

PATENT SPECIFICATION

(11) 1 437 685

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- (21) Application No. 3311/74 (22) Filed 24 Jan. 1974
 (31) Convention Application No. 2 303 932 (32) Filed 26 Jan. 1973 in
 (33) Germany (DT)
 (44) Complete Specification published 3 June 1976
 (51) INT. CL.³ G03B 31/00
 (52) Index at acceptance
 G2E A20A1 A20A3 A20BX A20CX



(54) IMPROVEMENTS IN OR RELATING TO MOVIE CAMERAS

- (71) We, BRAUN AKTIENGESELLSCHAFT, a German Body Corporate, of 22 Rüsselsheimer Strasse, D 6000 Frankfurt-am-Main, Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—
- 10 This invention relates to movie cameras and to the generation of control signals therein, particularly the generation of sinusoidal signals useful for synchronising the running of the film for display in conjunction with a tape recorder for sound reproduction.
- 15 For producing such control signals it is known to employ a control frequency generator which in its structure resembles a dynamo and is driven synchronously with respect to the running of the movie camera. Such a control frequency generator requires substantial driving energy, occupies substantial space and notably contributes to the cost of the apparatus so that it is inappropriate to amateur movie cameras.
- 20 It is an object of the present invention to provide an improved control frequency generator for a movie camera which is simple in its structure and can be economically manufactured and, at the same time, requires small space and energy for its operation.
- 25 According to the present invention the running gear of the movie camera includes a rotating member of a soft magnetic material provided with a magnetic discontinuity in the circumferential direction and a permanent magnet is arranged with one of its poles in the vicinity of the region of discontinuity, sensing means for sensing the magnetic flux being placed between that region and the adjacently lying pole, which sensing means produces electrical control frequency pulses.
- 30 The sensing means may comprise a field plate the resistance of which changes with the pulsating magnetic flux so that the magnitude of the control frequency is defined by the electrical resistance of the field plate. The sensing means may alternatively comprise an induction coil, in which case the electrical control frequency magnitude is a voltage. As another alternative, a Hall generator may be used as the sensing means.
- 35 A relatively pure sinusoidal frequency can be obtained when the sensing means is fed into a filter network. Such network is preferably constructed in such a manner that the fundamental frequency is attenuated weakly, whereas the harmonics are attenuated strongly.
- 40 According to a preferred form of the invention the permanent magnet is arranged with its other pole in the vicinity of the said rotating member of the gear away from the magnetically discontinuous region. As a result, a much larger magnetic flux is produced and consequently the flux change becomes relatively large.
- 45 According to a preferred aspect of the present invention a simple structure results when the magnetically discontinuous region is a non-circular part of the shaft of the driving gear of the movie camera. With such construction there is no need for additional elements as only an appropriate shaping of a portion of the shaft is necessary.
- 50 Alternatively the magnetically discontinuous region may be in the form of a disc. It is then possible to attain a relatively large change of magnetic flux without adversely affecting the stiffness of the shaft of the driving gear. The disc may be provided with apertures.
- 55 The invention will become more readily apparent from the following description of preferred embodiments thereof shown in the accompanying drawings, in which:—
- 60 Figure 1 illustrates schematically the essential elements of the driving gear of a

movie camera including a control frequency generator,

Figure 2 is a sectional view along the line II-II in Figure 1,

5 Figure 3 is an alternative possible sectional view along the line II-II of Figure 1, and

Figure 4 is another possible sectional view along the line II-II of Figure 1 and illustrates the use of alternative sensing means.

10 With reference to Figure 1 it is seen that the driving gear arrangement of a movie camera includes a motor 1 which by means of a pinion gear 2 drives a toothed wheel 3 which is secured onto a long shaft 5.

15 The toothed wheel 3 is in operational engagement with a toothed wheel 4 having a similar number of teeth thereon and which carries secured thereto a shutter device 6 which rotates in front of a picture window 7.

20 The motor 1 is energised by means of a switch 9 from a battery 11 when a hand operable starting button 8 is depressed.

The shaft 5 is provided with a pair of recessed regions 16 and 17 which have a dimension reduced, by milling, such as can be seen more closely in the illustration of Figure 2 or alternatively in Figure 3. In the vicinity of such regions 16 and 17 the north pole of a permanent magnet 18 is placed, the south pole of which lies at a location remote from the aforementioned regions 16, 17 and near the shaft 5 so that a magnetic circuit is formed as hereinafter described. In front of the north pole of the permanent magnet 18 lies a field plate 19 the output connections of which are fed into a sine-wave shaping amplifier 15. The output voltage of the amplifier 15 is taken off at the output terminals 10.

40 The supply conductor 12 for the amplifier 15 is connected to one of the terminals of the motor 1 and when the switch 9 is actuated the amplifier becomes energised simultaneously with the motor 1.

45 During operation of the running or driving gear of the movie camera, the shaft 5 is rotating so that alternately one of the recessed regions 16 or 17 is followed by a non-recessed region 14 of the shaft 5 as it passes in front of the field plate 19. As a result, the air gap of the magnetic circuit swept by the field lines of the permanent magnet 18 will continuously change, so that the induction process taking place within the magnetic circuit will also consequently change. The resulting changes of the ohmic resistance of the field plate 19 result in an output which is then amplified in the sine-wave amplifier 15 and produces a sinusoidal output voltage.

