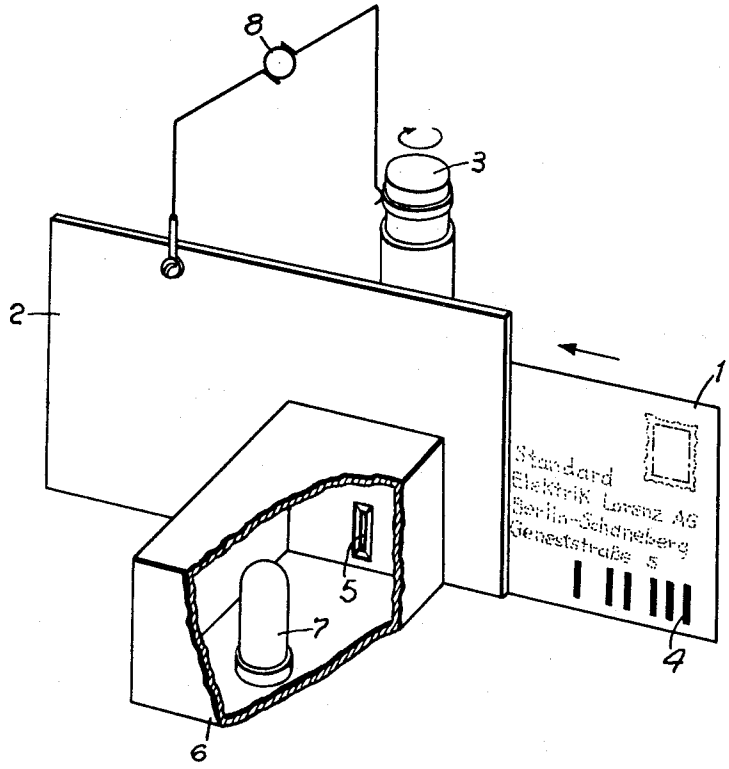
March 30, 1965 L. SCHROTH 3,176,140

PHOTOSENSITIVE DOCUMENT IDENTIFICATION APPARATUS

Filed Jan. 4, 1960



INVENTOR.
LOTHAR SCHROTH
BY
ATTORNEY

United States Patent Office 3,176,140
Patented Mar. 30, 1965

3,176,140

PHOTOSENSITIVE DOCUMENT IDENTIFICATION APPARATUS

Lothar Schroth, Berlin, Germany, assignor to International Standard Electric Corporation, New York, N.Y., a corporation of Delaware

Filed Jan. 4, 1960, Ser. No. 336
Claims priority, application Germany, Jan. 5, 1959, St 14,640
7 Claims. (Cl. 250—219)

This invention relates to apparatus for identifying articles to be sorted, such as letters, postcards, or similar objects, in accordance with destination markings on the documents which consist of either self-radiating or reflecting substances. This invention is particularly concerned with the sorting of mail items in accordance with their destinations and the means for reading their destination markings.

It is already known to provide documents, for example, securities and bank-notes, with self-radiating substances in order to protect them from being forged. Moreover it is possible to apply special markings composed of self-radiating substances to documents so that they can be scanned by photoelectric devices which, in accordance with the respective markings, provide electric signals indicative of the destinations of the documents. Such an arrangement is generally used in a conveying system which has one input and several outputs, each of the outputs being assigned a specific identification marking. The electrical identification signal provided by the scanning device is used to control the route of the scanned items through the conveying system so that the items are routed to the outputs corresponding to their destinations.

This method works well as long as the identification markings on the items to be sorted result in unambiguous electrical signals from the photoelectric devices. However, this is not usually possible as the surfaces of the documents often bear characters which are read by the photoelectric devices. These characters may be printed or written characters containing a particular color or substance which is added to the paper. For example, the bleaches used for white envelopes often result in false signals being generated.

It is also possible to employ identification markings which consist of a magnetic material for detection by magnetically responsive scanning devices. However, iron bodies (such as paper clips) contained in the envelopes often have deleterious effects upon the scanning results. These problems can be overcome by the use of fluorescent or phosphorescent substances. The use of radioactive substances is also possible and will also eliminate the described sources of error, however, these substances cannot be used in all cases.

With respect to quite a number of fluorescent substances it is known that they fluoresce by being exposed to an electric field as well as when they are exposed to light. This phenomenon is known as electro-luminescence and is used in television for image converters, image storing tubes, and fascimile records. The present invention proposes to utilize this nature of electro-luminescence materials for sorting documents such as mail items. This is accomplished by scanning the identification markings on the documents when they are in an electric field.

One arrangement for sorting articles in accordance with my invention utilizes two electrodes between which an electric field is set up. The electrodes can be disposed either on one and the same side next to each other or may be arranged on either side of the conveying path along which the items to be sorted are conveyed. The electrodes, to which an alternating voltage of about 1000 volts with a frequency of approximately 1000 c.p.s. is

applied, may be of the plane-shaped type, so that documents can be moved between them. However, in order to obtain a high field intensity without having to use extremely high voltages, it is proposed to design one of the electrodes as a roller which, with a slight spring pressure, presses the conveyed documents against the other electrode. In this way the distance between the electrodes is reduced to a minimum as it is determined solely by the thickness of the documents. If the goods to be sorted do not exceed a predetermined thickness it is possible to achieve a practically constant electroluminescence. In the case of thicker documents an embodiment might be preferred in which the electrodes are arranged on one and the same side in order to avoid both a large electrode spacing and the need to apply an excessively high voltage to the electrodes.

