For presentation July 8, 1971,
NATIONAL CABLE TELEVISION ASSOCIATION,
Washington, D. C.

TELECINE SYSTEMS

FOR THE CATV ORIGINATION CENTER

by

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Although "live" programming is considered a necessary part of the program origination services of a community-oriented CATV system, tele-cine facilities will hold the key to success or failure of such an operation from an economic standpoint. The word "tele-cine" was developed during the early days of television broadcasting to define those facilities devoted to the video reproduction of the various film media.

Since the original commercial telecine television camera was an "iconoscope" camera which had a very large sensitive surface (about 3" x 4"), a film projector was focused onto the sensor by using a standard projection lens as shown in Fig. 1. This technique was quite simple and optical alignment was very easy.

Eliminating the "Shutter Bar" effect

In the case of motion picture film, the theatre projector had to be modified in order to prevent a "shutter bar" effect caused by the

difference in frame rates between television and motion picture standards. Standard sound motion picture film operates at 24 frames per second while the U. S. standard for television scanning is 30 frames per second. The intermittent mechanism had to be modified so that the length of time between "pull-downs" alternates between 1/20 and 1/30 second. The average of these two fractions is 1/24 second, or the time demanded by the standard 24-frame-per-second motion picture projection rate. When this particular intermittent mechanism is coupled with a five bladed shutter, the frame that remains for 1/20 second is scanned by three 1/60 second fields, while the one remaining for 1/30 second is scanned by two fields. It is not practical simply to speed the motion picture film speed up to 30 frames per second. Unnatural motion results, of course, and sound frequencies are distorted.

The introduction of new super-8mm sound film projectors with different frame rates further complicated the technical aspects of television film coverage. These commercial projectors also had to be specially modified for proper operation at commercial television standards.

Multi-projector systems

As the requirement for more and more film and slide origination developed at the television stations, it became apparent that techniques whereby more than one projector could be used with each camera were necessary. One such arrangement used at the WNBT film studio in New York (Figs. 2 and 3) was a track assembly whereby the camera could be rolled from port to port in the studio wall in order to pick up several slide and motion picture film projectors. A somewhat similar arrangement used at another early television station provided for the camera to be mounted

on a pedestal with a panning mechanism. This camera could be turned by remote control to face a number of different projectors mounted on stands placed in a semi-circle. Both of these systems had the inherent disadvantage of a significant time lapse when changing from projector to projector.

With the introduction of the vidicon television sensor in later years, the image size of the sensor was reduced to 3/8" and 1/2" and optical alignment became much more difficult. "Uniplex" television cameras coupled to one projector were still used (Fig. 4); however, scan reversal was necessary when using the one-for-one system.

An economical method for using several projectors with one camera was needed. Furthermore, it was desired to reduce the time lapse required to alternate between projectors. These requirements were accomplished by using a prism or mirror "multiplexer" assembly which would direct the light from as many as three projectors directly onto the surface of the vidicon tube (Fig. 5). Mechanical "dousers" were inserted or removed from the light path of each projector to select the proper image.

Although this technique was relatively inexpensive, it was extremely difficult to align the images. Control of light levels had to be accomplished by use of "automatic target" controls or individual remotely controlled "neutral density disks" mounted in the light path from each projector.

A simple method to accomplish alignment of several projectors, as shown in this picture (Fig. 6), was to provide the camera with an objective lens which was focused upon the image plane developed at a "field

lens" located between the projectors and the pick-up device. The use of this lens provided several advantages (Fig. 7). First and most important, optical alignment was considerably less complex. Secondly, the light could be controlled by inserting a neutral density disk in the camera optical path thus reducing the number of disks required. Light control could also be accomplished by using an automatic iris on the objective lens. In addition to douser operation with a prism multiplexer, selection of the proper image was accomplished by pneumatic insertion or removal of "first surface" mirrors as shown in Fig. 8.

Two-camera, multi-projector systems

With the introduction of the multiple surface mirror multiplexer head as shown in the left half of the illustration (Fig. 9), it became practical to use two cameras with three or four projectors as indicated in the layout on the right. A control system that would allow the image from any of the projectors to be directed to either camera was used. An intricate system of automatic controls prevented the image which was "on air" from being disturbed if a conflicting command was given for the alternate camera. Control of the light was accomplished by neutral density disks at the sources or located in the light path at each camera. Although these systems were quite versatile and economical for large television stations, it appears that the complexity is not required for most CATV installations.

