14 is a front view and section of a part of a receiving apparatus, which may cooperate with senders made according to my invention.

My invention has two principal applications. When applied to the transmission of pictures, by wire or wireless telegraphy, it constitutes an improvement of a known art.

Another, not less important application is the copying transmission of telegrams, whereby an original letter or telegram is automatically copied at a distant receiving station. Hitherto telegrams had to be transformed to a telegraphic key, which transmission not seldom is a cause of errors, like any human operation. In the intended copying transmission of telegrams, the said source of errors is done away with.

As will be explained hereafter, transmission of telegrams is made possible by eliminating intermediate steps inherent to the known processes of picture transmission, and by speeding up the transmitting operation.

For convenience the subject to be transmitted is referred to as a picture in the following. It is however clearly understood that this term is always used in its broader meaning, which includes letters and telegrams.

Referring to the Figures 1–3 of the drawings, the sending device 11 consists of a main frame 12, in which two rolls 13 and 14 are journaled. These rolls carry an endless belt 15, which is positively fed by any suitable means. A picture to be transmitted is fastened on belt 15 at 17, and moves then slowly with the belt over stationary table 18 which is strongly illuminated.

The illuminated picture is projected by suitable means, such as a lens 20, to a belt 21, which is positively fed over a table 23 and two rolls 24, 25. Belt 21 is provided on its outer side with a light sensitive surface or layer, which changes its electric conductivity under the influence of light. Various substances can be used for this purpose, one of which is selenium.

On its downward side belt 21 moves in opposite direction as compared with belt 15, and with the same velocity as the projected picture, whose original moves with belt 15. In other words, the belts 15 and 21 are timed up together and move with speeds proportional to the respective distances of their picture surfaces from lens 20. The projected picture is then relatively at rest with respect to belt 21.

A rotary contact carrier 26 carries electric contacts 27, 28, 29, arranged equidistant from its axis 30, and during its rotation

moves said contacts successively over the said light sensitive surface of belt 21. Inasmuch as electric voltage is applied between the inner side of belt 21 and contact carrier 26, an electric current will pass through a contact (27 in Fig. 1) and the point of the light sensitive surface immediately under it. This electric current changes in intensity with the changing electric conductivity offered by the dark and light points of said light sensitive surface, as a contact moves over them.

Although in the very moment of contact the contact member obscures the projected picture around the point of contact, the operation is not impaired, because of the time required by the light sensitive substance to change its resistance, that is to say because of the inertia of reaction. The time it would take to change the electric resistance by a substantial amount, is very much larger than the time of interference, for the contact carrier rotates at high speed.

A lighted point of the projected picture is first under the influence of continuous light. Shortly before contact is made, the projected light is split up into rapid flashes by the relatively advancing rotating contact holders. The length of the flashes compares with the length of the interruptions, as the space between adjacent contact holders compares with the width of the contact holders. (See Fig. 3.) Inasmuch as the width of the contact holders is small as compared with their distance from one another, the average intensity of light at a considered point is only slightly reduced by the moving contacts.

The inner side of belt 21 is preferably an electric conductor. Electric voltage may be applied to the inner side of said belt, or to table 23 over which said belt moves. This is schematically indicated by a wire 31 in contact with table 23. Another wire 32 is in contact with carrier 26. It is understood that the parts under voltage are suitably insulated.

Either direct current or alternating current may be used for application to the projected picture surface. In the latter case a current of high frequency is preferred.

Contact carrier 26 is rotated by a shaft 35, a worm 36 and a worm wheel 37. Preferably rotation is effected at high speed, while the motions of the belts 15 and 21 are comparatively slow, usually a small fraction of an inch per revolution of said carrier 26. The contacts 27, 28, 29 cover the picture surface 38 (see Fig. 3) along successive lines 39, 40, 41, which are substantially circular arcs. Only points situated along such lines will be transmitted, and for this reason adjacent lines should be close enough to establish a coherent picture.

It is noted that the arc of contact 42 is

smaller than the arc, for which two adjacent contacts (27, 28) are apart, so that not more than one contact is in action at every moment.

