

EUROPEAN PATENT APPLICATION

Application number: **89118221.4**

Int. Cl.⁵: **G03D 15/04**

Date of filing: **02.10.89**

Priority: **05.10.88 IT 8413888**

Date of publication of application:
11.04.90 Bulletin 90/15

Designated Contracting States:
AT BE CH DE ES FR GB GR IT LI LU NL SE

Applicant: **Photo Engineering International S.r.l.**
Via Dosa, 1a
30030 Olmo di Martellago (Venezia)(IT)

Inventor: **Signoretto, Roberto**
Via Dosa 1a
I-30030 Olmo di Martellago (Venezia)(IT)

Representative: **Piovesana, Paolo**
Corso del Popolo, 70
I-30172 Venezia-Mestre(IT)

Electromechanical, intermittent operation device, particularly for photographic cutters.

An electromechanical intermittent operation device, particularly for photographic cutters, characterised by comprising:

- a direct current motor (17), the shaft (16) of which is directly coupled to a cam (15) for controlling the member (6) which is to be intermittently operated,
- a member (6) to be intermittently operated, provided with elastic means (11) which, in the absence of other external forces, maintain it in its waiting condition,
- means (22) for cyclically feeding the electric motor with an overcurrent for a time sufficient to cause it to pass beyond the half way stage in the operating cycle, and then interrupting the electrical feed,
- means (22) for short-circuiting the rotor winding on interruption of the electrical feed, and
- means (22) for feeding the rotor winding with a countercurrent pulse of such a duration as to halt the motor (17) without oscillation exactly in its waiting position.

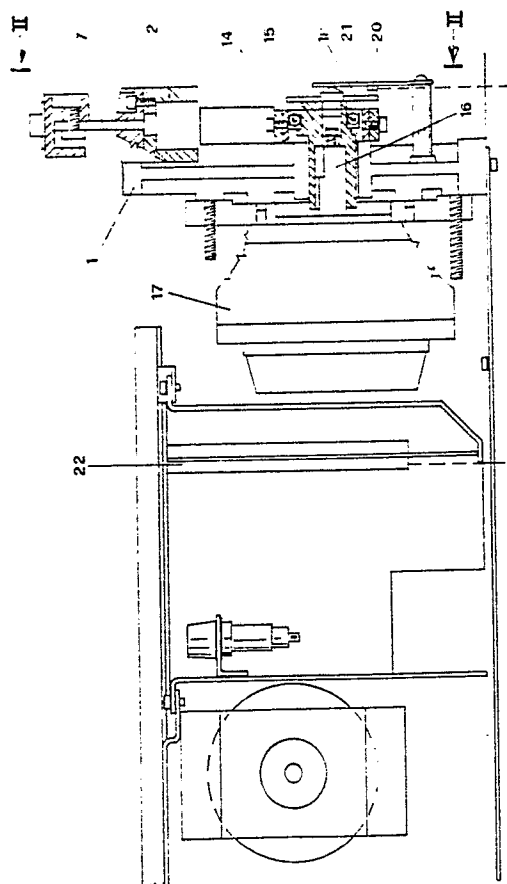


FIG. 1

EP 0 362 761 A2

This invention relates to an electromechanical intermittent operation device, particularly for photographic cutters.

In photographic laboratories cutters are known comprising a fixed blade disposed transversely to a track along which the continuous paper strip on which the photographs have been printed advances, a blade mobile vertically in the manner of a guillotine relative to said fixed blade, and a mechanism which cyclically moves the mobile blade relative of the fixed blade synchronously with the advancement step of the paper strip.

Known mechanism for operating the cutter mobile blade generally comprise a continuously rotating electric motor, a cam member which converts the rotary motion of the motor into reciprocating motion of the mobile lever, and a mechanical and/or electromagnetic clutch which periodically engages the cam member with the motor and disengages it when the motor shaft has undergone one revolution. A braking system is also provided to brake the cam member at the moment of their disengagement in order to keep the mobile cutter blade separated from the fixed blade while awaiting repetition of the cycle, to allow the paper strip to further advance between one cutter operation and the next.