Color telecine for cable TV

A typical color telecine film island for CATV use is shown in this "exploded view" (Fig. 10). Components of the system include a remote-controlled slide projector, a remote controlled super-8mm film projector, and a specially developed lightweight 16mm film projector. These units

are mounted on a rigid framework and coupled through a mirror multiplexer system to a Norelco LDH-1 type Color Film Camera. Here (Fig. 11), light control is provided by an automatic iris on the objective lens coupled with automatic target control of the vidicon sensors. The use of a wave-form monitor and a monochrome picture monitor is recommended if one desires to have the highest picture quality. A high quality system such as the one described will assure a noise-free picture which will meet or exceed the quality picked up from local stations or network originations and relayed to your customers. This system is compatible with either monochrome or color operation. The high quality color system shown in the diagram costs about $25,000.

Sometimes it is desirable from an economy standpoint to utilize one camera for both telecine applications and pick-up of cards, opaque objects or "live" action scenes. Two methods are reasonable when such cost reductions are deemed necessary.

One method is to use a live camera with a zoom lens that can be integrated with an optical multiplexer. A precision wedgeplate is coupled to the multiplexer in such a way as to allow the camera to be critically aligned to the field lens (Fig. 12). The camera can then be attached or detached at will. Since many of the new cameras, either monochrome or color, have zoom lenses with automatic iris mechanisms, the light control is still automatically corrected.

Rear-screen projection

The second method for utilization of a live camera as a film chain involves the use of the rear screen principle. This method reverts back to the early days of television film systems inasmuch as a single "live"

camera can be used to pick up the images from several projectors as well as from cards, radar displays, meters, or "live" objects. You are all familiar with several of the "time n' weather" devices which form the simplest device in this category (Figs. 13 and 14).

One might expand this concept by using a large translucent screen and projecting several images from various projectors onto its image surface from a rear position. These images would be picked up by a camera located in front of the screen. Either one large screen can be used or several small ones with individual projectors as shown in Fig. 15. The advent of a special new type of rear projection screen which reduces "hot spots" and defocusing problems is the heart of the system. This screen allows a standard vidicon or Plumbicon* TV camera to be used for viewing images from practically any existing audio-visual projector and still be used to view a "live" scene (Fig. 16).

For this sample system, we have chosen to use four projection sources, a card rack and a live "video disk jockey" set (Fig. 17). We have provided for a "stop-motion" 16mm sound projector, a filmstrip projector, a 35mm projector and a television-modified super-8mm projector. Thus, one could accommodate almost any type of locally originated material as well as a vast storehouse of educational materials and "Freebies." In this case, two cameras are mounted on a pedestal (Fig. 18) located at the center of focus of a zoom lens that is provided with a close-up adapter. All pick-up points are located on an arc centered on the pedestal. Each projection console (Fig. 19) forms a chord of the circle. The card rack (Fig. 20) also forms an equal chord. Economy is the "name of the game" in the rear screen system. It is designed for minimum

operator costs in the "disk jockey" format. All "start," "stop," and "change" controls for each projector are located in a convenient place on the operational console (Fig. 21).

Since the camera is on a pan/tilt device and employs a zoom lens, one can modify materials brought to the station by amateur photographers. That is, if slides are poorly framed, they can be edited by changing size and framing position simply by focusing on the desired portion of the projected image as illustrated here (Fig. 22). This, of course, is a capability unique to the rear screen system.

All other monitoring, switching, and camera control functions are located in this same desk so that your local "disk jockey-engineer" can have everything at his finger tips.

