April 7, 1931. M. G. M. G. BIZOT 1,800,049

PRINTING MACHINE ADAPTED FOR USE WITH UNIMPRESSED FILMS REQUIRING A VERY LONG EXPOSURE

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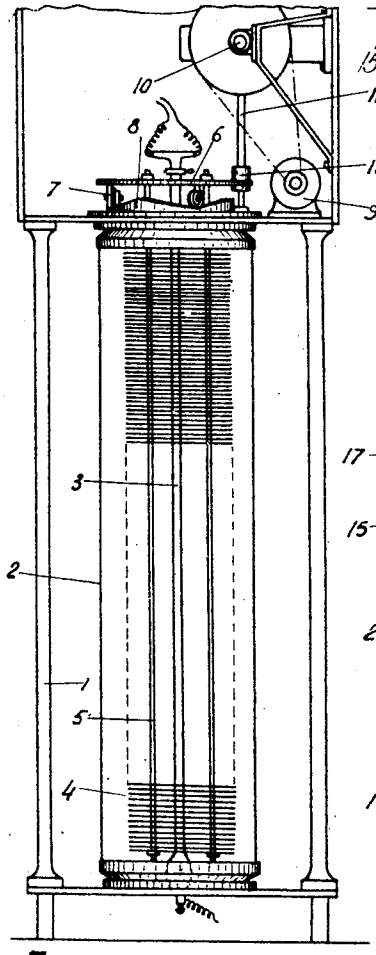


Fig. 1

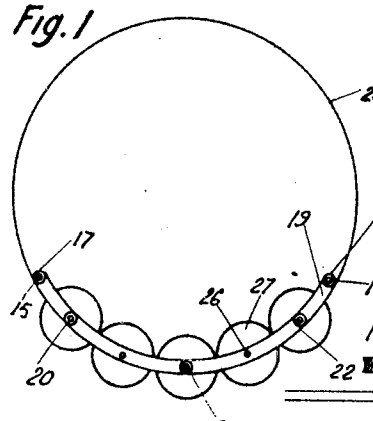


Fig. 3

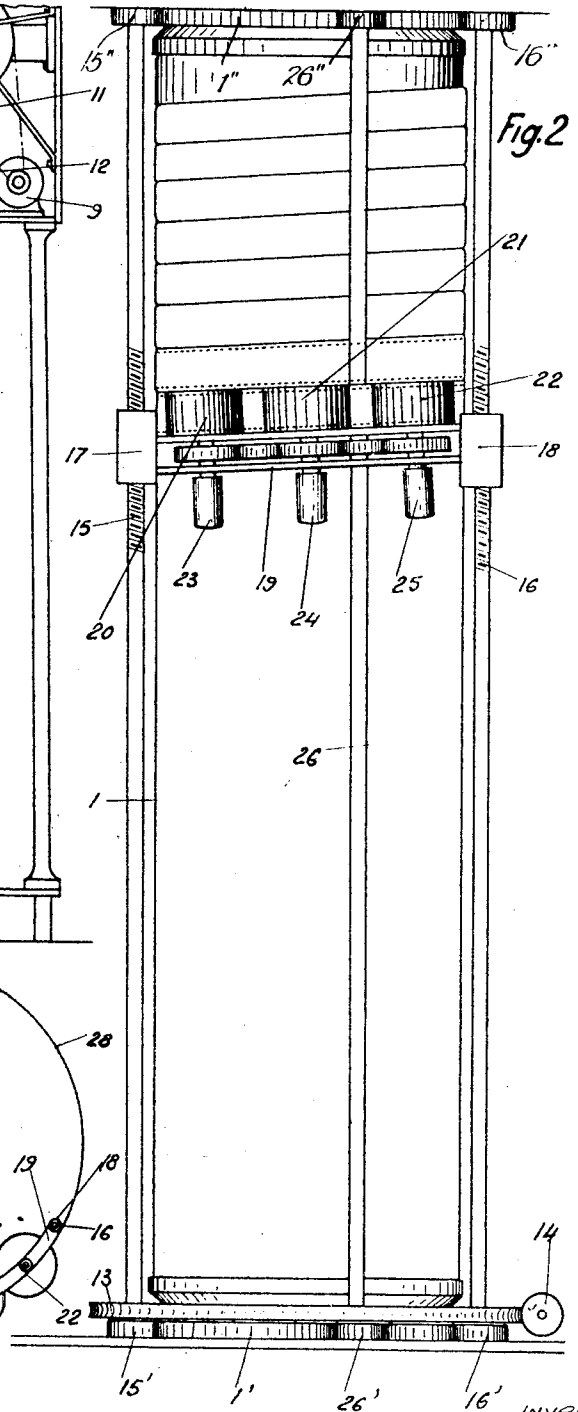


Fig. 2

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UNITED STATES PATENT OFFICE

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PRINTING MACHINE ADAPTED FOR USE WITH UNIMPRESSED FILMS REQUIRING A VERY LONG EXPOSURE

Application filed April 29, 1929, Serial No. 359,142, and in France October 11, 1928.

I have described in my copending U. S. application No. 322,836, filed November 30, 1928, entitled "Cinematographic film chiefly adapted for reproduction and apparatus for using same" a film for printing which requires a very long exposure, say ten or twenty minutes or even more.

My present invention has for its object a printing machine adapted for use with unimpressed films of this or any other type requiring a very long exposure. It comprises a large glass drum round which are spirally wound one over the other first the negative and then the film to be impressed. This negative and the said film are pressed down and shielded from light by a suitable dark band. A light source disposed along the axis of the drum projects its light normally on to the negative and positive films.

