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C. F. JENKINS

HIGH SPEED MOTION PICTURE MACHINE

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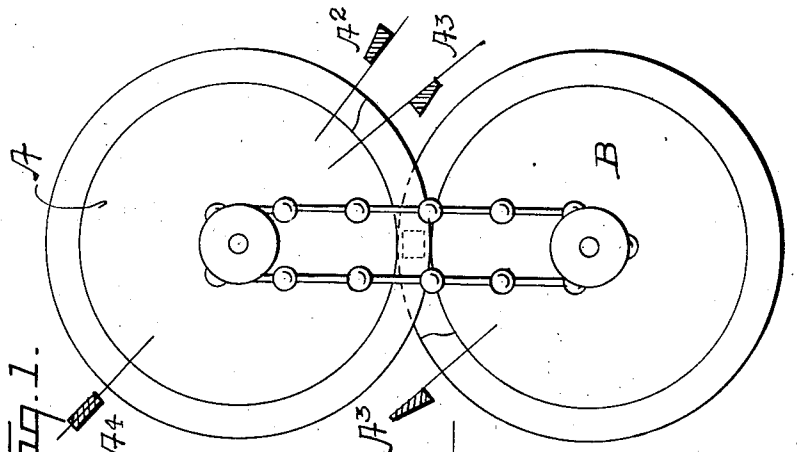


Fig. 1.

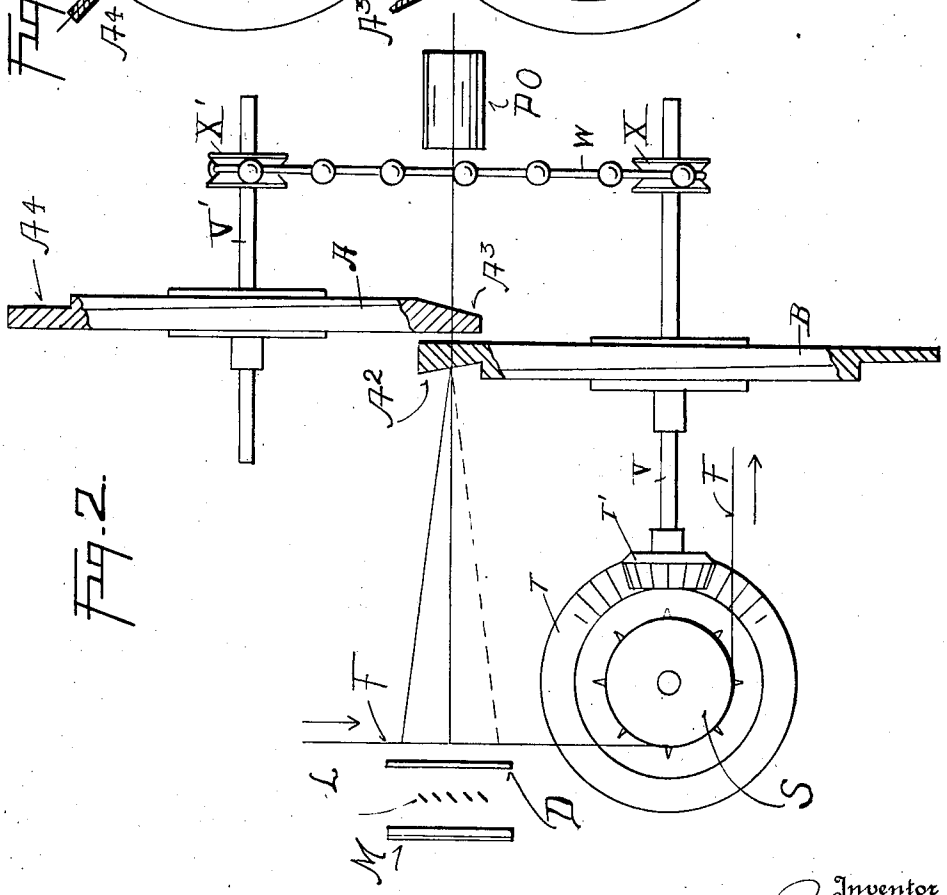


Fig. 2.

Witness:

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UNITED STATES PATENT OFFICE.

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HIGH-SPEED MOTION-PICTURE MACHINE.

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The object of this invention is to overcome a defect inherent in a circularly bent prism, sometimes employed where a film strip is fed continuously in a motion picture machine, and having the angle between its faces progressively varied in passing along the curve.

In actual practice it has been found that in such prisms there is a dioptric error which seems to be due to the approximately conical form of the ground surface.

The prisms used, which are not new per se, being disclosed in my Patent No. 1,385,325, have a marginal zone so formed that at a selected radius the outer side of the zone has a maximum thickness and the inner side a minimum thickness, with the outer side of the zone uniformly decreasing in thickness, in passing around the circle, until at a certain radius minimum thickness is reached, while the inner side of the zone progressively increases in thickness until it reaches a maximum equal to the outer margin maximum and at the same time that the outer side reaches its minimum.

The outer margin of the zone bends rays passing through it toward the thicker side, just as in a lens thickest at the center and when a picture is projected gives it a maximum width. The maximum thickness at the inner margin has a contrary effect, (just as in a lens thickest at its margin bends rays outward), giving a narrower picture. A picture, then, projected by a single prism of this kind varies in width many times a second, and this produces a blurred portion on each side of the picture.