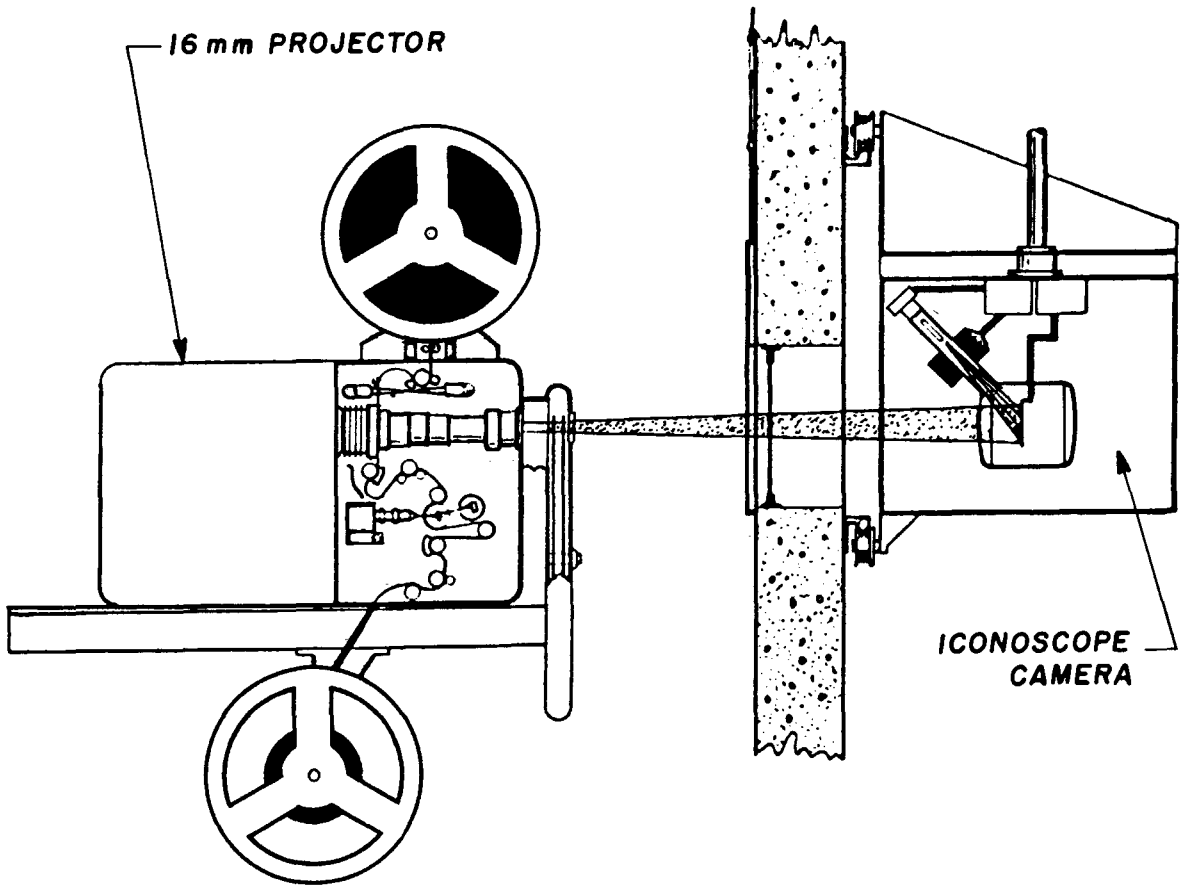
Titles

Several methods for title reproduction have been developed. In addition to the card rack previously discussed, both vertical and horizontal "crawl" devices have been fabricated from moving belt systems as shown in Fig. 23, or the rotating wheel principle shown in Fig. 24. The ability for a cable operator to use a standard typewriter, "rub-off" lettering, "paste-ups" or Polaroid* pictures is a real time and money saver for quickie commercials or promotional slides. A simple "document viewer" (Fig. 25) which again uses a zoom lens and appropriate lighting is ideal for this service. A "positive/negative" phase reversal switch on the camera control provides for image polarity to be reversed, thus allowing black letters to be reproduced in white. Electric zoom allows for size control, while "scan reversal" switches on the camera provide for special effects when desired. Either monochrome or color cameras can be used with this system.

"The telecine production center"--that's really where the action is in the money-making end of cable television origination. I hope that this review of the evolution of the telecine system and its variations, along with some of the tricks of the trade, will help each of you bring greater flexibility and imagination to your own plant to provide new versatility without mortgaging the ranch. If you want any help, give the boys in the Norelco back room a call. They might have just the solution for your problems!

