August 31st, 1964

PROPOSAL [redacted] STATINTL

This proposal relates to the development of a light amplifying screen utilizing dipolar suspension.

1. Description of the Device

The properties of dipole particles in suspension form are described in the enclosed pamphlet entitled "Dipoles and Their Application to Graphic Arts". These dipole suspensions form the basis for the device which is described as follows:

1 is a projector projecting an image in one portion of the spectrum with light 2, which for example may be rich in the ultraviolet or near blue portion of the spectrum. This light source is of a relatively low intensity. The image is projected upon a dipole screen generally indicated as 3, the operation of which is described more fully in connection with Figures 2 and 3.

The projector 4 projects a high intensity light beam 5 through the cutoff filter 6. The function of the cutoff filter 6 is to eliminate the ultraviolet or near blue portion of the spectrum from the light beam 5. The light beam 5 carries no image. A complimentary light cutoff filter 7 is also placed in front of the projector 1 so as to eliminate any light other than the ultraviolet near blue light which is practically invisible.

The dipole screen is constructed as shown in Figures 2 and 3.

Referring to Figure 2, there is shown the condition of the dipole suspension 10 in oriented state, normal to the plane of the screen 3. A neutral molecule 11 is shown just prior to the impingement of an ultraviolet ray 12. After absorbing the ultraviolet ray 12, the neutral molecule 11 splits into positive and negative ions respectively 13 and 14, which migrate to the faces 15 and 16 of the dipole cell under the influence of an electrical field 17 shown in Figure 2.

After the ions 13 and 14 have moved to the cell walls 15 and 16, the electric field 17 is now shielded and the space occupied by the dipole layer 19 is free of the electric field, and the dipole particle 10 in Figure 3 is shown in its random position. The relaxation to the random position occurs by Brownian motion in the field free dipole layer 19.

Thus, in areas which are strongly illuminated by ultraviolet light 12, the dipole particles are disoriented. In those areas in which there is no illumination by the ultraviolet rays 12, the dipole particles are oriented. If the dipole particles 10 are absorbing when disoriented and transparent when oriented, and if the backing layer 20 has a white diffuse reflectivity, then those areas which are illuminated will appear dark, and those areas which are not illuminated will appear white as a result of the reflection of the secondary beam 5 from the projector 4.

Beam 5 carries no image upon incidence but will produce amplified negative image of the projected beam from the projector 1. Therefore, if a film 21 passing through the projector 1 is a negative film, its positive will be produced upon the dipole

amplifying screen 3.

Conversely, if reflective dipoles 10 are utilized and the backing screen 20 is a black absorbing screen, then a positive film 21 projected upon the screen 3 and illuminated by the uniform light source 5 will reproduce an amplified positive image.

It will be understood that while the reflective system as shown in Figure 1 requires that the observer's eye be at position 24, that alternatively it will also be possible to utilize a transmittance system where the observer's eye or camera may be located in position 25.

II Work Program

The purpose of the work program will be to establish the feasibility of the above concepts and to set up the equipment essentially as shown in Figure 1.

Projectors 1 and 4 and the filters 6 and 7 are conventional. The dipole screen as shown in Figures 1 and 3 have also been reduced to practical hardware and are demonstrable at the present time and will exhibit a large area uniform change responsive to an applied electric potential.

The work program will concentrate upon, therefore, the study of suitable molecules illustrated as 11 in Figure 2 and incorporated within the layer 19. These molecules will be chosen from well known photochemical species which are capable of being split when subjected to ultraviolet light but which will recombine in the dark.

Numerous such species are known and primarily include transition metal halide salts or the acid halides which will be dissolved within the dipole suspension in such quantity as to be suitable for masking the electric field when illuminated by ultraviolet light, but which will recombine in the dark.

These studies will initially be performed in laboratory cells and rate studies will be taken of the alignment and disalignment of dipolar materials in the presence of ions combined and uncombined. The rate of disorientation of the dipole particles will be affected by the concentration and the splitting apart of the ions by ultraviolet light and the rate of orientation of the dipoles will depend on the rate of recombination of these ions.

