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PHOTOGRAPHIC CAMERA SHUTTER CONTROL

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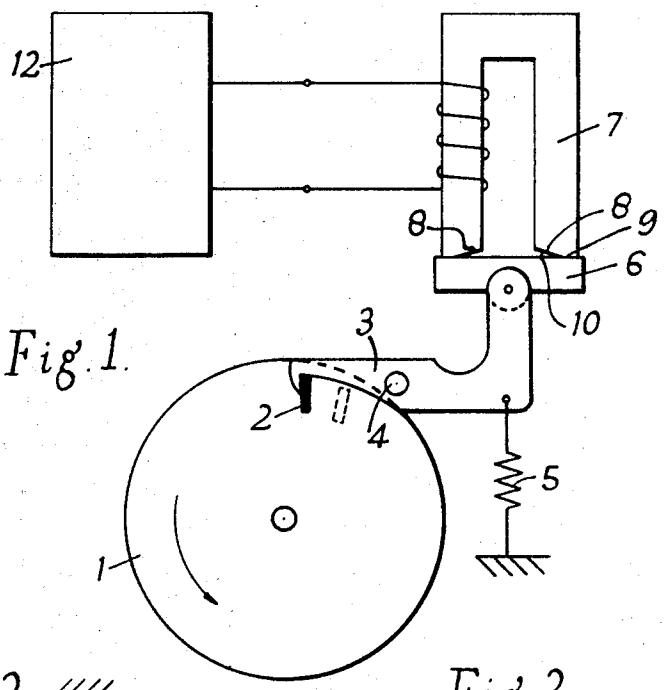


Fig. 1.

Fig. 2.

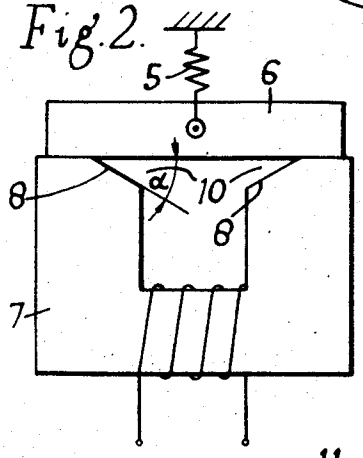
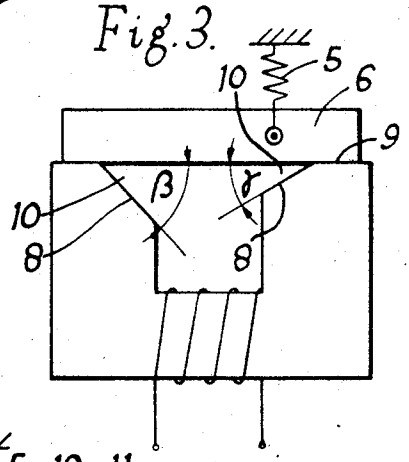


Fig. 3.



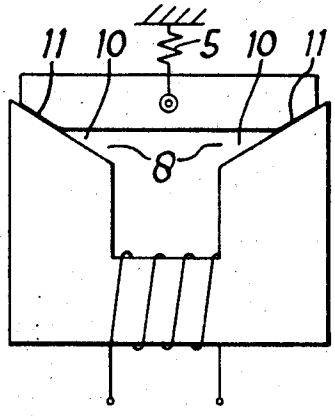


Fig. 4.

INVENTORS

ERICH HILBIG
HEINZ EHRENTRAUT
HUBERTUS REIMANN
SIEGFRIED SCHUTZE
BY Young & Thompson
ATTYS.

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PHOTOGRAPHIC CAMERA SHUTTER CONTROL

Erich Hilbig, Heinz Ehrentraut, Hubertus Reimann, and Siegfried Schutze, Dresden, Germany, assignors to VEB Pentacon Dresden Kamera- und Kinowerke, Dresden, Germany

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ABSTRACT OF THE DISCLOSURE

A camera is provided with a magnetic shutter control arrangement. The holding magnet system is arranged to release a tensioned shutter member after the elapse of a predetermined exposure time. The air gaps between the magnet poles and the amature are of different sizes in order to reduce the fall-off time of the armature on demagnetization of the magnet. The air gaps are of different sizes due to the formation of bevelled portions at the pole ends, except for narrow strips thereon. The angle of the bevelled surface to the adjoining armature surface of one pole being greater than the bevelled angle of the other pole.