One drawback of this known intermittent operating system is the high stresses to which the clutch for engaging the motor with the cam member is subjected during the life of the cutter. In this respect, a machine which operates for example at an operating rate of 20.000 cycles/hour for 8 hours per day and 200 days per year undergoes 32 million cycles per year, resulting in considerable wear and the risk of frequent breakages and faults in general.

A further drawback is the fact that notwithstanding such high stresses, a performance of 20.000 cycles/hour is not considered exceptional, even though a rate of 25.000 cycles/hour is currently considered a limit which can only be exceeded with difficulty.

A further drawback is that even though the absorbed power is low, the energy required to keep the electric motor continuously rotating and to brake the mobile parts after each cycle is certainly not negligible.

Attempts have also been made to use electric motor with periodically controlled rotation (such as stepping motors), but none of these attempts has given satisfactory results because of the low operating speed of this type of motor and the high cost involved, in that such an intermittent control system requires motors of a certain power.

Furthermore, stepping motors have to be powered during their halt periods, which means that some energy is required even to maintain rest conditions.

Finally, stepping motors require a sophisticated information system for signalling their position in the case of power interruption, in order to enable them to be returned to their initial waiting position on restoration of power.

According to the invention all these drawbacks are obviated by an electromechanical intermittent operation device, particularly for photographic cutters, characterised by comprising:

- 5 - a direct current motor, the shaft of which is directly coupled to a cam for controlling the member which is to be intermittently operated,
- a member to be intermittently operated, provided with elastic means which, in the absence of other external forces, maintain it in its waiting condition,
- 10 - means for cyclically feeding the electric motor with an overcurrent for a time sufficient to cause it to pass beyond the half-way stage in the operating cycle and then interrupting the electrical feed,
- 15 - means for short-circuiting the rotor winding on interruption of the electrical feed, and
- means for feeding the rotor winding with a counter-current pulse of such a duration as to halt the motor without oscillation exactly in its waiting position.
- 20
- 25

A preferred embodiment of the present invention is described hereinafter with reference to the accompanying drawings in which:

Figure 1 is a longitudinal section through a photographic cutter provided with the device according to the invention;

Figure 2 is a partial front view thereof on the line II-II of Figure 1.

As can be seen from the figures, the device according to the invention is applied to a conventional photographic cutter comprising a frame 1 to which a support 2 is applied for a pair of fixed blades 3 disposed parallel to each other and transversely to a track 4 along which a continuous strip (not shown on the drawings) to be cut into individual photographs advances.

Specifically, the frame 6 comprises a lower cross-member 8 which receives the movement, and an upper cross-member 9 which supports both the mobile blade 7 and the two columns 5 which connect the two cross-member 8 and 9 together.

Ball guides 10 are interposed between the bores through the support 2 and the columns 5 to produce very smooth axial sliding of these columns, and a helical spring 11 operating by expansion is interposed, about each column 5, between the support 2 and the upper cross-member 9.

In the centre of the lower cross-member 8 of the frame 6 there is provided an aperture 12 bounded upperly and lowerly by two contact plates 13, 13' against which a bearing 14 rests. This latter is mounted on a cam 15 fixed to the shaft 16 of a direct current electric motor 17, itself fixed to the

cutter frame 1.

A disc 18 from which a circular rim sector 19 has been removed is also fixed on the motor shaft 16. A reflection sensor 20 is fixed to a support 21 rigid with the machine frame 1, in a position facing the circular rim of the disc 18 from which the sector 19 has been removed.

The output of the sensor 20 is connected to an electronic circuit 22 which is connected into the power circuit of the motor 17 for the purpose stated in the following description of operation of the device.

When the cutter is in its pause state, ie while the paper strip is advancing, the position of the motor shaft 16 is such that the support frame 6 for the mobile blade 7 is at the top of its upward stroke and the motor 17 is not powered, the stability of this position being ensured by the springs 11.

In synchronism with the cutter operating cycle, as soon as the paper strip stops moving, the circuit 22 causes the electric motor 17 to fed with a higher current than the maximum allowable for the motor, this however not resulting in any damage or overheating because of the essential pulse nature of this current and the relatively long pause time between one cycle and the next.

The motor 17 rotates to lower the mobile blade 7 relative to the fixed blade, with consequent cutting of the paper strip.

At the same time this rotation of the motor 17 causes the disc 18 to rotate.

