Dec. 16, 1941. K. THÖM 2,266,287

METHOD OF MAKING DISKS FOR GENERATING ELECTRICAL IMPULSES

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FIG. 1

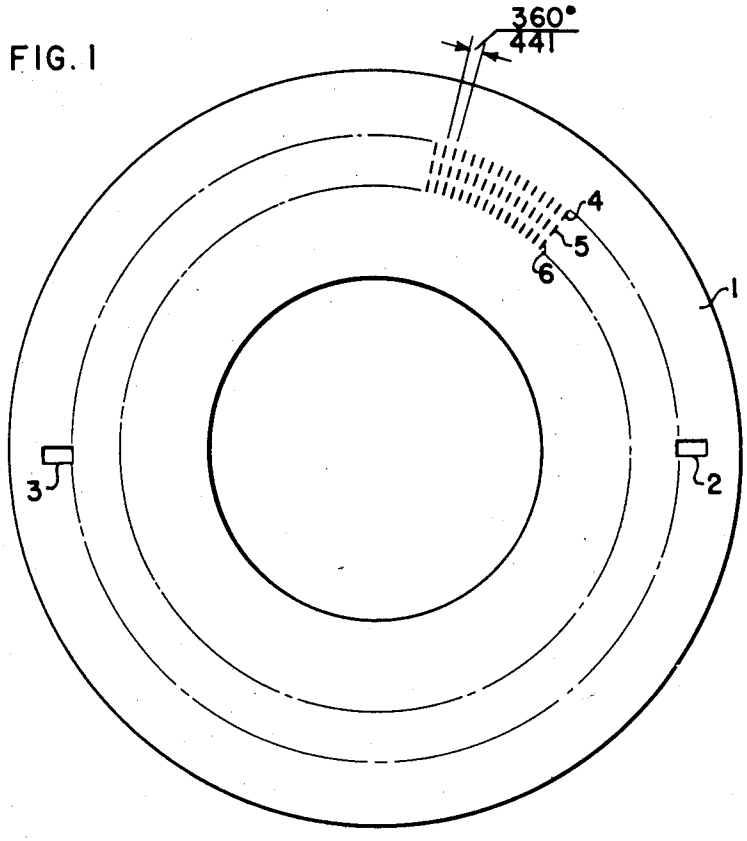
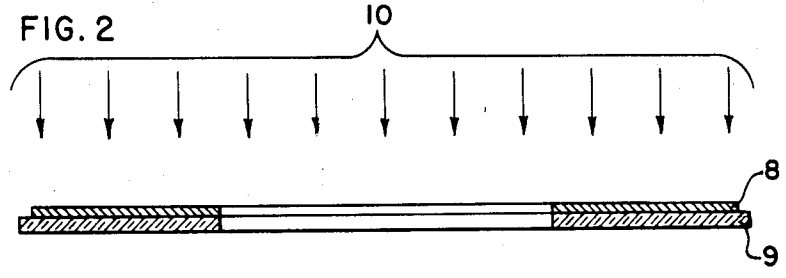


FIG. 2



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METHOD OF MAKING DISKS FOR GENERATING ELECTRICAL IMPULSES

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1 Claim. (Cl. 95—5)

The invention relates to improvements in the manufacture of rotating disks used in electro-optical arrangements for generating impulses in electrical systems as television, electrical signalling, telephotography, etc. In circuits for electrical signals in general and especially in circuits for television transmission there are often required periodical electrical signals of a definite length and of a definite amplitude. Very often it is important that the time between two consecutive signals is always absolutely constant.

It is known to generate electrical signals, especially synchronizing signals, by means of rotating disks with an appropriate number of radial slots, so that at certain moments the light of the lamp will reach a photoelectric cell where an electrical signal will be generated.

The difficulties connected with the construction and manufacture of the aforesaid disks will become apparent by the following example. In a high definition television system a great number of line-synchronizing impulses will be necessary during the transmission for one picture, e. g. 441 signals in $\frac{1}{30}$ sec. for a television transmission.

