Yeaton

INVENTION DISCLOSURE

Title: Optical Combining System

Purpose: Particularly for combining three primary colored television images.

Advance over Prior Art: Perfect optical coincidence of overlapping images.

Description and Sketch: (See Sketch Attached)
Many systems of super-imposed projection have been proposed, particularly for use with color (Baird etc.). Most of them are unworkable because they are optically fundamentally unsound, or based on optical approximations which lose their validity at wide apertures and large angular fields of view.

The following system can be used either for the projection of standard films or slides or television primary pictures. In the latter case, certain simplifications are permissible, provided the teaching of this disclosure is followed.

In Figure 1 R_1 G_1 B_1 are three similar, separate, possibly colored, rectangular, primary images, which may be film, slides or television primaries. LR_1, LG_1, LB_1 are three similar projection lenses. R_2 (G_2) B_2 are secondary trapezoidal images of R_1 G_1 B_1 produced by these lenses (G_2 need not be trapezoidal).

In R_1 G_1 B_1 the upper and lower (or left and right) parts of the primary images are equal: $a = b$.

In R_2 (G_2) B_2 the upper and lower parts of the secondary images are unequal.

In R_2 a is smaller than b. (IN G_2 $a = b$).

In B_2 a is greater than b.

Field lenses may be situated in or close to the planes R_2 G_2 B_2.

Wedge prisms may also be situated in planes R_2 and B_2 (in which case a plane parallel plate may be placed in plane G_2). These serve to bend the light in the required direction.

LR_2 LG_2 LB_2 are three further and similar projection lenses (not necessarily similar to LR_1 LG_1 LB_1).

Witnessed and Understood:
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Lenses LR_2 LG_2 LB_2 serve to project the trapezoidal secondaries R_2 G_2 B_2 onto the screen RGB_T.

The three images R_1 G_1 B_1 now appear perfectly coincident and superimposed in rectangular form as the combined (tertiary) image RGB_T.

Reverting to Fig. 1, if lenses LR_1 LG_1 LB_1 operate under a magnification condition of M_1, then $\tan B_1 = \tan \alpha_1 / M_1$.

Similarly, if lenses LR_2 LG_2 LB_2 operate under a magnification condition of M_2, then $\tan B_2 = \tan \alpha_2 / M_2$.

Now in television, unlike other fields, the elements R_1 G_1 B_1 LR_1 LG_1 LB_1 may be dispensed with. Predistorted primary or secondary images R_2 (G_2) B_2 may be produced by means other than optical.

This type of predistortion may be carried out in a number of known ways. By means of front or rear scanned skew neck tubes whose locus of scanlies on a circle whose center is the bisector of the line joining the geometrical center of the trapezoid A and the convergence point B of the two sloping sides of the trapezoid. (Fig. 2)

Or the predistortion may be performed circuit-wise, or by predistorted magnetic fields (Fernseh, Fisher et al.)

The television images R_2 G_2 B_2 may be separate tubes or in a common tube with three guns, or all scanned by one gun.

This principle may be applied to either the horizontal or vertical plane or a combination of both.
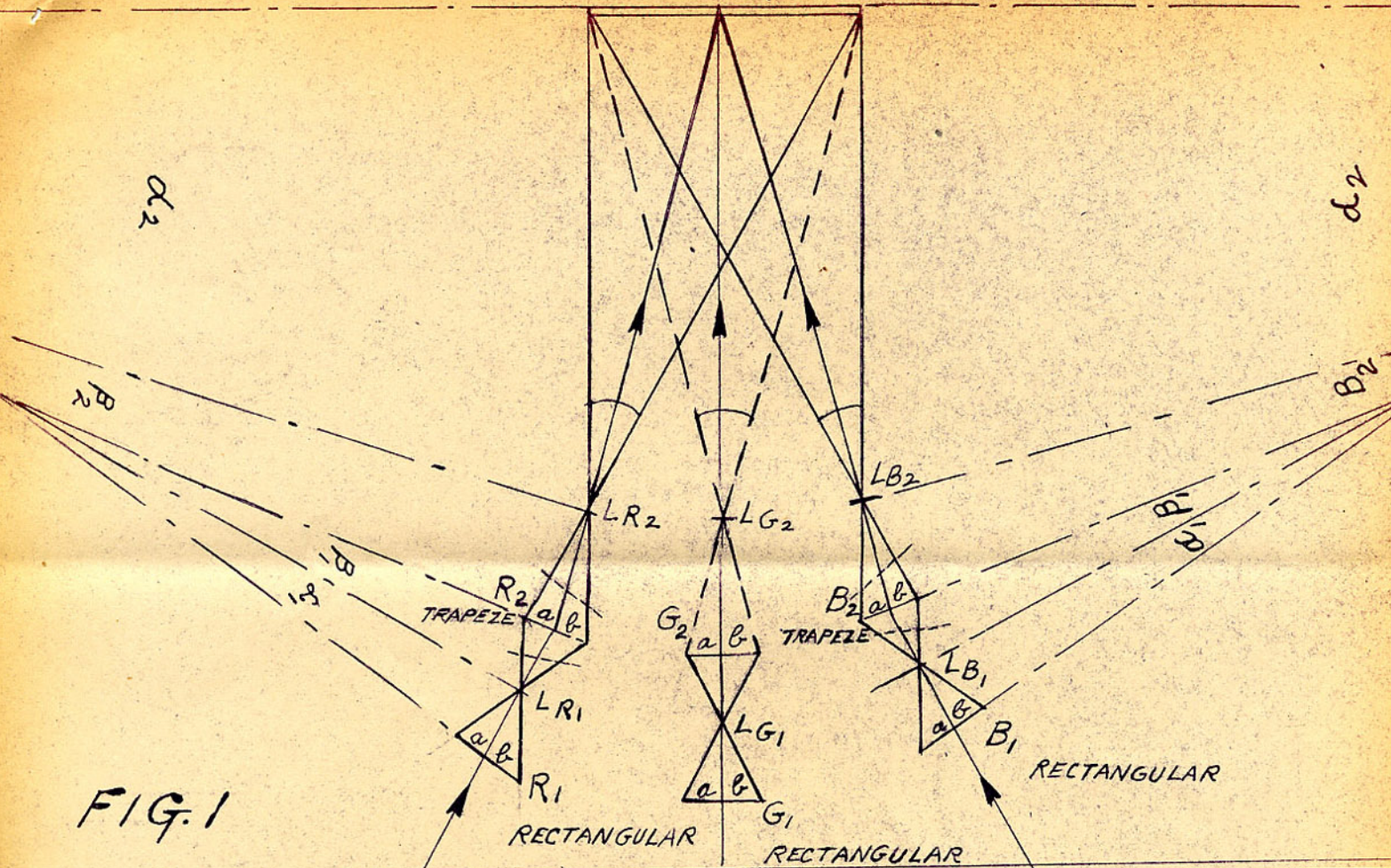
RGB$_T$ RECTANGULAR

α_2

α_2

β_2

B_2

LR_2 LG_2 LB_2

R_2 a b
TRAPEZE

B_2' a b
TRAPEZE

G_2' a b

β_1

β

α_1

B_1'

LR_1

LG_1

LB_1

a b

a b

a b

R_1
RECTANGULAR

G_1
RECTANGULAR

B_1

RECTANGULAR

FIG. 1

FIG. 2

TRAPEZOID

GEOMETRICAL
CENTER

A

LOCUS OF
ORIGIN OF SCAN

BISECTOR AB
(C. OF GUIDE)

EXAMPLE

B   CONVERGENCE POINT