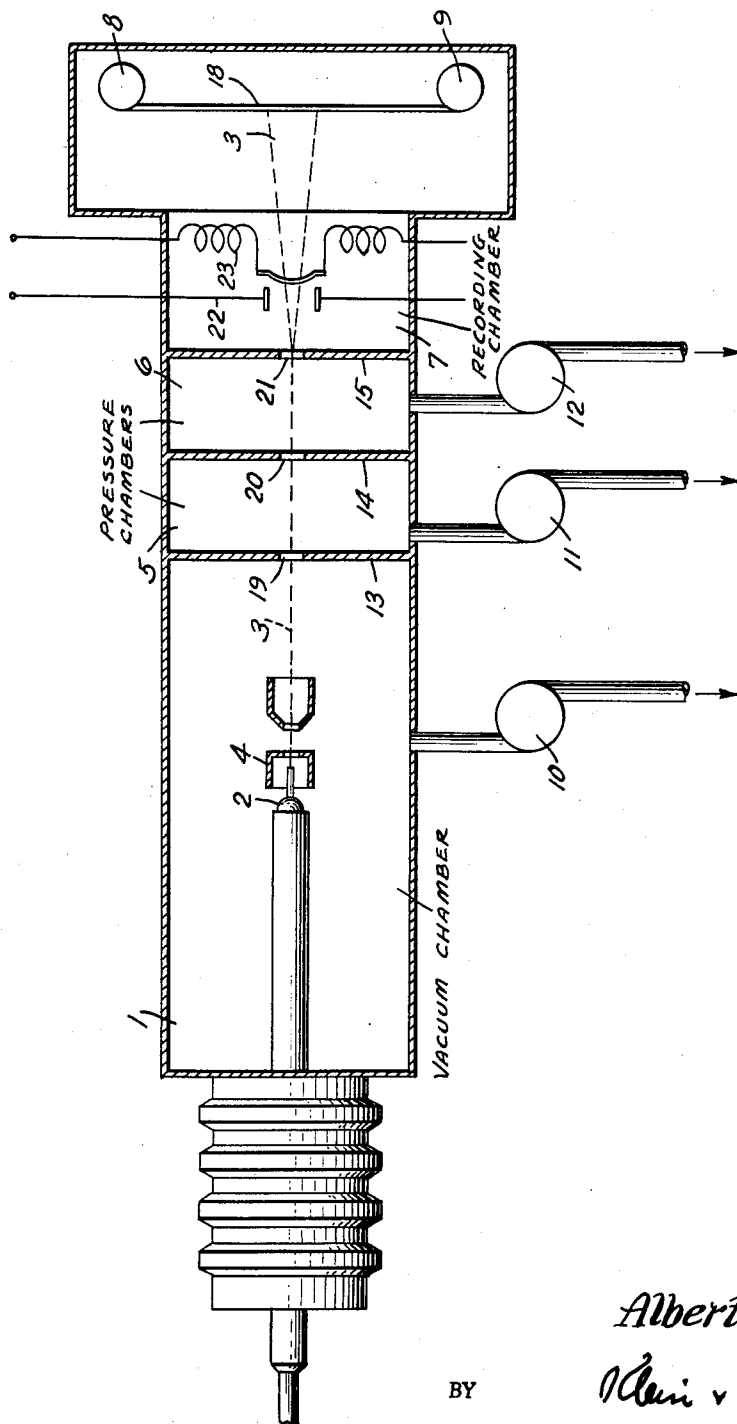


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 PRODUCTION OF PERMANENT PICTURE AND WRITING
 CHARACTERS BY MEANS OF ELECTRON BEAMS
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PRODUCTION OF PERMANENT PICTURE AND WRITING CHARACTERS BY MEANS OF ELECTRON BEAMS

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8 Claims. (Cl. 346—110)

The invention provides a method for the production of permanent picture and writing characters by means of corpuscular beams on a base of any desired material. According to the invention the support to be coated which may consist of a material such as paper, synthetic resin, ceramic materials, or metals having a surface structure capable of being modified, is interposed into the path of a sharply concentrated corpuscular beam, and picture generating contrasts are produced by intensity variation of the corpuscular beam and mutual movement between the corpuscular beam and the support on which at the irradiated point the picture or writing characters are to be produced.

There are various possibilities for realising the idea of the invention. Thus the corpuscular beam which preferably is an electron beam, may be arranged to oxidise, decompose, or vary chemically in some other manner, the surface of the support to be provided with picture or writing characters. In two-layer or multi-layer picture supports the individual layers may be arranged to be removed more or less by the energy of the impinging electrons or other corpuscles, so that, provided the structure or colour of the individual layers is different, black-and-white or multi-colour contrasts are produced after the lower layers have become exposed according to the intensity of the corpuscular beam. For example one may even produce multi-colour contrasts on a support prepared by vapour deposition of only a single dielectric layer of a thickness of 0.1 to 1μ by modulating the corpuscular beam in such manner that after removal of the surface elements by the beam, thicknesses of the layer are left which will show interference colours corresponding to the remaining thickness.

It is also possible by the method of the invention to remove or oxidise at the irradiated point thin metal layers, applied upon a support, and thus to produce picture contrasts.

Particularly economical is the use as picture support of plain paper having no additional layers whatsoever. By the thermic energy conveyed by the electron beam the organic material of the paper will be superficially decomposed or carbonised so that the writing will appear black in contrast to the non-irradiated paper surface. Apart from plain black-and-white effects it is also possible to produce different graduations of blackening by a corresponding intensity control of the beam. When employing corpuscular beams of somewhat high energy and good focussing, writing velocities in the order of 100 metres per second and more may be reached on ordinary paper. Since the electron beam can be modulated in an inertialess manner, the invention permits, for example, fully to utilise this high writing velocity in radio picture telegraph and telewriting receivers. A standard quality radio picture can thus be built up in a few seconds.