To obtain a really good television picture it is desirable that the beginning of each line is situated exactly below the beginning of the previous line with a tolerance of $\pm\frac{1}{10}$ the length of a picture element. For the conventional relation 5:6 between height and length of the transmitted picture it may be assumed that one line consists of about 500 picture elements. In one second there will be transmitted 30 pictures, each picture consisting of 441 lines, each line consisting of 500 picture elements; therefore one picture element will be transmitted in $\frac{1}{6615000}$ second. If the time interval between two adjacent synchronizing signals is not absolutely constant, then the edge of the transmitted picture is not a straight line but more or less notched, owing to the faulty synchronizing of the adjacent lines. For a given maximum tolerance of $\pm\frac{1}{10}$ the length of a picture element the time interval between two adjacent line-synchronizing signals must be kept constant, the fault not exceeding $\frac{1}{66150000}$ second.

Hitherto it has not been possible to manufacture disks with the aforesaid accuracy and therefore the edge of the transmitted pictures always was notched.

It is an object of the present invention to overcome these synchronizing difficulties, thus enabling the generation of proper electrical impulses for high-definition television transmission. The present invention provides a method of manufacturing disks for generating electro-optical impulses without the above disadvantages. An object of the invention is to avoid faulty locations of the slots on the rotating disks by using the method of photographic integration.

Other aspects of my invention will be apparent or will be specifically pointed out in the description forming a part of this specification, but I do not limit myself to the embodiment of the invention herein described, as various forms may be adopted within the scope of the claim.

Referring to the drawing Fig. 1 diagrammatically shows the manufactured disk, and

Fig. 2 explains the principles of the manufacture using photographic integration.

Fig. 1 shows an elevation of the rotating disk 1. The disk contains two radial slots 2 and 3 for generating the so-called frame signals in television transmissions. The periphery of the disk between the slots 2 and 3 is covered with an opaque layer so that small irregularities of the surface (e. g. scratches) can not cause faulty signals or a noise signal. Furthermore the disk has 441 radial slots 4 which are arranged in a circle. These slots serve to generate by well-known electro-optical means the line synchronization signals which are used in television transmission. Instead of using only one circle of slots with great radial length it may be advantageous in some cases to provide several circles of radial slots, the slots of the different circles being so arranged that always one slot 4 of the outer circle is in line with the corresponding slots 5 and 6 of the other circles, respectively.

Fig. 2 serves for explanation of the basic principles for the manufacture of the above described disks without any faulty location of the radial slots. At first a master-disk 8 is made in a well-known manner of a thin metal foil and the slots are worked in with the best possible accuracy. Then the master-disk 8 is laid upon a photographic plate 9, carefully centred, after which both the master-disk and the photographic plate 9 are illuminated by parallel light rays 10 so that after the illumination there will be formed a latent image on the photo-sensitive surface of the plate 9. After the illumination the master-disk 8 is rotated with respect to the photographic plate 9, the angle of rotation corresponding exactly to the angle between two adjacent slots. In the given example the angle is

$$\frac{360^\circ}{441}$$

according to the 441 radial slots for the line synchronizing impulses. Then the master-disk and the photographic plate are illuminated again and a second latent image is formed in the photo-sensitive surface of the plate 9.

In the same way as above described the master-disk 8 is again rotated, then the plate 9 illuminated etc. until finally 441 exposures have

been made. The latent image on the photographic plate 9 will be made visible by developing and fixing the plate 9 in the well-known manner. On the resulting negative image of the slotted disk the distances between the adjacent slots are exactly equal as all faulty locations and irregularities of the slots of the master-disk are eliminated by the above described photographic method. It is then very easy to obtain photographic positive copies of the plate 9, each copy showing the same regularity and accuracy as the photographic negative.

In many cases it is sufficient to use a considerable greater angle of rotation after each illumination, the angle being equal to

$$\frac{n}{z} \cdot 360°$$

z signifying the number of the radial slots of the disc and n signifying any integer number.

The invention is not limited to the embodiment described in connection with the drawing, and many modifications thereof can be made without departing from the scope of the invention.

What I claim is:

The method of photographically manufacturing disks for generating periodical electrical pulses comprising the steps of making a master disk by providing a thin metal foil with substantially identical radial slots substantially evenly distributed in circular arrangement, the distribution of said slots being incidentally slightly inaccurate due to small inaccuracies in the manufacture thereof, placing said slotted foil upon a photographic plate, temporarily exposing areas of said photographic plate to light falling through the slots in said master disk while in stationery position, rotating said master disk through an angle equal to an integer number of average angular divisions between the centers of adjacent slots, again temporarily exposing substantially the same areas of said plate to light falling through different slots of said master disk while in stationary position, and developing and fixing said plate.

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