METHOD FOR RECORDING FINGERPRINTS

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UNITED STATES PATENTS

1,170,273 2/1916 Jorgensen 117/0.5

ABSTRACT

A method of recording fingerprints whereby the finger is coated with a reducing agent, electro-oxidation products are generated on the ridges of the finger and the finger contacted with a recording substrate containing an indicator for the electro-oxidation products.

6 Claims, 2 Drawing Figures
**Fig. 1.**

**Fig. 2.**
METHOD FOR RECORDING FINGERPRINTS

This invention relates to a method for recording fingerprints. More particularly, this invention relates to a method of recording fingerprints which does not require inking or staining of the fingers and which can be imprinted rapidly and permanently to a variety of substrates without the need for development.

BACKGROUND OF THE INVENTION

Fingerprinting has been recognized for several decades as an excellent means of identifying one individual from all other individuals. In spite of many technological advances which have been made in other areas of identification, the method of fingerprinting still in most widespread use involves a laborious process whereby printer's ink or black ink is coated on an inking slab, the fingers are pressed firmly onto the slab so as to completely coat the fingers with the ink, and then the fingers are pressed firmly onto the substrate upon which the prints are to be recorded. Removal of the ink from the fingers thereafter is a tedious and inconvenient procedure.

One of the characteristics of present day business life is a decreasing use of cash and an increasing use of substitutes such as checks, credit cards and the like. Unfortunately, this has created an increased opportunity for forgeries, use of bad checks, fraudulent credit card purchases and the like, particularly in view of our highly mobile society where local merchants no longer are personally acquainted with their customers. Thus the prevention of these crimes is of prime concern to the business community and it would be highly desirable to be able to provide a method and apparatus for recording fingerprints which is convenient enough and rapid enough so that a merchant could record the fingerprints of customers making noncash purchases on the spot. Such recording would have an inhibiting effect on the would-be criminal, who would have to leave behind incriminating evidence.

Various methods for recording fingerprints besides the traditional ink method have been proposed from time to time, but they have never been widely adopted. For example, U.S. Pat. No. 2,299,652 discloses a chemical fingerprint recording method whereby the fingers are contacted with a solution containing a colorless chemical and applied to a paper which has been impregnated with an indicator solution. This method eliminates the use of ink on the fingers but requires special solutions and a supply of treated paper. This method has the further disadvantage that the prints are subject to fading and to reversible reactions with contaminants in the environment.

U.S. Pat. No. 2,736,114 employs a similar method with a paper impregnated on one surface with an indicator and coated on the other surface with an adhesive. The adhesive enables the paper having the print on one side to be affixed to an instrument such as a check or note. However, the danger of loss or separation of the affixed paper during handling is apparent.

U.S. Pat. No. 3,408,217 discloses an electrical system for recording fingerprints whereby a charge is deposited on an insulator in a pattern corresponding to the fingertip ridges by passage of an electric current through the fingers. The prints are then developed using xerographic techniques. However, this method requires bulky equipment which is too expensive to be employed by most retain establishments.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic arrangement of an apparatus useful in the present process.

FIG. 2 is a schematic diagram of circuitry which can be employed in the apparatus.

DETAILED DESCRIPTION OF THE INVENTION

Although reference is made hereinafter particularly to fingerprints, the method and apparatus herein described is equally applicable to prints of other body extremities, such as the foot, palm and the like.

The present method for recording fingerprints comprises the steps of (1) coating the finger with a sensitive reducing agent, (2) passing a current through the reducing agent coating so as to generate electro-oxidation products on the surface of the finger and (3) contacting the finger to a recording medium containing an indicator for the electro-oxidation products. A current can be passed through the reducing agent coating as by pressing the finger to a conductive substrate connected to a source of direct current.

A preferred reducing agent-indicator combination which we have found to be sensitive, reliable and permanent is potassium iodide-starch. The finger is first coated by moistening with a solution of potassium iodide or other iodide containing solution. The finger can be immersed in the solution or, more conveniently, pressed to an absorbent material saturated with the solution, such as an ordinary stamp pad.

The coated finger is next pressed to a conductive substrate such as a plate or film connected to a source of direct current. The substrate can be any conductive surface large enough for the fingers to rest against. Suitable substrates include metal plates having a thin noble metal coating of gold, silver, platinum or the like, or glass plates having a thin, transparent conductive coating of tin oxide or indium oxide. A second finger or fingers can be contacted to a second conductive substrate to complete the circuit. The finger to be printed is contacted to the positive side of the direct current circuit. The electrical potential applied to the fingers is on the order of 20-30 volts, which is sufficient to generate the electro-oxidation products within a short period of time, but insufficient to generate any sensation in the person being fingerprinted.

Generation of the current through the finger produces electrochemical oxidation products on the finger. In the case of potassium iodide, free iodine is generated according to the equation:

\[ 2I^- \rightarrow I_2 + 2e^- \]

The free electrons pass to the anode.

