

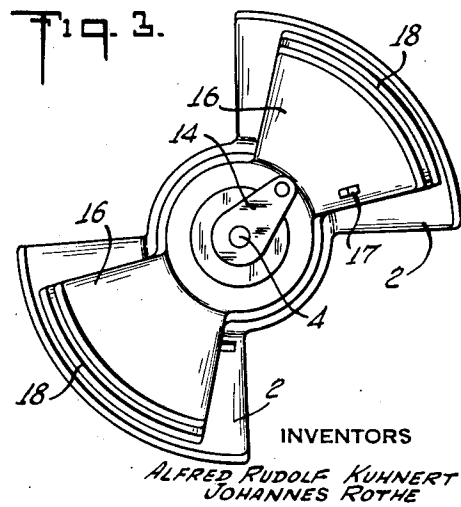
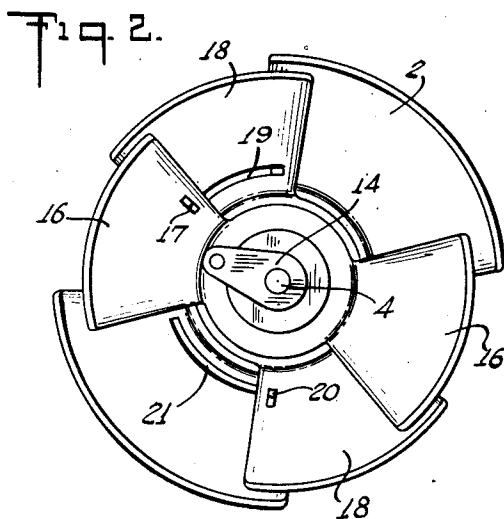
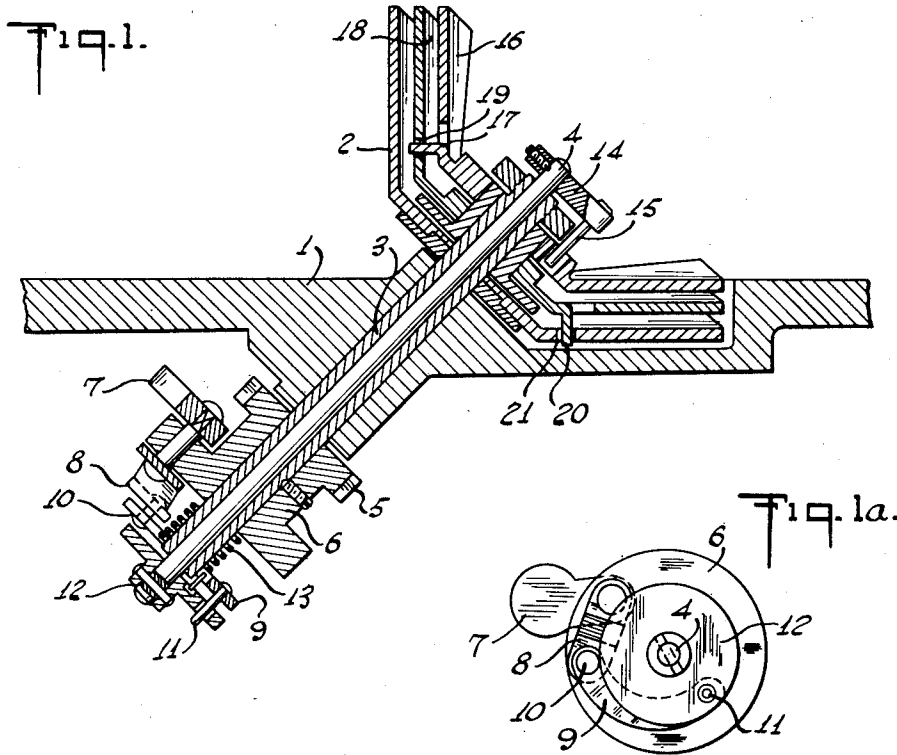
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ROTATING FIRE SHUTTER

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ROTATING FIRE SHUTTER

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8 Claims. (Cl. 88—19.4)

This invention relates to a conical diaphragm or shutter provided with rotating fire shutter blades or wings for use in projection work.

Conical diaphragms having a fire shutter inside of them and being actuated by a centrifugal friction clutch also arranged within them are known. Such an arrangement, however, is open to the objection that the clutch is subjected to considerable heating which is due to the development of frictional heat and to the positioning of the clutch within range of the projecting beam. As this heat development renders lubricants ineffective, the clutch is exposed to much wear and its proper functioning is thus interfered with.