# # #


TELECINE SYSTEMS
for the CATV
ORIGINATION CENTER



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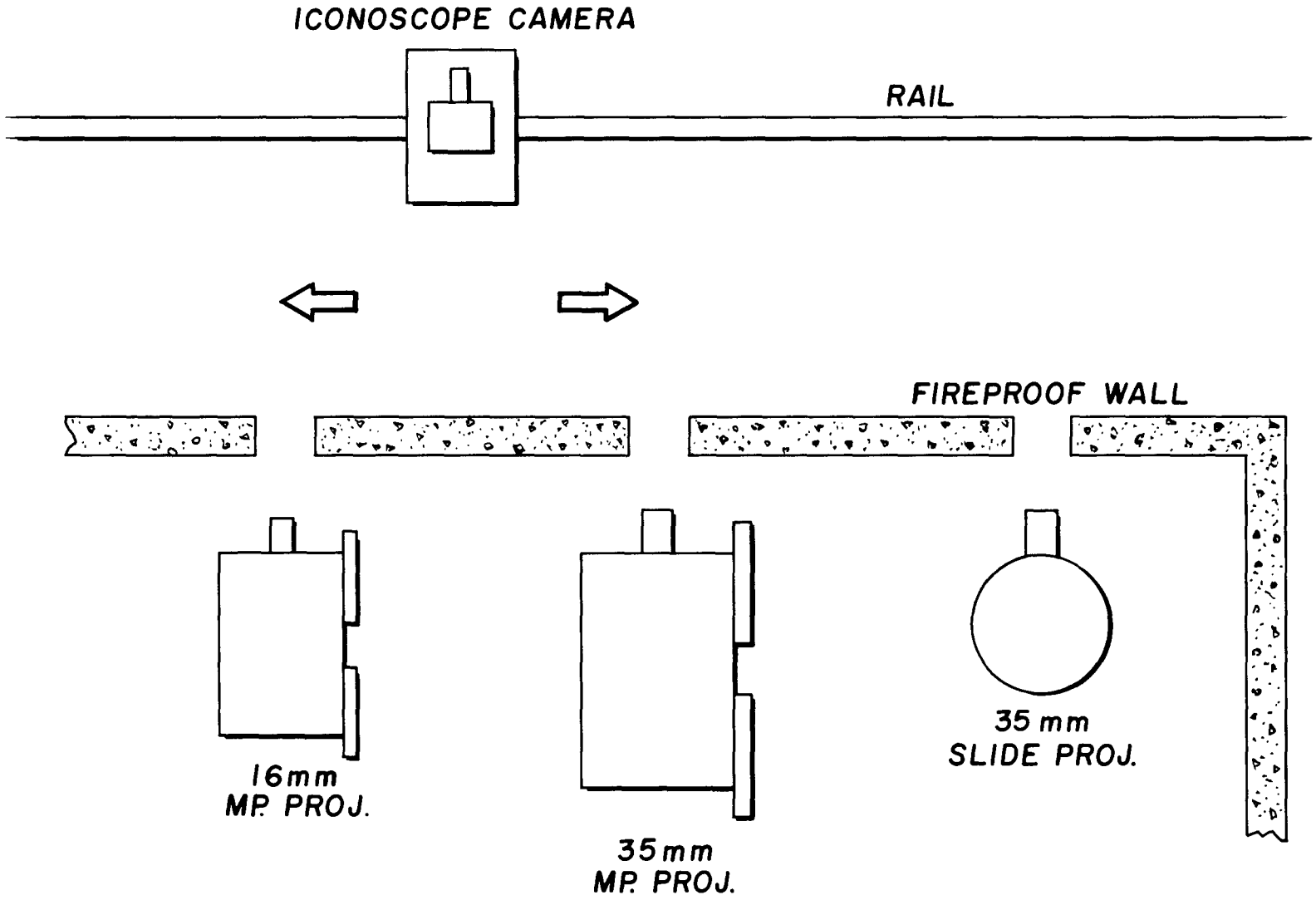