In order to eliminate short circuits between the electrodes they can be provided with a thin insulating layer. Also, limit stops can be provided to insure that both a maximum and a minimum spacing is maintained between the electrodes. In addition, it is possible to drive the roller-shaped electrode so that it moves the goods to be sorted through the conveying system. The electric field intensity can also be amplified in that metallic substances, for example, Fe-crystals can be embedded in the luminescent substance applied to the document.

The scanning device may consist of a photocell arranged near a slot in the plane-shaped electrode. This photocell is excited by the identification markings when they are just between the electrodes in front of the slot and luminesce due to the electric field produced between the electrodes.

Referring now to the drawing, there is shown an arrangement for identifying articles to be sorted in accordance with my invention. A letter or postcard is provided in the lower right-hand corner with a number of destination markings **4** in the shape of bar-shaped symbols arranged in a certain spaced relationship with respect to each other. These markings were applied by a special machine before the letter was fed to the sorting device and consist of electro-luminescent substances, for example, zinc- or cadmium-sulphides. The letter **1** is placed on edge and moved along on a conveyor belt (not shown). During its travel the letter passes between the plane-shaped electrode **2** and the roller-shaped electrode **3**. The roller-shaped electrode **3** is driven by the conveying system so that the letter **1**, after the scanning, is moved away from the electrodes. An alternating voltage is applied via generator **8** to the electrodes. At a position opposite the roller-shaped electrode **3**, plane-shaped electrode **2** is provided with a slot **5** which corresponds to the position, width, and height of the bar-shaped identification markings **4**. Within a special shielding or enclosure **6** near slot **5** a scanning photocell **7** comprising a radiation sampling means is arranged. It is obvious that the electric field has its highest intensity near the slot and it is here that the highest light excitation is produced by the identification markings. The light pulses received by the photocell are fed to a conventional type of identification-evaluation circuit for controlling the switches (routing devices) of the conveying system.

While I have described above the principles of my invention in connection with specific apparatus, it is to be clearly understood that this description is made only by way of example and not as a limitation to the scope of my invention as set forth in the objects thereof and in the accompanying claims.

I claim:

1. Apparatus for identifying documents having electroluminescent indicia thereon comprising: means including a cylindrical and a plane electrode for producing an

electric field; means for rotating said cylindrical electrode for propelling the documents having electroluminescent indicia thereon between said electrodes so that the electroluminescent indicia crosses the electric field which causes the electroluminescent indicia to fluoresce; sampling means adjacent one of said electrodes for sampling the presence of electroluminescent radiation; and means on said one electrode by which said sampling means can view said indicia.

2. Apparatus according to claim 1 wherein said sampling means comprises a photoelectric cell enclosed in a light shielding.

3. Apparatus for the scanning of only electroluminescent indicia on documents having electroluminescent indicia according to claim 1 wherein both said electrodes are covered with a layer of insulating material.

4. Apparatus according to claim 1 further comprising means to amplify the effect of said electric field consisting of metallic particles embedded in the said indicia.

5. Apparatus for identifying documents having electroluminescent indicia thereon comprising: means for producing an electric field, said means comprising a cylindrical electrode, means for rotating said cylindrical electrode, a plane electrode juxtaposed so that the cylindrical electrode when rotated by said rotating means draws the documents to be sorted between the two electrodes whereby the electroluminescent indicia thereon will cross the electric field, a source of alternating current, means for connecting the opposite terminals of said source respectively to the plane and cylindrical electrodes; means for detecting the presence of electroluminescent radiation comprising a photoelectric cell enclosed in a special shielding having a slot adjacent one of said electrodes and a complementary opening in said one electrode which cooperates with said slot in such a manner that electroluminescent indicia on crossing the field will be seen through this slot while it is being activated by the field.

6. Apparatus, according to claim 5, further comprising means to amplify the effect of said electric field consisting of metallic particles embedded in the said indicia.

7. Apparatus for identifying documents having electroluminescent indicia thereon comprising: means for producing an electric field comprising a cylindrical electrode, means for rotating said cylindrical electrode, and a plane electrode juxtaposed so that the cylindrical electrode when rotated by said rotating means draws the documents between the two electrodes so that the electroluminescent indicia thereon will cross the electric field, a source of alternating current, means for connecting the opposite terminals of said source respectively to the plane electrode and the cylindrical electrode; means including said electrodes for propelling a document having electroluminescent indicia thereon so that the indicia crosses the electric field which causes the electroluminescent indicia to fluoresce; sampling means adjacent to one of said electrodes for sampling the presence of an electroluminescent radiation, and said one electrode comprising means by which said sampling means can view said indicia.

References Cited by the Examiner

UNITED STATES PATENTS

1,401,303	12/21	Baldwin.
2,716,298	8/55	Spielmann.
2,908,806	10/59	Cohen.
2,933,602	4/60	Gillson.
3,092,726	6/63	Adams et al.

FOREIGN PATENTS

686,642	1/53	Great Britain.

OTHER REFERENCES

Waymouth et al.: Experiments on Electroluminescence, Physical Review, vol. 95, No. 4, Aug. 15, 1954, pp. 941–949 relied on.

RALPH G. NILSON, *Primary Examiner.*

RICHARD M. WOOD, MAX L. LEVY, WALTER STOLWEIN, *Examiners.*