The finger, now having free iodine on the surface, is then contacted to a recording medium containing an indicator. In the case of iodine, uncoated paper contains sufficient free starch or related compounds to form colored reaction products. Thus when the finger is pressed to any untreated, ordinary paper, a dense, high resolution, permanent print of the identifying ridges of the finger appears on the paper.

At a potential of about 20-30 volts applied for about 5-10 seconds, a charge of about 0.5 milli coulombs will be delivered, which will in turn produce a dense, easily readable, permanent fingerprint from the resulting...
electro-oxidation products. Since the amount of electro-oxidation product formed on the finger is directly proportional to the total charge passed through the finger (current x time), a lower current will require more time to develop sufficient electro-oxidation products. If too high a current is employed, of course, it will be detectable by the person being fingerprinted and may be uncomfortable. The current can be supplied by suitable batteries, or by conversion of regular electric current in known manner.

The above method is rapid and inexpensive and produces high quality fingerprints without the need for development and without leaving any color or obvious residue on the fingers. Fingerprints can be permanently imprinted onto checks, credit card purchase receipts, identification cards and the like, with minimal inconvenience to the person whose print is taken.

An apparatus useful for carrying out the method described above is simple, compact and inexpensive to make.

FIG. 1 is a schematic arrangement of an apparatus suitable for practicing the invention. A container for the reducing agent 1 which can be a stamp pad, is filled with a 15% aqueous solution of potassium iodide as the reducing agent. One electrode 2, a tin oxide coated glass plate, is connected to the positive side of a battery 3 by a wire 4. A second electrode 5, also a tin oxide coated glass plate, is connected to a timer switch 6 which in turn is connected to the negative side of the battery 3 with wires 7 and 8 respectively. The timer 6 turns on upon completion of the circuit and allows current to pass through the circuit for about ten seconds after which it opens the circuit. An audible or visible signal may then be emitted from the timer 6. A recording element 9 can be any uncoated paper substrate, such as a check.

Different persons have differing skin resistance and the same person's skin resistance may vary from time to time. Notwithstanding such differences and variations, it is desirable that approximately 0.5 millicoulombs of charge be delivered to the finger to be imprinted so as to develop the desired amount of electro-oxidation products thereon. Compensation for such differences and variations may, for example, be accomplished by providing, in a system having a fixed time period of charging, suitable circuitry to automatically provide a predetermined amount of current flow, i.e., a constant current circuit. Alternatively, compensation may be provided by allowing the current to vary with varying skin resistance, but automatically providing an adjusted time period of charging in order to obtain the desired total charge.

FIG. 2 is a schematic diagram of suitable constant current circuitry. As shown in FIG. 2, a first tin oxide coated glass plate 12 is connected directly to the positive electrode of a battery 14. A second tin oxide coated glass plate 16 is connected to the collector electrode 18 of an NPN transistor 20. The emitter electrode 22 of the transistor is serially connected to the negative electrode of the battery 14 through a first variable resistor 24 and a timer switch 26. The anode of a Zener diode 28 is connected to the juncture between the resistor 24 and the timer switch 26 and the cathode of the Zener diode 28 is connected to the base electrode 30 of the transistor. A second variable resistor 32 is connected between the tin oxide coated glass plate 12 and the transistor base electrode 30.

In operation of the circuit of FIG. 2 the variable resistors 24 and 32 are adjusted so as to open the circuit when the appropriate amount of charge has been delivered.

Although the resistance between the two plates 12 and 16 may vary by a factor of 2 to 3, the current flowing between the two plates will be only slightly affected, thereby providing a predetermined total charge at the finger in question. Thus, the desired number of molecules of free iodine will be formed on the finger to be printed in the prescribed time, which in turn will permit a uniform imprint on the recording medium independent of the individual skin resistance.

We claim:

1. A method of recording prints of the body extremities which comprises
a. coating the extremity to be recorded with a reducing agent,
b. passing a current through the reducing agent coating so as to generate electro-oxidation products on the coated extremity and
c. contacting the extremity with a recording medium containing an indicator for the electro-oxidation products to form a permanent image of said extremity on said recording medium.

2. A method according to claim 1 wherein the reducing agent is potassium iodide.

3. A method according to claim 2 wherein the recording medium is untreated paper.

4. A method of recording fingerprints which comprises
a. coating one or more fingers to be printed with a solution containing potassium iodide,
b. pressing the coated finger or fingers onto a conductive substrate connected to the positive side of a direct current power source,
c. placing another finger or fingers on a second conductive substrate connected to the negative side of the power source, thereby generating free iodine on the surface of the finger or fingers to be printed, and
d. contacting the finger or fingers to be printed onto a starch-containing recording medium to form a permanent fingerprint on said recording medium.

5. A method according to claim 4 wherein the recording medium is untreated paper.

6. A method according to claim 4 wherein the direct current power source delivers about 0.5 millicoulombs charge to the finger.