It is the object of the invention to eliminate these disadvantages by utilizing a feature of disc type diaphragms or shutters fitted with fire protection wings which rotate with the shutter. According to the invention, the conical diaphragm or shutter is driven by a hollow shaft containing another shaft which controls the fire protection wings of the shutter and is connected with a centrifugal governor disposed on the shaft of the diaphragm or shutter. Since the governor is arranged inside the enclosed projector mechanism, it runs constantly in oil and, furthermore, forms a unit with the driving pinion of the diaphragm shaft.

When diaphragms or shutters having an open sector which is larger than the closed one are used, satisfactory covering of the projecting beam cannot be effected by one blade or shutter member or blade. If, on the other hand, the fire shutter member were larger than the open sector and the fire shutter in the open position, the open sector of the diaphragm would not be fully exposed, whereas in case of a shutter member of smaller size than the open sector the path of rays would not be fully covered.

For this reason, according to a further feature of the invention, the fire shutter members covering the open sector are divided into individual parts or blades preferably two parts, which are arranged one behind the other in the direction of the shaft controlling the fire shutter, the front part taking along the rear part in both directions by means of tongues or lugs.

One embodiment of the invention is diagrammatically illustrated in the accompany drawings, wherein

Figure 1 is a section of a partially shown projector mechanism provided with a conical shutter, fire shutter and control means thereof.

Fig. 1a is a cross-sectional view of the lower part of the mechanism in the direction of the arrow of Fig. 1.

Fig. 2 shows the position of the divided fire shutter parts when covering the projecting beam; and

Fig. 3 shows the shutter parts in a position permitting the free passage of the path of rays.

In the wall 1 of the casing or drive housing of the projector mechanism, which is shown only in part, a hollow shaft 3 driving the shutter and attached to blade 2 is provided. Within this hollow shaft 3 a shaft 4 controlling the opening and closing of the fire shutter blades is disposed. To the shaft 3 a driving pinion 5 is secured

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and suitably connected to the main driving means of the projector. The pinion 5 has a projection 6 on which the gyrating mass or fly weight 7 of the centrifugal governor is rotatably arranged. The mass 7 is rigidly connected with a lever 8 rotatably connected by means of a pin 10 with a second lever 9 shaped in such manner that it encompasses one end of a torsion spring 13 supported by the shaft 3. The end of the lever 9 supports a pin 11. A driving disc 12 is firmly connected with the shaft 4. The pin 11 engages a recess of the driving disc 12. The torsion spring 13 is secured at one end thereof to the disc 12 and at the other end to the shaft 3.

The displacement of the gyrating mass 7 occurring at changes of speed of the drive is transferred as a rotary motion over the levers 8 and 9 and the pin 11 to the driving disc 12 whereby the force exerted by the spring 13 has to be overcome.

An entraining device 14 is fastened to the shutter end of the inner shaft 4, the pin 15 of entraining device or catch 14 engaging the recess of the forward fire protection wing 16 of the fire shutter. The entraining tongue or lug 17 may be formed in wing 16 by being pressed out and engages a guide flap 19 of the rearward fire protection wing or blade 18 to carry it along. In the same manner, tongue or lug 20 is pressed out from the rearward fire protection wing 18 and engages a guide flap 21 of shutter 2 and defines the terminal positions of the rearward fire protection wing.

When the projector mechanism is at rest or is not running at full speed, the fire protection wing or blades assume the position shown in Fig. 2, i.e., they completely cover the open segment of the shutter. When the projector mechanism is running at normal operating speed, the centrifugal governor or gyratory mass 7 is swung outwardly by the centrifugal force of rotation and through levers 8 and 9 displaces entraining disc 12 against the resisting force of spring 13, and also displaces inner shaft 4 with respect to outer shaft 3, and thereby moves the entraining lever or catch 14 to entrain and rotate the forward fire protection wing 16. The rearward fire protection wing 18 follows this movement, being carried along by tongue or lug 17. In the resulting open position, the shutter and fire protection wings assume the position shown in Fig. 3.

Obviously, many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims, the invention may be practiced otherwise than specifically described.

