

[54] **INTERMITTENT MOVEMENT FOR FEEDING FILM** 1,450,343 4/1923 Wescott..... 226/65
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[58] **Field of Search** 226/55, 56, 57, 58,
226/64, 65, 66

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[57] **ABSTRACT**
The intermittent movement comprises pull-down claw means and registration pin means. The registration pin means comprise a rocker lever having a curved tip portion which is concentric with the bearing.

12 Claims, 6 Drawing Figures

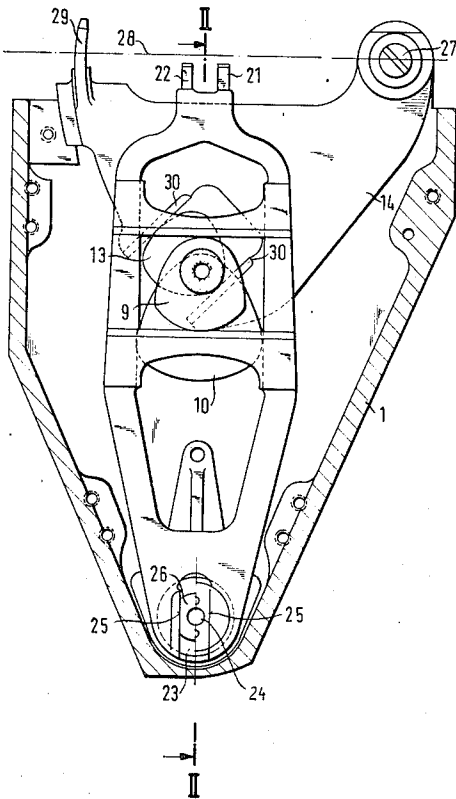


Fig. 1

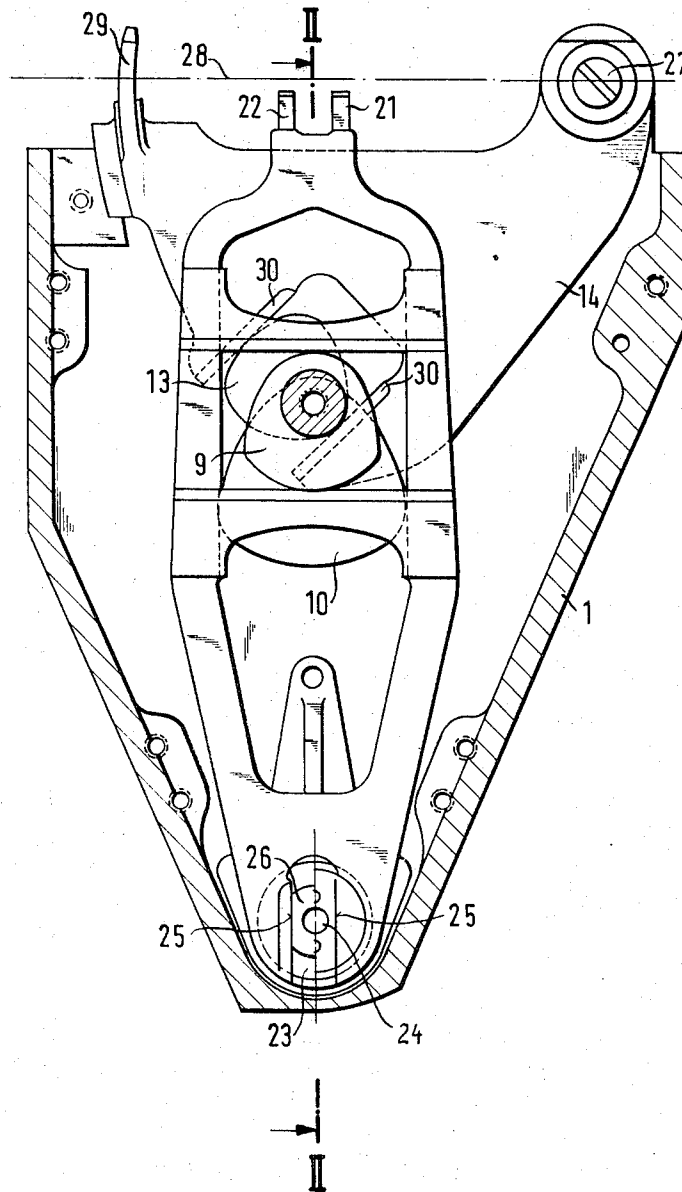


Fig. 2

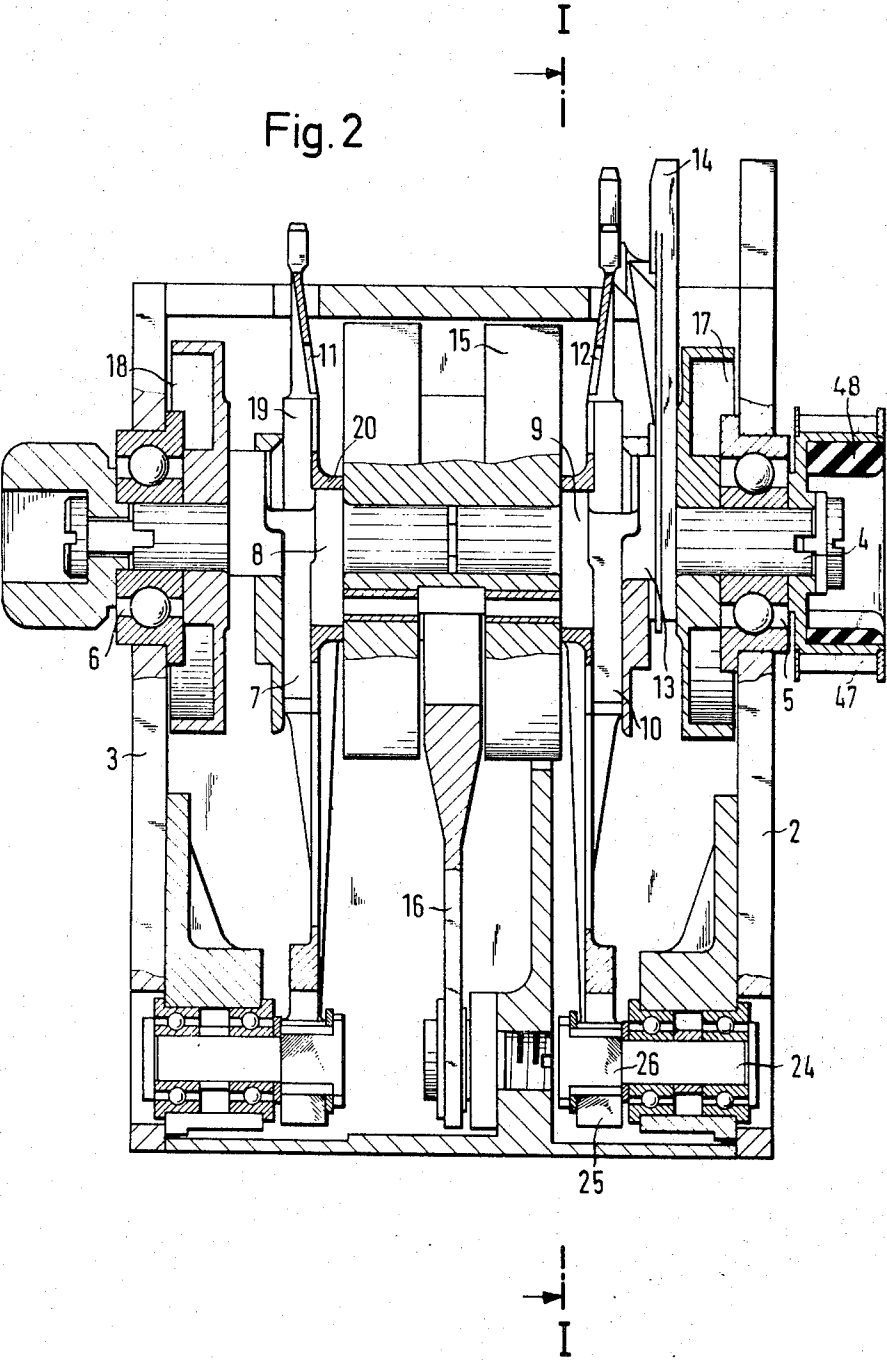


Fig. 3

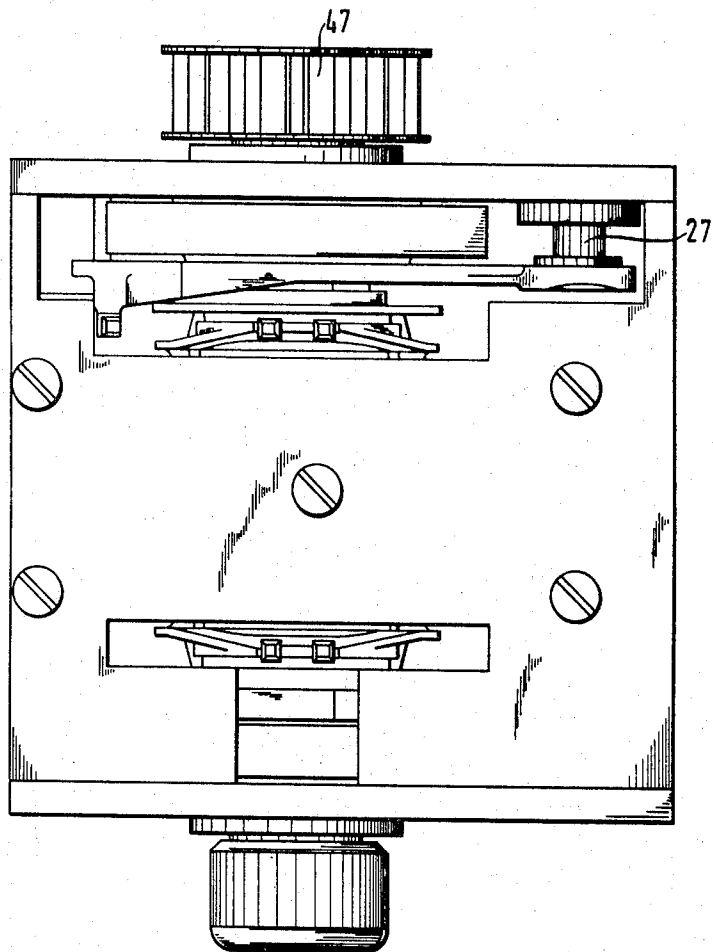


Fig. 4

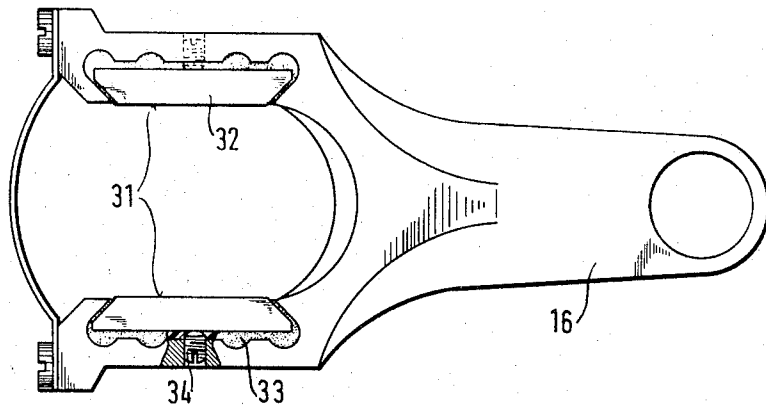


Fig. 5

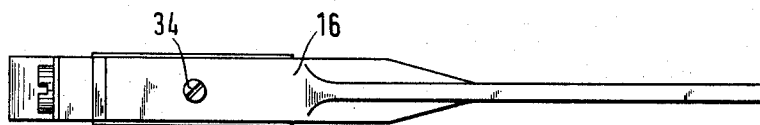
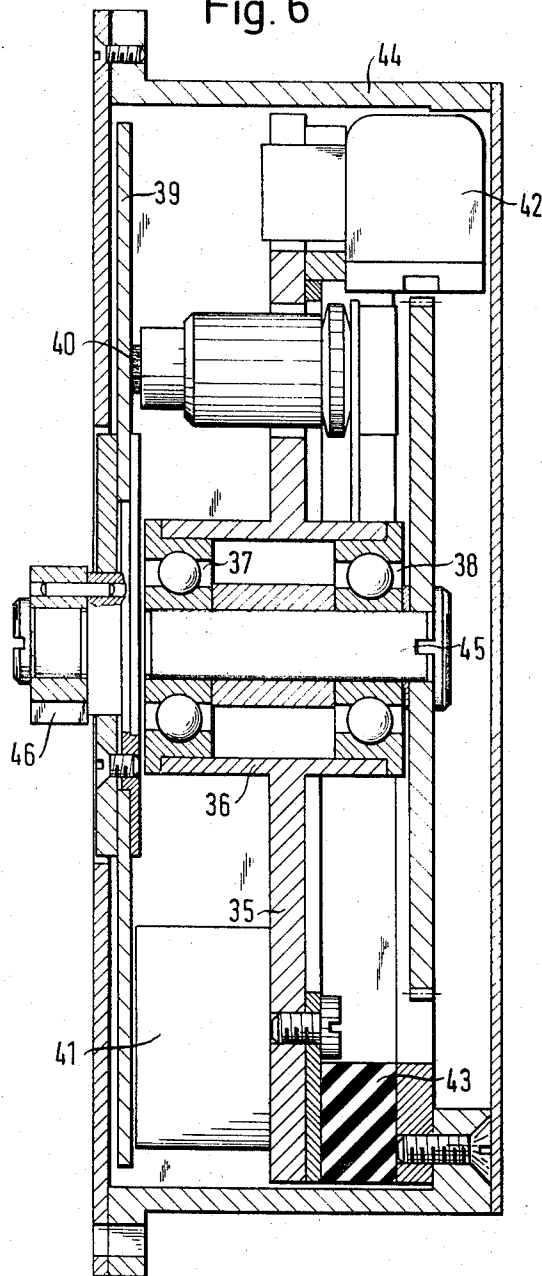


Fig. 6



INTERMITTENT MOVEMENT FOR FEEDING FILM

This invention relates to an intermittent movement for feeding film, which comprises pull-down claw means and registration pin means, particularly to intermittent movements of this kind in which the cam-controlled pull-down claw means and registration pin means are carried by an intermittently rotatable shaft, which is driven by