It has been discovered that by overlapping such a prism by an analogous parallel prism rotating about a parallel axis and so adjusted that light will pass directly through correspondingly thick parts of both at the same time, the marginal parts of one disk bending the rays as stated, while like parts of the other disk bend the rays to the same degree in a contrary direction, the picture, therefore, never varying in width.

A method of practically applying this discovery is shown in the accompanying drawings, in which,

Fig. 1 shows in side view of circular prisms, in this instance formed at the marginal portions or zone of two properly overlapped glass disks.

Fig. 2 is a diagrammatic representation of the two disks seen in edge view, with related parts of a projecting machine, the prism zones of the disks being shown in diametrical section.

In these views, A and B represent two substantially identical glass disks each cut away laterally to form at its peripheral zone a circular prism which overlaps the companion disk to a distance equal to the width of the prism zone; and the disks are so turned that when at the overlapping point one prism has its greatest thickness at its outer margin, the other has at the same point the greatest thickness at the inner margin.

In Fig. 2, F represents a film strip, L a source of light, M a mirror, D a diffuser screen, S a sprocket drum for constantly drawing the film downward, T a gear fixed to the drum shaft and engaging a pinion T′, and V a pinion shaft carrying the disk B and a pulley X, the latter connected by a beaded belt W to a pulley X′ on the shaft V′ of the companion disk A. In this particular illustrated arrangement, the parts are so proportioned that while the film advances a picture's width, each disk makes one complete turn. The forms A^2, A^3 of the maximum and minimum prism cross sections and the form A^4 of the cross section midway between the others are shown in Fig. 1 alongside radial lines, which may be considered as the lines of section. These sections correspond with the fact stated that while the thickness at the outer margin of the prism varies from a maximum to a minimum, the thickness at the inner margin is varying from a minimum to a maximum, and midway between the two extremes the thickness is the same, and the two faces of the prism are parallel.

Since the errors of the two prisms balance, the picture projected through the prisms and the projection objective PO, will appear upon the screen as clear and sharp.

What I claim is:

1. The combination with a circular rotary prism having two opposite faces progressively varying in inclination with respect to each other when the inclination is measured on radial lines, of a second substantially identical prism overlapping the first having its prismatic faces inclined oppositely from the corresponding face parts of the first and thereby adapted to compensate errors inherent in the first.

2. The combination with a circular, rotary, transparent disk having its peripheral zone progressively varied in thickness in passing along its outer margin and oppositely varied at the same rate in passing along its inner margin, in the same direction, of a second substantially identical disk marginally overlapping the first, and means for rotating the disks oppositely at the same peripheral speed, whereby optical errors in either disk are corrected by the companion disk.

3. In optical apparatus for bending light rays, the combination of two marginally overlapped refracting circular prisms in parallel planes and each having on a certain radial line its outer margin of maximum and its inner margin of minimum thickness and each having the thickness of the two marginal portions progressively and oppositely varied in passing around the curve, giving warped spiral faces to the prisms.

4. The combination with a circular rotary refracting prism having its outer margin progressively changed from a maximum to a minimum and its inner margin changed oppositely from a minimum to a maximum, of an oppositely deflecting rotary prism marginally overlapping the first and rotating about a parallel axis, and means for rotating both prisms at the same time.

5. The combination with two circular overlapping refracting prisms arranged to rotate synchronously about parallel axes on opposite sides of the overlapping point and each having the angle in a radial plane made by its faces progressively changed, in passing along the curve, in such manner that the outer margin of one and the inner margin of the other simultaneously change from maximum to minimum thickness.

6. Light refracting and compensating means comprising a plurality of prismatic elements each continuously varying in refracting power and constructed continuously to change the angle between incident and emerging rays of light, said prismatic elements being arranged in overlapping relation and mounted for movement in directions to provide continuous correction one by another, and means for so moving them.

7. Light refracting and compensating means comprising a plurality of curved prismatic elements each continuously varying in refracting power and constructed continuously to change the angle between incident and emerging rays of light, said curved prismatic elements being arranged in overlapping relation and mounted for movement in directions to provide continuous correction one by another, and means for so moving them.

8. Light refracting and compensating means comprising a plurality of curved prismatic elements each continuously varying in refracting power, one having a constantly varying positive lenticular surface and another a constantly varying negative lenticular surface, said prismatic elements being arranged in overlapping relation and mounted for movement in directions to provide continuous correction of one by another, and means for so moving them.

9. In an apparatus of the character described, the combination with a holder for a picture whose image is to be projected onto the screen and a source of light, of a system of lenses, two prisms arranged between the picture and the screen and in optical alignment with the lenses, both prisms being curved respectively about their centers of movement and the operating portions thereof overlapping and being oppositely curved, the prisms operating to locate the image upon the screen and to correct curvilinear aberrations produced by one or the other thereof.

10. The process of correcting spherical aberration in a continuously rotatable light refracting prism, consisting in continuously rotating a second prism having an error of an opposite sign so as constantly to oppose, in the path of a beam of light, one error by the other, to afford constant compensation.

In testimony whereof I hereunto affix my signature.

CHARLES FRANCIS JENKINS.