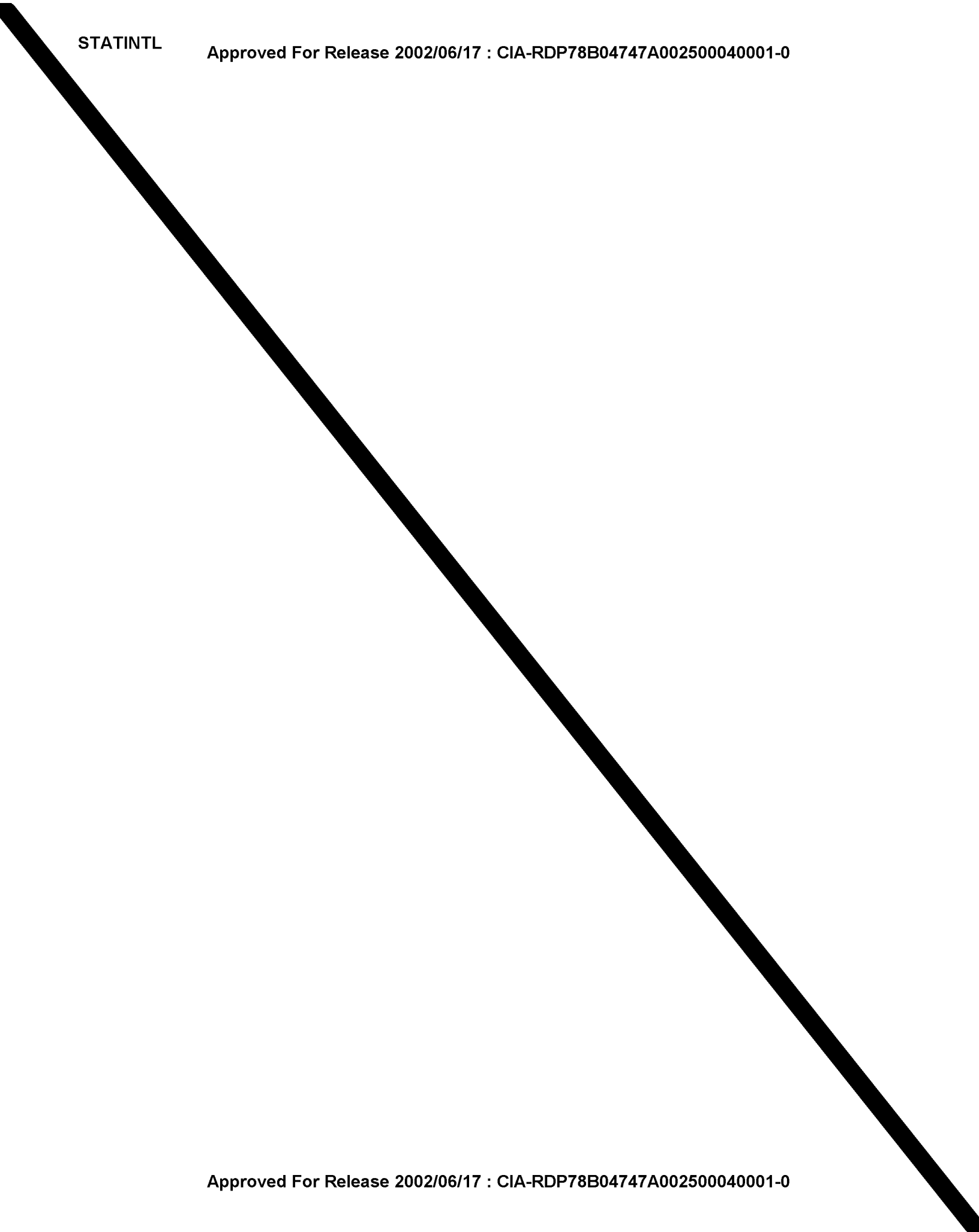
STATINTL The present equipment [redacted] which includes a unique optical bench equipped with illuminating source, photosensors, logarithmic amplifiers and memoscope and camera, is essential to the effective prosecution of this work and is already available in operating condition and is presently being utilized part time on other projects. The necessary electrical equipment is also available. Therefore, with only a relatively small expenditure for chemicals and glass ware, we will be able to execute this program with a minimum of delay and only a modest requirement of the purchase of additional equipment.

The work is to be divided into two phases.

Phase I will include the studies of the dipolar photoionic phenomena to establish the necessary parameters.

Phase II will comprise the construction and test of a system shown in Figure 1.

The work on Phase 1 will continue for six months, but it is hoped that at the end of four or five months progress will be sufficient to make a demonstration based upon Figure 1.