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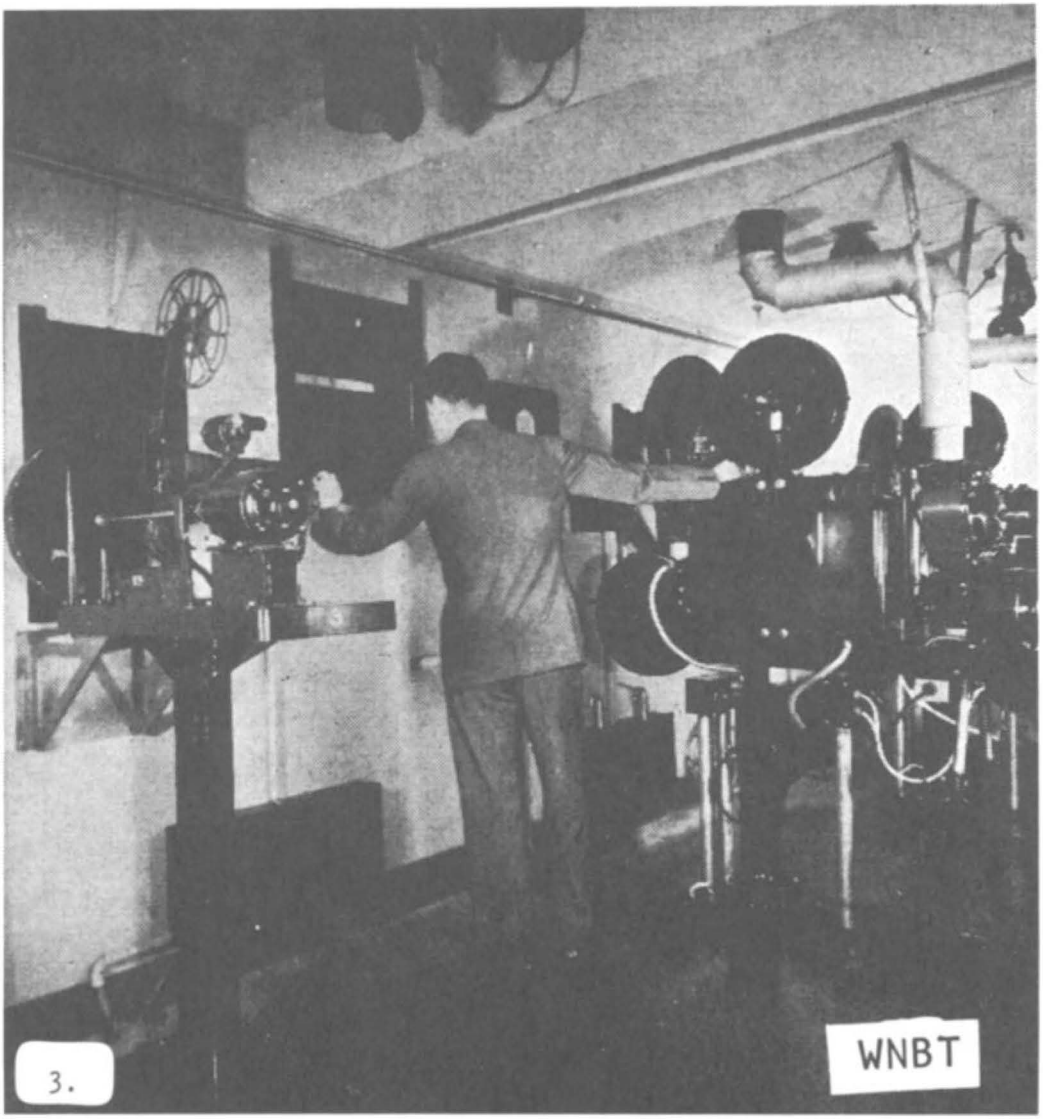
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