After the shaft 16 has rotated through an angle just greater than 180° , ie after the blade has terminated its descent stroke, the missing sector 19 of the disc 18 faces the sensor 20, which is therefore de-energized to cause the circuit 22 to interrupt power producing a braking effect on the motor and on the mobile parts connected to it.

When the sector 19 has passed by and the solid portion of the disc 18 again faces the reflection sensor 20, it transmits a new signal to the circuit 20, whiche feeds a countercurrent pulse to the rotor winding with a duration such as to halt the rotor exactly at the position required for the start of the next cycle.

In practice, the angular width of the sector 19, which correponds to the braking time, is determined experimentally and is fixed, whereas the duration of the countercurrent pulse is adjusted when setting up the cutter, after which it remains fixed but can be varied.

After the cutter mobile blade 7 has halted at the top of its upward stroke a command is fed for advancing the paper strip as a preliminary to the next cutting operation, during this advancement the motor being able to disperse any thermal stresses which may have derived from its overcurrent feed.

The purpose of the springs is not only, as

stated, to maintain the rest position without the need to provide energy, but also to enable said rest position to be automatically attained, again without the need to provide energy, after an accidental interruption in the power supply or any stoppage of the device outside its rest position.

From the foregoing it is apparent that the device offers numerous advantages compared with conventional devices of equal cost, and in particular:

- there is no rapid engagement-disengagement between parts running at different speeds, and therefore a lack of overall noise and a reduction in the considerable stresses which formerly limited overall reliability,
- its construction is very simple and practically no maintenance is required,
- a high operating rate of the order of 30,000 cycles/hour can be attained,
- energy consumption is low.

Claims

1. An electromechanical intermittent operation device, particularly for photographic cutters, characterised by comprising:

- a direct current motor (17), the shaft (16) of which is directly coupled to a cam (15) for controlling the member (6) which is to be intermittently operated,
- a member (6) to be intermittently operated, provided with elastic means (11) which, in the absence of other external forces, maintain it in its waiting condition,
- means (22) for cyclically feeding the electric motor with an overcurrent for a time sufficient to cause it to pass beyond the half way stage in the operating cycle, and then interrupting the electrical feed,
- means (22) for short-circuiting the rotor winding on interruption of the electrical feed, and
- means (22) for feeding the rotor winding with a countercurrent pulse of such a duration as to halt the motor (17) without oscillation exactly in its waiting position.

2. A device as claimed in claim 1, characterised in that the member to be intermittently operated is a photographic cutter comprising a support (2) for a fixed blade (3), and a frame (6) to which a mobile blade (7) is fitted, said frame (6) being mobile relative to said support (2) and being associated with said cam (15).

3. A device as claimed in claims 2, characterised in that the frame (6) intermittently operable by the cam (15) comprises a lower cross-member (8) engaged with said cam (15), an upper cross-member (9) to which the mobile blade (7) is applied, and a pair of columns (5) connecting said

cross-members (8,9) together and passing through the support (2) for the fixed blade (3), between said support (2) and said frame (6) there being interposed elastic elements (11) acting in the sense of keeping the two blades (3,7) spaced apart when other forces are absent. 5

4. A device as claimed in claim 3, characterised in that the lower cross-member (8) of the frame (6) comprises an aperture to which there are applied two plates (13,13') against which the cam (15) makes contact. 10

5. A device as claimed in claim 3, characterised in that ball guides (10) are interposed between the columns (5) of the frame (6) and the corresponding passage bores provided through the support (2). 15

6. A device as claimed in claim 2, characterised in that between the motor (17) and the external power supply there is connected an electronic circuit (22) which is controlled in synchronism with the cutter operating cycle in such a manner as to feed an overcurrent pulse to the motor (17), interrupt said pulse, short-circuit the rotor winding, and feed this latter with the counter-current pulse. 20 25

7. A device as claimed in claim 6, characterised in that to the shaft (16) of the motor (17) there is fitted a disc (18), from the circular rim of which there has been removed a sector (19) for activating/deactivating a fixed sensor (20) controlling said electronic circuit (22). 30

8. A device as claimed in claim 7, characterised in that the sensor (20) is of reflection type, interacting with the disc (18).