The film to be impressed is not perforated before printing because due to the usual irregular distances between the perforations it would be absolutely impossible to make all the perforations in the two films coincide throughout their length as certain pictures printed on the positive film would in such a case be shifted with reference to their perforations. When the unimpressed non-perforated film has been impressed and the picture fixed, the pictures of the perforations in the negative appear. For a correct marking of these perforations, they should be provided at these pictures. The film is therefore passed through a perforating machine and the pitch of the machine is adjusted continuously so as to cause the perforations to be constantly provided in the pictures of the negative in spite of the irregular intervals between the latter.

The printing lamp which is to illuminate, in a uniform manner and exclusively through beams perpendicular to the films, the whole length of the film wound over the glass drum, is preferably constituted by a tubular mercury vapor lamp disposed along the axis of the glass drum. A large number of parallel screens are arranged very near one another round the lamp which screens consist in discs normal to the drum axis throughout the length thereof. These screens serve to cut up the beams of light into beams containing only rays perpendicular to the film. The discs are connected through bars so as to form a unit hanging from its upper end. In order that the illumination should be identical in all points of the film, the unit is rotated continuously whereby the detrimental effect of the shadows of the connecting bars is avoided; a longitudinally reciprocating movement of small amplitude is also given to the unit so as to avoid the effect of the shadows of the discs themselves.

I use for winding and unwinding the negative film preferably with its celluloid face turned inwards, the film to be printed also preferably with its celluloid face turned inwards and the outer band, a cage rotating round the glass drum and provided with a carriage bearing the feed and take-up reels and inclined by an angle corresponding to the pitch of the films as wound on the glass drum. The carriage is borne by two nuts screwed over threaded rods parallel to the axis of the glass drum which rods rotate round their axis whilst the cage rotates round the drum.

I have described hereinbelow by way of example and shown on accompanying drawings a form of execution of my invention.

Fig. 1 is a side view of the glass drum with its lamp and screens.

Figs. 2 and 3 are a side and a plan view of the outer cage with its film-winding carriage.

Referring to Fig. 1 the frame 1 carries the vertical glass drum 2, along the axis of which is disposed the tubular mercury vapor lamp 3. Round this lamp are disposed a large number of discs 4 very near to each other and connected by means of bars 5 secured at their upper end to a toothed wheel 6.

This wheel 6 rests through rollers 7 on a cylindrical cam 8; an electric motor 9 drives through a suitable gearwork 10—11—12 the wheel 6 which rotates; thus slowly and constantly a complementary reciprocating vertical movement is given to the wheel 6, due to the presence of the cam 8.

Round the glass drum 2 may rotate a cage secured to the lower worm wheel 13 (Fig. 2). This wheel is controlled by a worm 14 and carries two vertical threaded rods 15 and 16

ending at both ends with pinions 15′—15″—16′—16″ meshing with stationary toothed wheels 1 and 1′. On these rods are also mounted the corresponding nuts 17, 18 carrying the carriage 19. This carriage comprises two cheeks inclined to correspond with the pitch of the films wound over the glass drum and carries on its upper surface three reels 20, 21, 22 feeding respectively to the glass drum the negative film, the unimpressed film and the outer protecting band. These three reels act as free wheels when the carriage moves downwards and allow the three strips to wind off them on to the drum wall with a slight braking action. When the carriage moves upwards again, a clutch device disposed in each reel causes them to rotate for rewinding the strips from the drum wall on to the reels.

Three other reels 23, 24, 25 disposed underneath the first reels and acting in a similar but reverse manner allow the machine to be used in a continuous manner. Whilst the first three reels 20, 21, 22 are winding up their strips, the reels 23, 24 and 25 unwind the strips carried by them. The reels are controlled by a shaft 26 also carried by the outer cage formed by the wheel 13 and its rods 15 and 16. The shaft 26 ends with pinions 26′, 26″ meshing with the stationary toothed wheels 1, 1′. The shaft 26 passes through the carriage 19 and controls through a spherical joint the pinion 27 which drives the several reels.

The outer cage 13—15—16 is closed by a protecting plate 28 (Fig. 3).

What I claim is:

1. A machine for printing unimpressed films requiring a very long exposure from a negative comprising a large transparent drum for receiving the superposed negative, unimpressed film and protecting material, a printing lamp disposed inside and along the axis of the drum, and a series of screens perpendicular to said axis and disposed very near each other for allowing only normal rays to fall on the drum wall from the lamp.

2. A machine for printing unimpressed films requiring a very long exposure from a negative comprising a large glass drum for receiving the superposed negative, unimpressed film and protecting material, a tubular mercury vapor lamp disposed inside and along the axis of the drum, a series of disc-shaped screens perpendicular to the said axis disposed very near each other, bars for connecting the screens together and means for giving the screens and bars a continuous rotary motion round the axis and a small reciprocating motion along said axis.

3. A machine for printing unimpressed films requiring a very long exposure from a negative comprising a large glass drum for receiving the superposed negative, unimpressed film and protecting material, a tubular mercury vapor lamp disposed inside and along the axis of the drum, a series of disc-shaped screens perpendicular to the said axis, disposed very near each other, bars for connecting the screens together, a toothed wheel secured to the said bars, means for rotating said wheel continuously, a stationary cam shaped path for the toothed wheel adapted to give the latter a slight reciprocating motion along the axis of the drum and rollers interposed between the cam-shaped path and the toothed wheel.

In testimony whereof I have affixed my signature.

MARCEL GEORGES MARIE GASTON BIZOT.