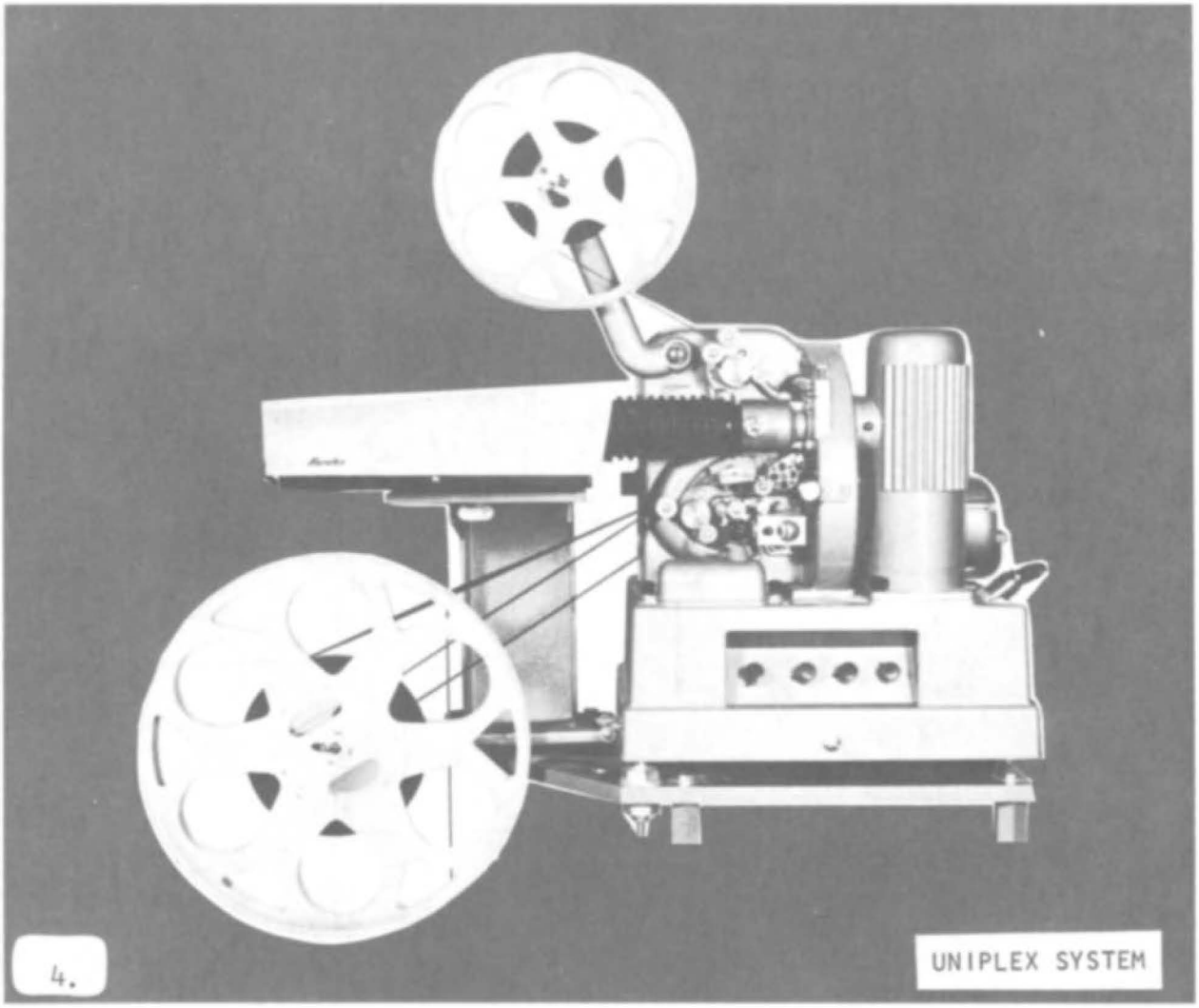
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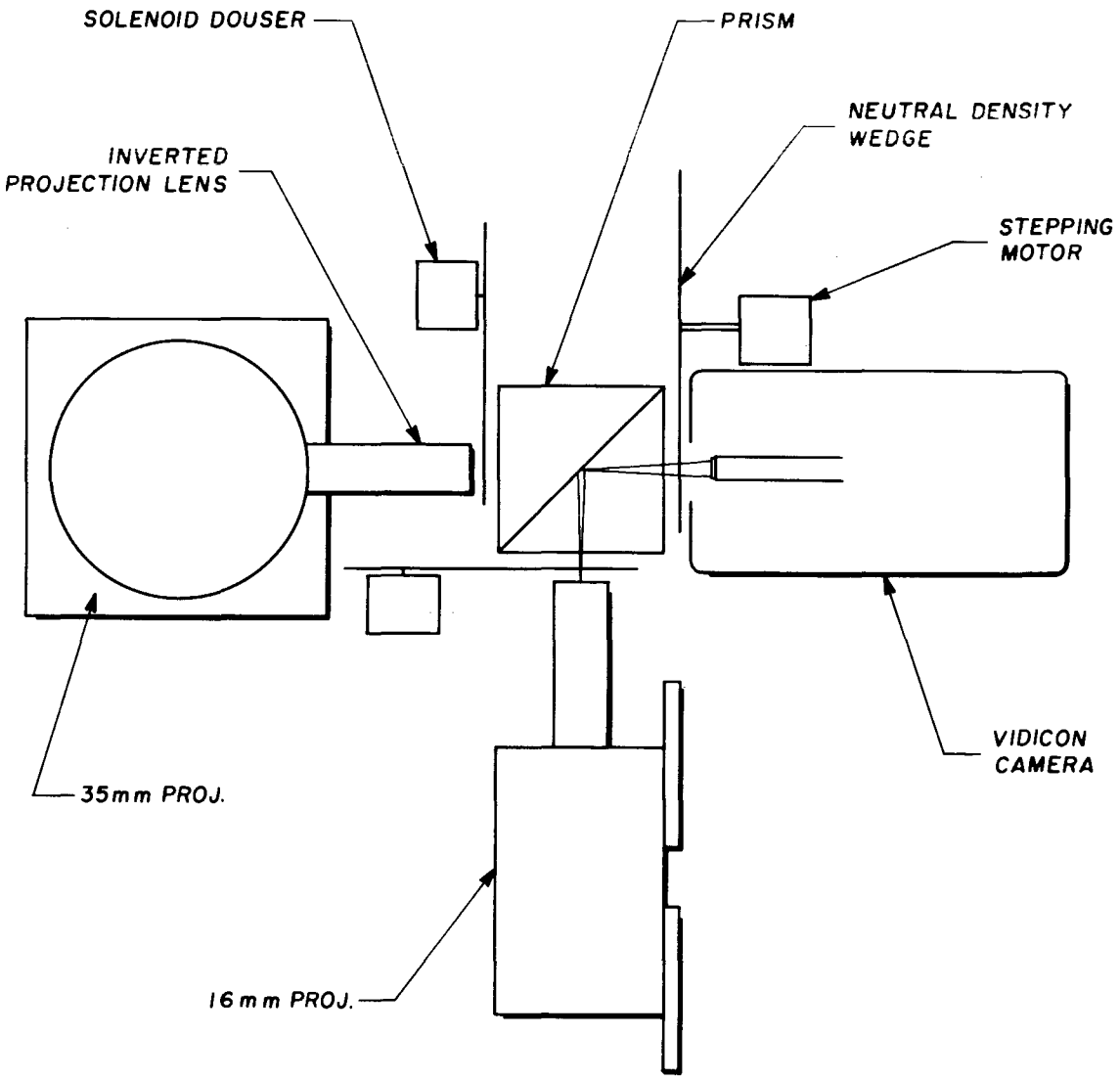