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DIM BLOCKING SCREEN

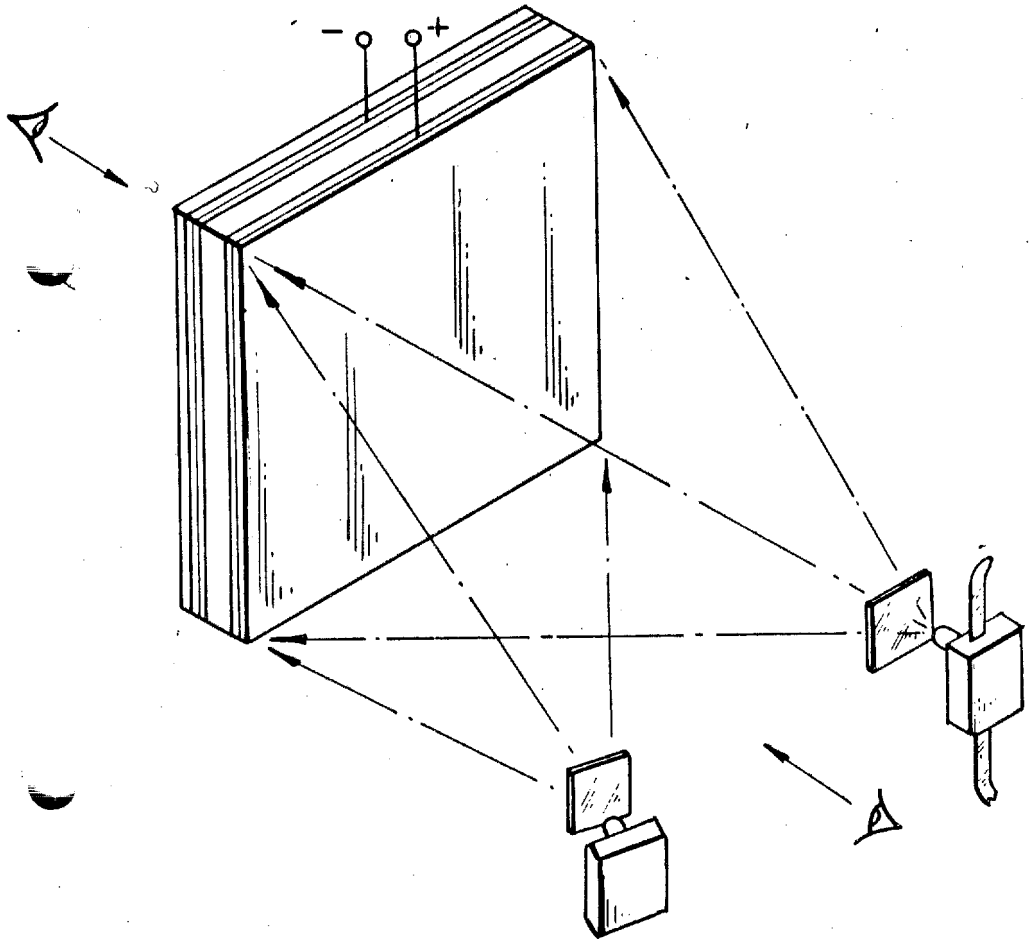
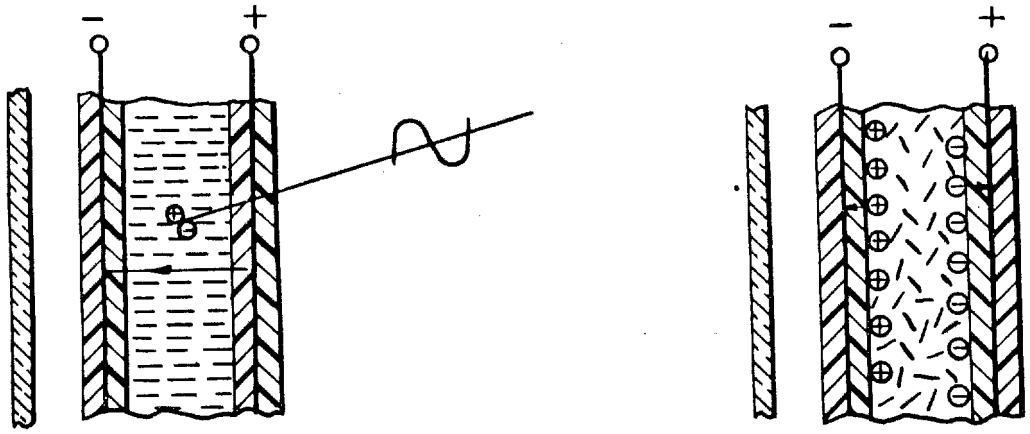


FIG. 1



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