9. A device as claimed in claim 7, characterised in that the electronic circuit (22) comprises a member arranged to feed the electric motor (17) with an overcurrent pulse until the sector (19) begins to lie in front of the fixed sensor (20), a member arranged to short-circuit the rotor winding of said motor for the entire time during which said sector (19) faces said sensor, and a member arranged to feed a countercurrent pulse through said rotor winding for a time which commences when said sector (19) no longer faces said sensor (20) and terminates after a predetermined time which can be adjusted within said circuit (22). 35 40 45

50

55

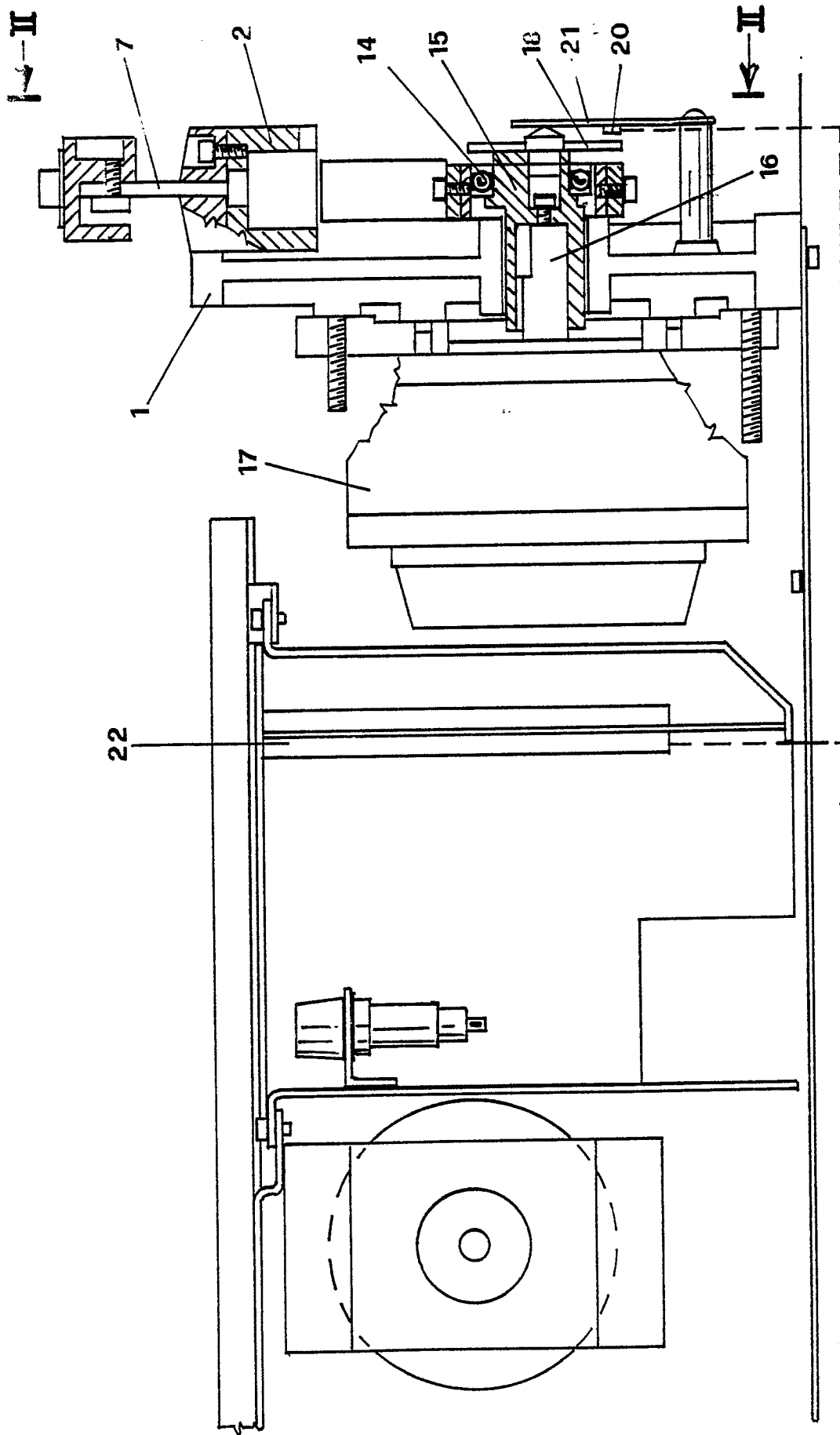


FIG. 1

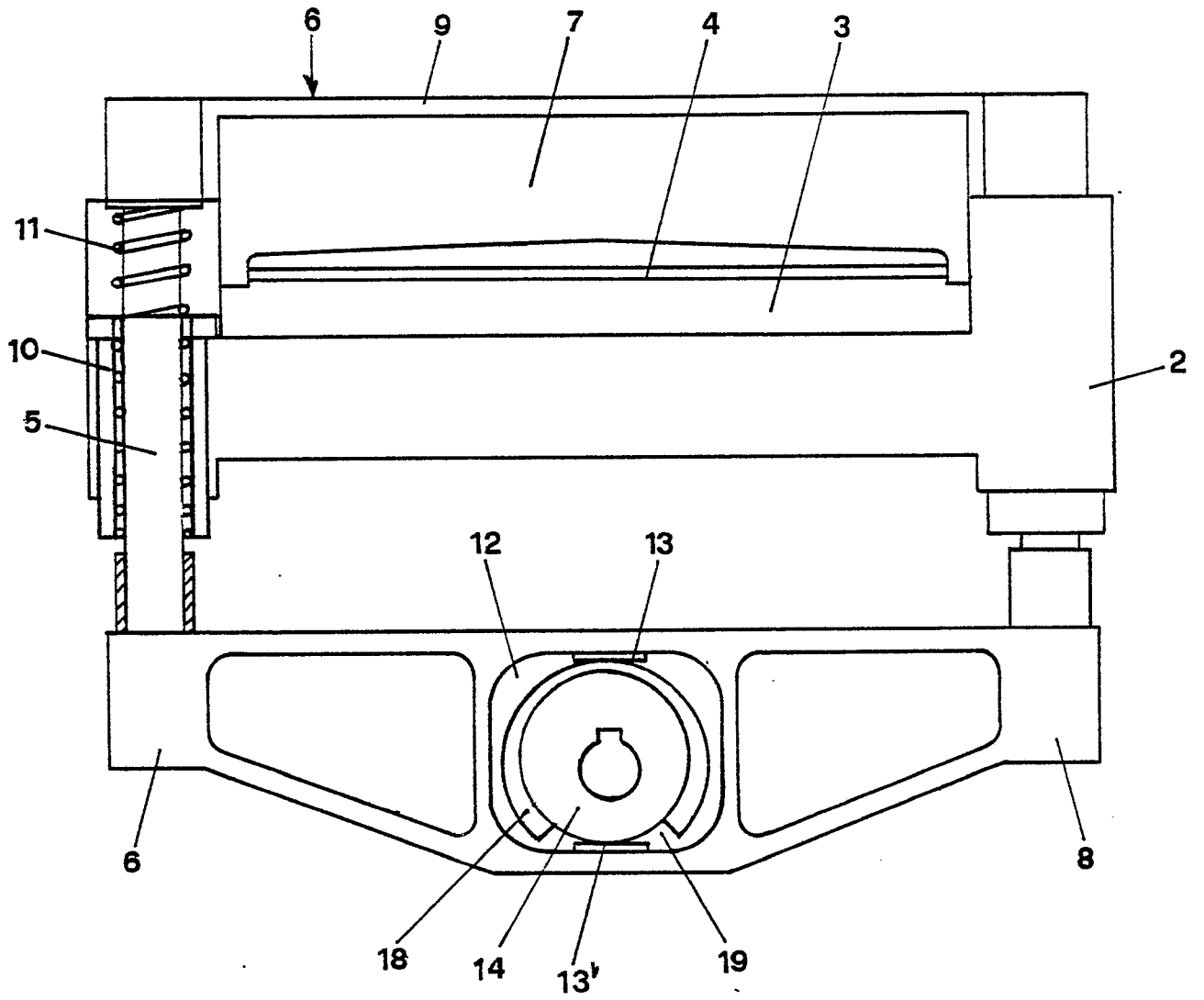


FIG. 2