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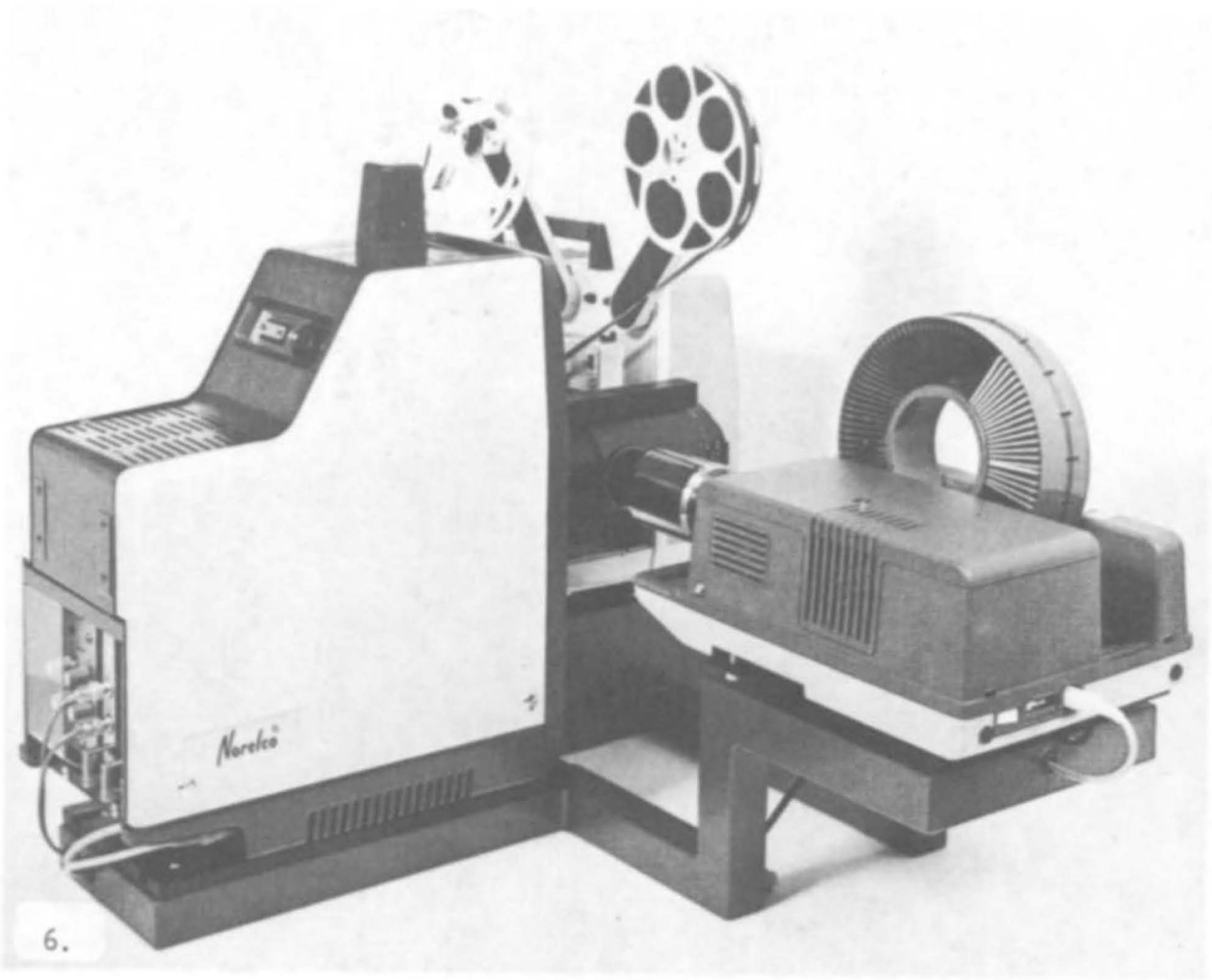