What we claim is:

1. A combined conical light-controlling and fire shutter for motion picture projectors having a drive mechanism enclosed within a drive housing; comprising a hollow shaft projecting through said drive housing for driving said shutter, said shutter comprising a plurality of jointly and mutually rotatable shutter blades outside said drive housing, at least two forward ones of said blades in a predetermined closed position covering respective open sectors of a third one of said blades, said hollow shaft being operably attached to said third one of said blades, an inner shaft disposed within said hollow shaft and operably connected to the blades of said shutter for controlling the opening and closing of said shutter, driving pinion means secured to said hollow shaft within said drive housing and operably connected to the main drive mechanism of said projector, a centrifugal governor eccentrically arranged on said hollow shaft and within said drive housing for rotation with said hollow shaft and for radial movement therefrom by centrifugal force, and lever means for transmitting said radial movement of said centrifugal governor to said inner shaft so as to rotate said inner shaft with respect to said hollow shaft, to there-

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by rotate said two blades from said predetermined closed position into an open position with respect to said third blade.

2. A combined light-controlling and fire shutter as set forth in claim 1, further defined in that said centrifugal governor is eccentrically arranged on said hollow shaft by being pivoted near the outer circumference of said driving pinion means.

3. In a moving picture projector having a drive mechanism enclosed within a drive housing, a device for automatically opening and closing a rotating light-controlling and fire shutter; comprising a rotatable outer shaft projecting through said housing, and an inner shaft coaxially and rotatably positioned within said outer shaft, gear means operably connected to said projector drive mechanism and fixedly attached to said outer shaft within said housing, a fly weight eccentrically and pivotally attached to said gear means within said housing, a first lever rigidly secured to said fly weight for pivoting therewith, a second lever pivotally linked at one end thereof to said first lever and provided at the other end thereof with a pin, a driving disc firmly connected to said inner shaft and having a recess therein for engaging said pin, and a torsion spring around said outer shaft, said spring being secured at one end thereof to said driving disc and at the other end thereof to said outer shaft, whereby at increased speeds of said drive centrifugal displacement motion of said fly weight is transmitted through said first and second levers to rotate said driving disc against the torsion action of said spring, and whereby at decreased speeds and stationary position of said drive said spring retains said inner shaft and outer shaft in non-rotating relationship to each other.

4. A device according to claim 3 in combination with a light-controlling and fire shutter, said shutter comprising a plurality of jointly and mutually rotatable shutter blades rotatably arranged along said hollow shaft outside said drive housing, a rearward one of said blades being operably connected to said hollow shaft for rotation therewith, successive ones of said blades from said forward one to said rearward one being each provided with arcuate guide slots and projecting entraining lugs engaged therein for limited mutual rotation of said blades with respect to one another and for joint rotation of said blades with each other, and entraining means fixedly attached to a forward end of said inner shaft for engaging the forward one of said shutter blades.

5. In a moving picture projector having a drive housing disposed within the projector, a rotatable hollow outer shaft extending through said drive housing, means for rotating said outer shaft from within said drive housing,

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an inner shaft extending through said outer shaft turnable with respect to said outer shaft, a plurality of light shutter blades secured to said outer shaft outside of said housing, a plurality of fire shutter blades rotatably mounted on said outer shaft and operably connected to said inner shaft outside of said housing, resilient means locating said light shutter blades and said fire shutter blades in a predetermined closed position during a condition of non-rotation of said outer shaft, a centrifugal governor eccentrically arranged on said hollow shaft within said drive housing for rotation with said hollow shaft and for radial movement therefrom by centrifugal force upon rotation of said outer shaft, and lever means for transmitting said radial movement of said centrifugal governor to said inner shaft so as to rotate said inner shaft with respect to said hollow shaft to thereby rotate said fire shutter blades from said predetermined closed position into an opened position overlying said light shutter blades.

6. In a moving picture projector as set forth in claim 5, said fire shutter blades including a first pair and a second pair, coaxially mounted lugs on said first pair and said second pair, recesses in said second pair and said light shutter blades, said lugs and said recesses engaging said first and second pairs to each other and said light shutter blades for positioning of said blades in covering relation during rotation of said outer shaft.

7. In a moving picture projector as set forth in claim 6, said resilient means biasing said shafts for changing the relation of said inner and outer shaft during stoppage of rotation of said outer shaft whereby said fire shutter blades and said light shutter blades are arranged in adjacent overlapping relation.

8. In a moving picture projector as set forth in claim 6, said centrifugal governor and said lever means being susceptible to lubrication within said housing, said blades being sectoral and connected in rotatable pairs.

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