The accuracy of the transmitted picture may be increased by enlarging the projected picture, as compared with the original, as indicated in Fig. 1 by a distance of belt 21 from lens 20, which is larger than the distance of belt 15 from lens 20.

When the contact carrier 26 is rotated, and the belts 15 and 21 are correspondingly fed, a projected picture moves past the path of the electric contacts 27, 28, 29 and fluctuations in an electric current are produced by the different electric conductivities offered by the light and dark spots of the projection.

In the hitherto known senders which operate by projection of light, the various points of a picture are successively projected to a light sensitive cell. It is noted that according to my invention a whole picture area, or a whole picture, is simultaneously projected to a light sensitive surface, and voltage is successively applied to the different points of said projected area. In this way the inertia of the said surface, in adapting electric conductivity to the quantity of projected light, is eliminated, i. e. prevented from having any influence harmful to the speed of the transmission, especially so, when the projected picture is relatively stationary on the light sensitive surface. Any point of the projected picture will be exposed to its coordinate quantity of light during a comparatively long time, during which the electric conductivity can be easily and completely adjusted to the projected light. When a contact moves over a point of the light sensitive surface, the electric conductivity has been fully prepared, and immediately the coordinate amount of current will pass through.

The movements of the sender can therefore be kept at high speed. This is one of the essential factors which makes transmission also of telegrams possible. Another important feature in this connection is the elimination of intermediate steps, as will be more fully explained.

A sender cooperates with a distant receiver, such as briefly outlined in Fig. 14. A receiver contains a contact carrier 46, which corresponds to the contact carrier (26) of the sender, and whose contacts 47 sweep over a tape or band 48, which is fed in correspondence to belt 21 of Fig. 1.

Preferably the received picture is kept full size. If the projected picture of the sender is an enlargement, as shown in Fig. 1, the size of carrier 46, the width and the feed of band 48 are correspondingly reduced, as compared with carrier 26 and belt 21.

It is obvious that the rotary contact car-

rier 46 of the receiver must be accurately timed up with the rotary contact carrier of the sender. Timing mechanisms have been used in telegraphy since scores of years, so that it is not deemed necessary to enlarge upon them, especially since they are not a part of the present invention.

The carriers 46 and 26 run with the same angular velocities, and any angular position of carrier 46 corresponds to an identical angular position of the distant carrier 26. The two carriers turn therefore as if connected by a shaft. In any moment and in any position of a contact, electric energy is transmitted from the sender to the receiver in correspondence with the light or dark spots of the projected picture. This transmission may be made by wire or by wireless telegraphy. The energy impulses are suitably amplified in the receiving station, and are transmitted to the contacts 47, which imprint them to band 48 in any suitable way.

A way preferred for copying transmission of telegrams is to amplify the energy impulses and the voltage in such a way, that an electric spark passes between contact 47 and table 49, whenever a dark point is to be marked on band 48. A transmitted telegram appears then on band 48 without further steps.

It is immaterial, whether a dark point corresponds to an increased or to a decreased energy transmission, as long as the original is composed of lines or points. In the latter case a spark immediately follows a dark point, instead of being exactly simultaneous.

Fig. 4 indicates the use of a prism 55 in addition to a lens 56. This makes possible to secure certain structural advantages. A picture 57 is projected to a light sensitive surface 58, which is angularly disposed to surface 57.

In the Figures 5 to 8, the symbols 60, 61, 62, 63 denote a light sensitive surface; 64 denotes an electric contact with a sharp point; 65 indicates a contact with rounded point; 66 is a contact with rounded point and separate core. The electric contact 67 is not in physical touch with surface 63, but disposed at a certain small distance therefrom. It is well known that electricity may pass out of sharp points without actually touching a conductor. Contact 67 permits particularly high speed of the contact carrier (26), but its weaker primary current needs more amplification.

The fluctuating current obtained by successively applying voltage to the various points of a light sensitive surface are suitably amplified, and are then either transmitted by wire or broadcasted in a known way.