an electric motor, and the movement of each pull-down claw is controlled by two cams, one of which causes the pull-down claw to enter the perforations in the film whereas the other imparts a feed movement to the film.

Intermittent movements for feeding film are known which in the central plane between the two perforation planes comprise a member in the form of a triangle of arcs or of a crank, and a bridgelike claw which extends from said member and which at its ends carries the pull-down claw pins and, if desired, the registration pins. Such claw arms have a large overhang and in view of their complicated loading by mass forces must be made from steel or other metallic materials and for this reason have a considerable weight. Particularly during a fast operation, extremely large mass forces act on the system in such an arrangement and give rise to strong vibration and very heavy wear so that the accuracy of the feed movement of the film is adversely affected.

Since the advent of sound recordings, it has been desired to reduce the noise which is generated by the pull-down claw and registration pin system owing to the above-mentioned circumstances. That desire has not been fulfilled, however, because it was believed that the components of the system must be made from steel or other metallic workpieces in view of their complicated loading by mass forces.

An intermittent movement for feeding film is known in which the film is driven in both perforation planes by a shaft through the intermediary of respective pull-down pins, the shaft carries a triangle of arcs in each perforation plane, each pull-down pin is connected by a claw arm to an associated triangle of arcs, the triangles of arcs mounted on the claw shaft extend in each perforation plane into a cam slot formed in a member which is disposed beside the claw arm and which performs only a reciprocating movement comprising standstill intervals at the end positions, and said cam slot member carries a registration pin, which is held in the perforation plane. Whereas in such an arrangement the claw arms may be made from lightweight materials, particularly from laminated woven fabric, the intermittent movement still comprises reciprocating components.

It is an object of the invention further to reduce the noise generated by the intermittent movement, particularly at high film speeds, and also to reduce the wear.

In an intermittent movement of the kind defined first hereinbefore, this object is accomplished according to the invention in that the registration pin means comprise a rocker lever, which has a curved tip portion which is concentric with the bearing. This arrangement eliminates the need for the known push rod arrangements, which are undesirable at high film speeds. The tip portion of the rocker lever of the registration pin means is designed so that said tip portion hardly contacts the edges of the perforation holes in the film during a normal, trouble-free operation.

To minimize the mass forces acting on the intermittently rotatable shaft, the invention proposes two further measures, which may be adopted in combination, if desired. One feature resides in that the arms of the pull-down claw means and registration pin means consist of a metal which has a low specific gravity, and the sliding surfaces are covered with a material which is light in weight and very hard. Said arms are desirably made from die-pressed aluminum or aluminum alloy, and the sliding surfaces are covered by strips of sapphire. To simplify the manufacture, strips of sapphire are embedded and adhered in the claw frames, and the adhesive contains a heat-dissipating filler.