60 It can be seen that due to the fixed coupling of the shaft 5 with the shutter arrangement 6, an alternating voltage is produced the frequency of which is in exact synchronism with the turning frequency of

the shutter arrangement 6.

The control frequency which can be taken off at the terminals 10 may be, for example, recorded on the second track of a magnetic tape and used as a pilot or clock sound, 70 while the sound to be reproduced during the showing of the film is recorded on the first track of the tape.

Figure 1 shows also an alternative embodiment in which a disc 4, provided with an aperture 23, passes in front of a rod magnet 24 on the end of which lying adjacent the aperture a Hall generator 25 is provided as a sensing means. The Hall generator develops a control frequency which is fed to 80 an amplifier similar to amplifier 15.

The recessed regions of the shaft 5, shown as of one particular shape in Figure 2, may alternatively be shaped as shown in Figure 3. From Figure 3 it is seen that the shaft 85 5 has a recessed region of an oval cross-section and, as a result, the flux change in the magnetic circuit, above described, will undergo a change which approximates a sinusoidal shape so that the sine-wave 90 shaping amplifier can be omitted or replaced by a straightforward amplifier.

Figure 4 illustrates a further embodiment of a control frequency generator according to the present invention in which instead of a field plate 19 as illustrated in Figure 1, an induction coil 20 is provided. Instead of the recessed regions 16 and 17 or 13 of Figures 1 to 3 the shaft 5 is provided with a disc 21 which has four cam-like wings or lobes formed thereon. During the rotation of the shaft 5 the lobes 22 pass in front of the induction coil 20 and the resulting change in the magnetic resistance or the reluctance of the magnetic circuit of the permanent magnet 18 causes a flux change in the vicinity of the induction coil 20 so that a voltage is induced in the coil. The induced voltage is fed to an amplifier and used for the purposes as described in connection 110 with the first embodiment described with reference to Figure 1.

The non-circular regions whether they are the regions 16, 17 or the oval region 13 or the lobes 22, serve as the means for changing the flux within the magnetic circuit. They can be disposed in alternative locations within the camera. For example, for similar purposes, one may use the teeth of the toothed wheels 3 or 4 made from a soft iron material. It is also noted that instead of providing the recessed regions 16, 17 or the oval region 13, or the lobes 22, one may similarly provide protruding portions on the shaft 5, such as iron protrusions which are 125 integral with or affixed to the shaft 5.

In the present specification, the term "a magnetically discontinuous region" refers to regions which, due to their shaping and/or to their magnetic flux-shaping properties, 130

cause a magnetic flux change during movement of the active parts of the running gear of a movie camera.

WHAT WE CLAIM IS:—

- 5 1. A movie camera having a generator for producing a picture and a sound synchronising sinusoidal control frequency, including a rotating member of the camera running gear which member is of soft magnetic material
- 10 and has a magnetically discontinuous region formed therein, a permanent magnetic having one pole thereof located in the vicinity of said region, and a magnetic-flux sensing means placed between said region
- 15 and the said pole of said permanent magnet for sensing the flux changes within the magnetic circuit during rotation of the camera gear and for producing the control frequency.
2. A movie camera as claimed in claim 1,
- 20 wherein said sensing means is a field plate or a winding on a pole-piece.
3. A movie camera as claimed in claim 1, wherein said sensing means is an induction coil.
- 25 4. A movie camera as claimed in claim 1, wherein said sensing means is a Hall generator.
5. A movie camera as claimed in any preceding claim, including a filter network
- 30 coupled to said sensing means for filtering out harmonics.
6. A movie camera as claimed in any preceding claim, wherein said permanent magnet has its other pole in the vicinity of said
- 35 rotating member away from said magnetically discontinuous region.
7. A movie camera as claimed in any preceding claim, wherein said magnetically discontinuous region comprises a non-circular
- 40 part of a shaft of said running gear.
8. A movie camera as claimed in any one of claims 1 to 6, wherein said magnetically discontinuous region comprises a disc.
9. A movie camera as claimed in claim 8,

wherein said disc has recessed and protruding regions giving rise to said flux changes in the magnetic circuit when the disc is rotated.

10. A movie camera as claimed in claim 1, wherein said camera includes a shutter device, said discontinuous region is an aperture in said shutter device and said sensing means comprises a Hall generator placed on said permanent magnet.

11. A movie camera as claimed in claim 55 1, wherein said magnetically discontinuous region comprises a pair of recessed regions provided on said rotating member of said camera gear, whereby when said recessed regions pass alternately with non-recessed regions of said rotating member in front of said permanent magnet, changes occur in the magnetic flux produced by said permanent magnet, a voltage in accordance with said flux changes being developed in the sensing means and fed to an amplifier for producing a sinusoidal control frequency.

12. A movie camera as claimed in claim 1, wherein said magnetically discontinuous region comprises an ovally shaped part of said rotating member of the camera gear which when said rotating member rotates produces a sinusoidal change in the magnetic flux produced by said permanent magnet.

13. A movie camera having a control frequency generator substantially as herein described with reference to the accompanying drawings.

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- 10 and has a magnetically discontinuous region formed therein, a permanent magnetic having one pole thereof located in the vicinity of said region, and a magnetic-flux sensing means placed between said region
- 15 and the said pole of said permanent magnet for sensing the flux changes within the magnetic circuit during rotation of the camera gear and for producing the control frequency.
2. A movie camera as claimed in claim 1,
- 20 wherein said sensing means is a field plate or a winding on a pole-piece.
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