BACKGROUND OF THE INVENTION

The invention relates to an arrangement for the shutter control of photographic cameras having a holding magnet system.

It is known to introduce a holding magnet into photographic cameras having electronic shutter speed control, which magnet locks the trailing shutter member for the duration of the exposure time and only releases said member after this delay time interval has elapsed and thereby terminates the exposure. In order to be able also to obtain extremely short exposure times with such holding magnet systems, the pole surfaces of the magnet or the bearing surfaces of the armature have been provided with a thin layer of non-magnetic material. This measure serves for clipping the magnetisation curve of the magnet system for the purpose of making a small remanence effective and thus of enabling a shortest possible fall-off time of the magent armature to be obtained. The same purpose is served by another known construction, in which the rounded portion of an armature comprises a non-magnetic covering and bears with the said covering against the flat pole surfaces of the magnet.

These known magnet systems have various disadvantages. In the former case, pole shoes and armatures contact one another over a relatively large area, so that extremely small fall-off times cannnot be obtained without high detachment forces, despite the existence of a non-magnetic intermediate layer, since the close adhesion of the armature to the pole surfaces prevents an unretarded falling off. In the case of the rounding of the armature, a linear bearing surface is obtained between the armature and pole surfaces. The compressive stress occurring in this case along the line of contact is so great, with the necessary high bearing forces, that gradual deformation occurs as a result of exceeding the permissible compressive stress of the comparatively soft magnetic material being used. With extremely short exposure times, however, already minute changes in the bearing conditions cause deviations of the fall-off time and thus also of the exposure time which can no longer be tolerated.

Common to both magnetic systems is the additional disadvantage that the layer thicknesses of the applied non-magnetic coatings cannot be kept constant to the necessary degree from one system to the other. This has

the result that individual adjustments must be made with all cameras as regards the desired fall-off time.

It is also known to arrange one or more air gaps between the armature and pole, by the pole surfaces being provided with closely adjacent depressions or by projecting pins of elastic material being let into the pole surfaces.

Systems have also become known in which the laminated magnet is composed of magnetic surfaces of different lengths, which are assembled in various forms.

The last-mentioned principles of the magnet systems cannot be carried into effect with magnets provided for use in photographic cameras, on account of the small dimensions of the cameras, and in addition they are costly to manufacture.

The object of the invention is to provide a magnet system which will be simple to produce and which, with considerable holding force in relation to the detachment force, will ensure the minimum fall off times, which will be constant, independently of the number of switching operations carried out, and with a number of different magnet systems to be produced. In addition, the fall off times are only to be subject to a minimum range of deviation.

SUMMARY OF THE INVENTION

The invention enables this object to be achieved by a system in which the pole surfaces of a U-shaped magnet form, with the armature surface resting against them, wedge-shaped air gaps of which the angle of one is larger than the angle of the other. These wedge-shaped air gaps ensure that the armature will fall away without retardation, with only a small range of deviation, when the feed to the magnet is interrupted, and also ensure a considerable holding force. To ensure constant overlap areas, despite the mobility of the armature, due to the universal suspension, one of the opposite surfaces of armature and magnet is larger than the other.

The invention is hereinafter expalined by reference to constructional examples in the drawings, wherein:

FIGURE 1 illustrates the principle of the shutter member locked by a holding magnet system;

FIGURE 2 is a holding magnet with bevelled pole surfaces;

FIGURE 3 is a holding magnet with pole surfaces bevelled at different angles of inclination;

FIGURE 4 is a holding magnet with bevelled armature and pole surfaces.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

According to FIGURE 1 a wheel **1** which is under spring action and which is connected to the trailing or followup shutter member is provided with a pin **2**, which is to be brought into connection with a locking lever **3**. This lever is mounted on a shaft **4** and is adapted to pivot against the action of a spring **5**. An armature **6** is universally suspended on the locking lever **3**. Arranged opposite the said armature is an electromagnet **7** of which the pole surfaces **8** are bevelled relatively to the active armature surfaces, except for a narrow strip **9**, so that a wedge-shaped air gap **10** is provided between each pole surface and the armature. The bevelling of the pole surfaces is produced by a simple grinding operation.