The other measure resides in that the mass forces which are due to the pull-down claw means and registration pin means are compensated by a counterweight, which is controlled by a cam in the form of a rounded triangle, which is mounted on the intermittently rotatable shaft. The counterweight consists preferably of a rocker lever.

The solution provided by the invention enables the continued use of the well-proved disc rotor motor for driving the intermittent movement. The rotor of such motor has only a small mass and while delivering a high torque reaches the desired speed within very short time. On the other hand, the noise generated by such motor is much reduced; this noise is due to the fact that the carbon brushes slide at high speed on the rotating disc, which owing to the type of the motor is large in diameter, the rotor shaft is short and the speed is automatically controlled. To accomplish its object, the invention teaches firmly to connect all noise-generating components to a mounting flange, which is suspended in a closed motor housing with vibration-damping rubber elements interposed, the rotor shaft is connected to the intermittently rotatable shaft by a clutch, which comprises vibration-damping rubber elements, and the motor housing which is thus sound-insulated is directly connected to an adjacent unit of construction.

The invention will be described hereinafter by way of example with reference to the drawing, which shows an embodiment.

FIG. 1 is a sectional view showing the intermittent movement according to the invention,

FIG. 2 is a sectional view taken on line I—I in FIG. 1,

FIG. 3 is a top plan view showing the intermittent movement of FIG. 1,

FIGS. 4 and 5 are two side elevations showing a rocker lever and

FIG. 6 is a sectional view showing a disc rotor motor for driving the intermittent movement.

A housing 1 for an intermittent movement is closed by plates 2 and 3. An intermittently rotatable shaft 4 is mounted by bearings 5 and 6 in said plates. The intermittently rotatable shaft carries cams 7, 8 and 9, 10, which have the form of rounded triangles and serve to control the movements of two pull-down claws 11 and 12. When the film is fed at a high speed, the forces required to accelerate the film are so large that a single pull-down claw having a single claw tip would not be sufficient for an intermittent feeding of the film but would destroy the film at the perforation holes. Depending on the position of the rounded triangle cams, the two pull-down claws 11, 12 pull down the film at a low or high speed. Where pull-down claws are provided on both sides, the intermittent movement may consist

of two identical units, which are mounted on respective plates and coupled to each other. This concept enables the use of prefabricated units, which is economically desirable.

To reduce the stress imposed on the film at its perforations, each pull-down claw comprises two pull-down claw tips 21, 22 so that the large accelerating forces are applied to the film over a larger area and a tearing of the film at the perforation holes need no longer be feared.

Another rounded triangle cam is mounted in the middle of the shaft and serves to control a rocker lever 16. This cam produces a rotary unbalance, which reduces the mass forces imposed by the pull-down claw means and registration pin means from the outside on the balanced, intermittently rotatable shaft. This reduces the vibration produced in operation. The intermittently rotatable shaft also carries flywheels 17 and 18, which dampen the discontinuous movement of the intermittently rotatable shaft and enable a static and dynamic balancing of the intermittently rotatable shaft by a removal or addition of masses.

The plates 2 and 3 of the intermittent movements and the pull-down claws 11 and 12 are respectively identical so that the manufacture is simplified. The pull-down claws 11 and 12 are provided with pairs of sliding surfaces 19 and 20 extending at right angles to each other. The rounded triangle cams 7, 10 which control the feed movement of the film engage the sliding surfaces 19, which extend parallel to the longitudinal axis of the pull-down claw. The depth of penetration of the pull-down claws into the perforations of the film is controlled by the rounded triangle cams 8 and 9, which engage sliding surfaces 20, which are parallel to each other and at right angles to the longitudinal axis of the pull-down claw.

At its lower end, each pull-down claw 11, 12 is forked to define an opening 23, which receives a pin 24. The fork-defined opening of the pull-down claw has sliding surfaces 25, which slides on sliding surfaces 26 of the pin 24. To enable an adjustment of the length of each step of the feed movement imparted by the pull-down claw to the film, the pin 24 is adjustable by means of cams 27'. The axis of rotation of the registration pin means may be similarly adjustable.

In the embodiment shown by way of example, the two cams 7 and 8 are mounted on the intermittently rotatable shaft 4 to act in the same sense so that the pull-down claws pull the film at a low speed. Alternatively, it may be desirable to cause the pull-down claws to pull down the film at a high speed so that the standstill times for the exposure are prolonged.