In the diagram shown in Fig. 9, voltage is obtained by an electric generator 70,

which produces either direct current or high frequency alternating current. The current passes through contact 71 and light sensitive surface 72, which together act in a way similar to a microphone. However, instead of sound waves, light and dark shades are transmitted.

The diagram indicated in Fig. 10 refers to direct current only. One pole of a battery 74 is connected with contact 75, and to the ground 76, if so desired. The other pole is connected with light sensitive surface 77. The current fluctuations obtained in this circuit are amplified in a relays 78, and transmitted to another circuit 79.

It is understood that the principle of my invention is independent of electric connections and combinations.

A further preferred embodiment of my invention is indicated in the Figures 11 to 13. The sender 85 contains a contact carrier 86 with radially and outwardly disposed electric contacts 87, which cooperate with a light sensitive surface 88. Said surface is curved, and forms a part of a cylindrical surface, which is coaxial with shaft 89 of contact carrier 86. In the present embodiment, surface 88 is stationary, and the contact carrier (86) is fed in the direction of its axis 89 while rotating. Voltage is applied between surface 88 and contact carrier 86 in any suitable way, such as indicated by two wires 90 and 91, the latter being in touch with shaft 89.

Picture projection is effected in a novel way, inasmuch as the picture (92) is projected to a curved sending surface (88), particularly to a cylindrical surface. I have found that a sharp picture projection can be obtained on surface 88, when the original 92 is located on a cylindrical surface 93 of equal radius and of the same direction as cylindrical surface 88. This holds also true when the projected picture is enlarged (or reduced) as compared with the original. It is noted that one of the cylindrical surfaces is convex and the other is concave.

Projection is effected by a lens 94. The original 92 is kept on cylindrical surface 93 by suitable fastening means, such as a curved glass plate 95, which is laid upon the original 92 and prevents wrinkles.

As indicated in Figure 13, the light sensitive picture surface or sending surface 88 is successively covered by contacts 87 along parallel lines 96.

It is understood that such changes and modifications may be made in my invention, as fall within the limits of the appended claims.

What I claim is:

1. In a sender for picture transmission, in combination, a light sensitive surface, an electric conductor in constant electric connection with said surface, said surface and

said conductor being relatively stationary, means for projecting a picture to said surface, means for moving an electric contact adjacent said projected picture, and means for applying voltage between said contact and said conductor.

2. In a sender for picture transmission, the combination of a light sensitive surface, means for projecting a picture to said surface, a contact carrier containing a plurality of electric contacts arranged in a circle, and means for successively moving said contacts across said projected picture.

3. In a sender for picture transmission, the combination of a light sensitive surface, an electric conductor in constant connection with said surface, means for projecting a picture to said surface, a rotatable contact carrier containing a plurality of electric contacts equidistant from its axis, means for rotating said contacts in front of and adjacent said projected picture, and means for establishing electric current by applying voltage to a contact and opposite voltage to said conductor.

4. In a sender for picture transmission, a light sensitive surface forming part of a concave cylindrical surface, and means for successively applying voltage to different points of said surface.

5. In a sender for picture transmission, a light sensitive surface forming part of a

surface of revolution, an electric contact rotatable on an axis angularly disposed to the perpendiculars of said light sensitive surface, and means for rotating said contact adjacent said light sensitive surface.

6. In a sender for picture transmission, a curved light sensitive surface forming part of a cylindrical surface, an original disposed on a curved surface, and means for projecting the original to the light sensitive surface.

7. A method of sending pictures and the like, which consists in projecting a picture to a light sensitive surface, in providing a rotatable contact carrier having a plurality of contacts equidistant from its axis, said contacts being apart for distances larger than the active width of said picture surface, in rotating said contacts adjacent the projected picture, and in providing feeding motion between said projected picture and said contact carrier.

8. A method of sending pictures and the like, which consists in projecting a picture to a light sensitive surface, and in successively moving a plurality of electric contacts across the projected picture surface, said contacts being arranged in a circle.

In testimony whereof, I hereto affix my signature.

ERNEST WILDHABER.