In FIGURE 2, the holding magnet is shown separately with its pole surfaces bevelled at an angle α.

FIGURE 3 shows a holding magnet, in which the pole surfaces subtend different angles β and γ with the effective armature surface and thus form wedge-shaped air gaps of different sizes.

The armature **6** is mounted outside the centre of said armature on the locking lever **3**.

According to FIGURE 4, the pole surfaces are provided with a bevelling throughout their length and the armature is also bevelled, so that both surfaces again bear one against the other in the region of a narrow strip **11**. The electromagnet is fed through an electronic time switch **12** which establishes the exposure.

The operation is as follows:

On setting the shutter, the wheel **1** which is connected to the trailing or follow-up shutter member is moved against spring force and in the direction opposite to that indicated by the arrow until the locking projection **2** connected to this wheel reaches the position shown in broken lines in FIGURE 1 and is separately fixed in this position. At the same time, by means of the shutter tensioning gearing, the locking lever **3** is pivoted against the action of the spring **5** about the shaft **4** until the locking lever moves with one of its ends into the range of movement of the locking projection **2** and the armature **6** universally mounted on the locking lever bears against the electro-magnet **7**. In this position, the locking lever **3** is first of all stopped mechanically in a manner not shown. When the release member is actuated, this mechanical lock is released after the electromagnet **7** has been supplied with current. The locking lever **3** is now held magnetically in the locking position against the action of the spring **5** and the locking projection **2** can move in the direction of the arrow up to the locking lever **3**. At this time, the armature **6** is only bearing on the narrow strips **9** of the electromagnet **7**, while wedge-shaped air gaps **10** are disposed between the remaining active armature surface and the ground pole surfaces **8**. Since the magnetic lines of force are concentrated in the region of the narrow strips **9**, the holding force is so great with the prescribed holding current that the armature reliably remains in the locked position, even if the camera is shaken. A feature contributing to this object is also that the effective armature surface is kept somewhat smaller than the opposite magnet surface. In this way, the same bearing conditions and thus the same tension conditions are provided for the universally mounted armature **6** in any possible position thereof. There is also no deformation of the narrow strips **9**, even after a large number of switching operations, since the said strips are chosen to be just so large that the permissible compressive stress obtains in them when the armature is bearing. The effective air gaps thus remain constant. Because of the wedge-shaped air gaps **10**, the magnetisation curve is so clipped that the force of remanence of the system is greatly reduced with an increased holding force. As a consequence, the spring **5** can pull off the armature **6** without any delay as soon as the holding current of the electromagnet **7** is broken by the electronic time switch **12**. The wheel **1** of the follow-up shutter member is released just as certainly because of the pivoted locking lever **3**, so that the said shutter member can run down and the exposure is terminated.

For further reducing the deviations in fall-off time, it is expedient to prescribe the fall-off sequence of the ends of the armature. For this reason, the pole surfaces according to FIGURE 3 are ground to a different degree, so that the said surfaces subtend the angles β and γ with the armature. As a result, a different reduction in the force of remanence is produced on both legs of the magnet, so that always the same end of the armature breaks away first. This effect is further supported by the fact that the armature **6** is mounted outside its axis of symmetry. The tension spring **5** thus engages off-centre on the armature, as shown in FIGURE 3. A modification of the shape of the armature and pole surfaces in order to obtain wedge-shaped air gaps is shown in FIGFURE 4.

The operation of this magnet system is the same as that which has already been described.

We claim:

1. In an arrangement for the shutter control of photographic cameras with a holding magnet system, which releases a tensioned shutter member after the elapse of a delay time interval necessary for the exposure, and in which an air gap is disposed between the armature attracted against the force of a spring and the pole surfaces of the magnet in order to reduce the fall off time, said magnet being U-shaped and having said pole surfaces bevelled towards the adjoining armature surface in the direction of its longitudinal axis, except for a narrow strip, the angle of the bevelled surface to the adjoining armature surface of one pole being greater than the angle of the bevelled surface of the other pole.

2. Arrangement according claim **1**, wherein the pull-off force acting on the armature is operative outside the center of the armature.

3. Arrangement accodding to claim **1**, wherein one of the facing surfaces of the armature and magnet is larger than the other.

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NORTON ANSHER, Primary Examiner

L. H. McCORMICK, JR., Assistant Examiner

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