When employing ordinary paper, a thin carburised line is produced as the track of the beam. One may, however readily for example, by treatment of the paper

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surface with temperature-sensitive colours, produce writing tracks of coloured appearance. The paper supports are preferably wound continuously during the writing from spools and are passed transversely through the beam at a suitably chosen velocity and re-wound on another spool, the relative movement in the other direction being effected by controlled deflection of the corpuscular beam. It is, however, also possible for the corpuscular beam to be deflected in an inertialess manner in two mutually perpendicular directions by means of known per se magnetic and electric devices, so that a predetermined section or strip on the support is provided with area-shaped picture contrasts.

When employing sheets of metal plate, or stone plates, as supports to be provided with pictures, printing blocks for a picture transmitted by wire or radio may be directly produced.

The writing process generally cannot be effected in the generating chamber for the corpuscular beam, since this chamber is under high vacuum conditions and the decomposition of the surface of the supports on which the pictures or writing characters are to be produced will produce vapours and gases in rather considerable quantities, which would deteriorate the vacuum and would make necessary continuous powerful pumping involving loss of time in order that a high vacuum may be produced and maintained. More particularly paper will always yield in a high vacuum great quantities of gas. Moreover the introduction of the picture material through locks into the vacuum involves considerable technical difficulty.

Accordingly the invention is preferably carried out with the help of apparatus such as that illustrated by way of example in the accompanying schematic drawing.

Corpuscular rays 3, generated in the vacuum chamber 1 by known per se means, for example, by a radiation source 2, including incandescent cathodes and concentrated and intensity-modulated by likewise known electric or magnetic devices 4, are conducted unimpeded by material windows into the writing chamber 7, which preferably is under normal atmospheric pressure, by means of a pressure-stage chamber system. The corpuscular beam in this case passes through the fine bores 19, 20 and 21 aligned relative to it, which are provided in the partition walls 13, 14 and 15, thus avoiding the diffusion losses and detrimental heating of the parts of the apparatus which are inherent in the use of material windows.

In this pressure-stage system the pressure in the individual chambers rises in a step-wise manner from the vacuum to the pressure, preferably equal to the outside pressure, which prevails in the writing chamber 7, where the support 18 that is to be provided with writing or the like is moved by means of take-up and supply rollers 8 and 9 transversely across the corpuscular beam, or where, in the case of controlled deflection of the corpuscular beam, the support to be provided with writing is scanned. The individual chambers are connected with suitable pumps 10, 11 and 12 for maintaining the appropriate pressure conditions. For this reason the quantities of gases which flow through the fine nozzles from the chambers in which gas pressure is higher into the chambers in which gas pressure is lower will not lead to an undesired increase in pressure in the chambers at the vacuum side.

This arrangement now makes possible the generation, according to the invention, of permanent writing or picture record characters on vacuum-sensitive supports, for example on paper, by movement of the latter and the corpuscular beam relative to each other in two dimensions.

The known per se electric or magnetic means 22, 23 required for the controlled deflection of the corpuscular beam in accordance with the pattern to be produced may be arranged in the writing chamber 7 immediately at the back of the passage aperture 21. The method according to the invention, due to its simplicity and multilateral adaptability, has advantages which are of great importance in practical use.

I claim:

1. A system for the production of a permanent record, 10 comprising a vacuum-tight casing defining a chamber, means for maintaining a high vacuum in said chamber, electrical and electro-magnetic means for generating, accelerating and focussing an electron beam in said chamber, a casing defining a recording chamber, said recording chamber being under substantially atmospheric pressure, a pressure-stage system defining pressure chamber means, said pressure-stage system being connected to and arranged between the high-vacuum chamber and the recording chamber, respectively, partition walls between the high-vacuum chamber and the adjacent pressure chamber, between adjacent pressure chambers, and between the recording chamber and the pressure chamber adjacent thereto, said partition walls having minute apertures in alignment with the path of the electron 25 beam focussed through said apertures into the recording chamber, pumping means for maintaining in the pressure-stage system pressures successively increasing from the high-vacuum chamber to the atmospheric pressure in the recording chamber, a support arranged in said recording chamber in the path of said electron beam, means for deflecting the electron beam in the recording chamber in accordance with a record pattern to be produced, the support having an electron-sensitive surface capable of being modified to produce said permanent record by 30

contrasts generated in said surface, and the support being arranged close enough to the aperture in the partition wall between the recording chamber and the adjacent pressure chamber to maintain a sharply concentrated electron beam at any point of the support where the deflecting means guides the beam.

2. The system of claim 1, comprising means for modulating the intensity of said electron beam.

3. The system of claim 1, wherein said electron-sensitive support surface is paper.

4. The system of claim 1, wherein said electron-sensitive support surface is a temperature-sensitive dye.

5. The system of claim 1, wherein said electron-sensitive support surface consists of multiple surface layers, whereby a multi-colored record may be produced. 15

6. The system of claim 1, wherein said electron-sensitive support surface consists of thin dielectric layers, whereby a multi-colored record may be produced.

7. The system of claim 1, wherein said electron-sensitive support surface is carried by a metal printing plate. 20

8. The system of claim 1, wherein said electron-sensitive support surface is carried by a lithographic printing plate.

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