The bearing center of the bearing 27 of the registration pin member 14 is disposed in the film plane 28. The tip 29 of the registration pin member is curved according to an arc of a circle having a radius which is equal to the distance from the tip 29 of the member to the center of the bearing 27. The registration pin member is controlled by the rounded triangle cam 13, which slides on the parallel sliding surfaces 30. These extend parallel to a center plane which intersects the axis of rotation of the bearing 27. The center of the bearing 27 is adjustable by means of an eccentric disc to permit of an exact adjustment of the registration pin member 14.

For counterbalancing, a rocker lever 16 is slidably mounted on a rounded triangle cam 15. FIG. 4 shows how the sliding surfaces 31 are formed by strips 32

made of a particularly hard material. The embedded strips 32 are adhered by an adhesive composition 33. The exact position of the strips in the rocker lever and the pull-down claws is adjusted by a screw 34.

FIG. 6 shows the disc rotor motor which in accordance with the invention is used to drive the intermittently rotatable shaft. The entire motor is mounted on a flange 35, which carries a bearing bushing 36 provided with bearings 37 and 38. Carbon brushes 40 slide on a disc-shaped rotor 39. Magnets 41 are mounted on the flange 35 to ensure an air gap of desired width. The flange is secured in a motor housing 44 by sandwich-type connectors 43. A clutch member 46 is mounted on a motor shaft 45 and interengages with a clutch member 47 mounted on the intermittently rotatable shaft 4. Rubber pads 48 are provided and substantially prevent a conduction of sound from the disc rotor motor to the intermittently rotatable shaft. All noise-generating components have the installation dimensions which are functionally required. The air gap between the rotor disc and the magnets is also retained. The carbon brushes secured to the mounting flange and the means for automatic speed control are also secured to the insulated mounting flange and are not changed in position relative to the rotor.

What is claimed is:

1. An intermittent movement for feeding film, comprising an intermittently rotatable shaft, means for controlling the rotation of said shaft, pull-down claw means mounted on said intermittently rotatable shaft, first and second cam means controlling the movement of said pull-down claw means, said first cam means controlling the entry of said pull-down claw means into the perforations of said film and said second cam means controlling the feeding movement imparted to said film by said pull-down claw means, registration pin means comprising a rocker lever mounted on said intermittently rotatable shaft, and third cam means controlling the movement of said registration pin means.
2. The intermittent movement of claim 1 in which said rocker lever of said registration pin means has a curve tip portion which is concentric with bearing means on which said registration pin means is mounted.
3. The intermittent movement of claim 2 in which said bearing means for said rocker lever of said registration pin means is positioned in the film plane.
4. The intermittent movement of claim 1 in which said pull-down claw means comprises rocker levers having forked positions defining pivots.
5. The intermittent movement of claim 1 and further comprising means for adjusting the axis of rotation of said registration pin means and said pull-down claw means.
6. The intermittent movement of claim 5 in which said means for adjusting the axis of rotation is a rotatable eccentric pin.
7. The intermittent movement of claim 1 in which said pull-down claw means and said registration pin means have arms formed from a metal which has a low specific gravity and have sliding surfaces covered with a material which is light in weight and very hard.
8. The intermittent movement of claim 7 in which said arms consist of die-pressed aluminum or aluminum alloy and said sliding surfaces are covered with strips of sapphire.
9. The intermittent movement of claim 8 in which said sapphire strips are embedded in said sliding sur-

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faces and attached thereto with adhesive containing a heat-dissipating filler.

10. The intermittent movement of claim 1 and further comprising a counterweight and a rounded triangular cam for controlling the movement of said counterweight mounted on said intermittently rotatable shaft, said counterweight serving to compensate for mass forces produced by said pull-down claw means and said registration pin means.

11. The intermittent movement of claim 10 in which said counterweight consists of a rocker arm.

12. The intermittent movement of claim 1, said rota-

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tion controlling means comprises a disc rotor motor having a closed motor housing, a mounting flange located in said closed motor housing and having vibration damping rubber elements interposed between said flange and said housing, said flange providing a mounting means for mounting all noise-generating components of said motor, a motor shaft connected to said intermittently rotatable shaft by a clutch, and vibration-damping rubber elements in said clutch, said motor housing thereby being sound-insulated.

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