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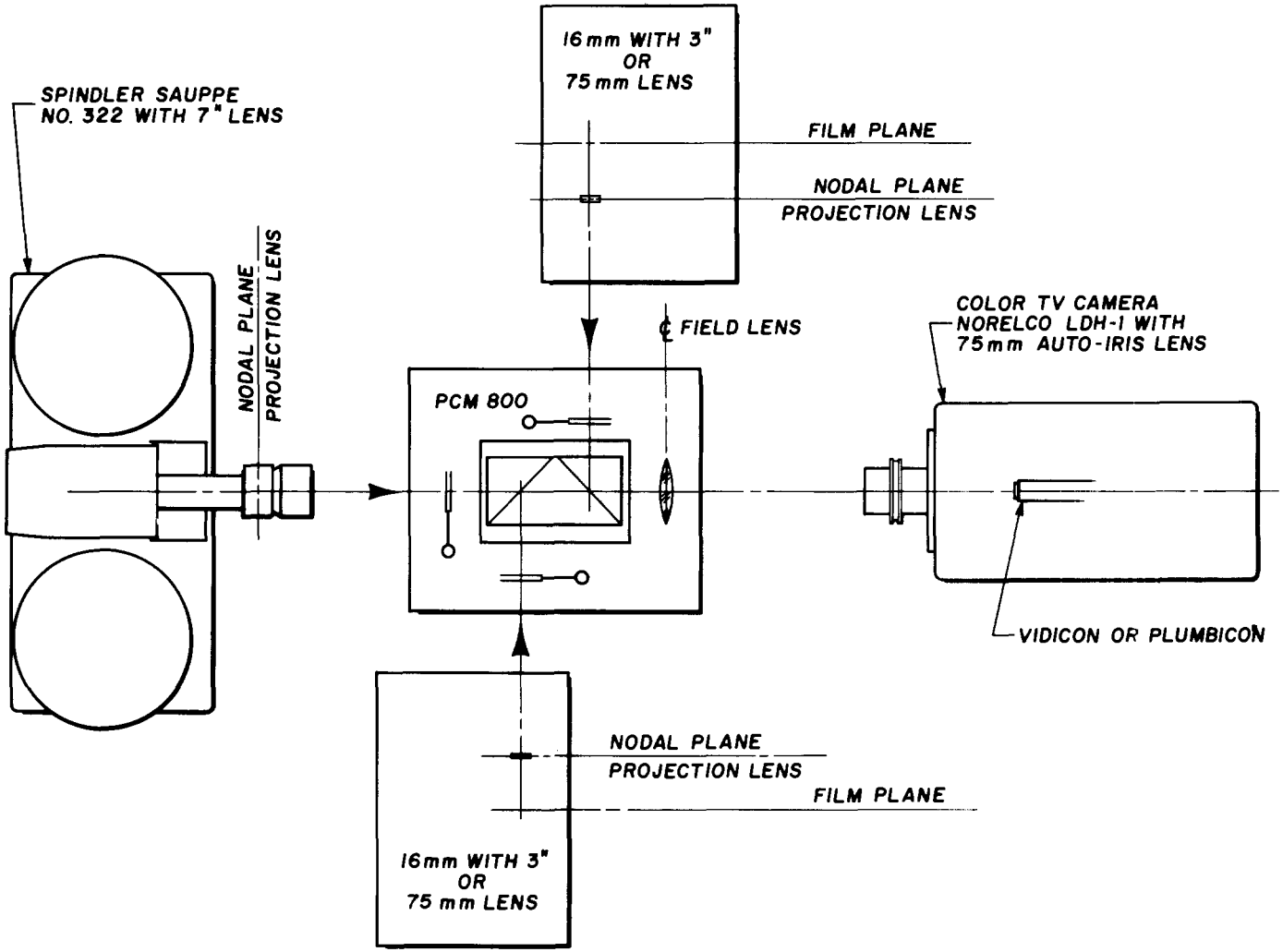

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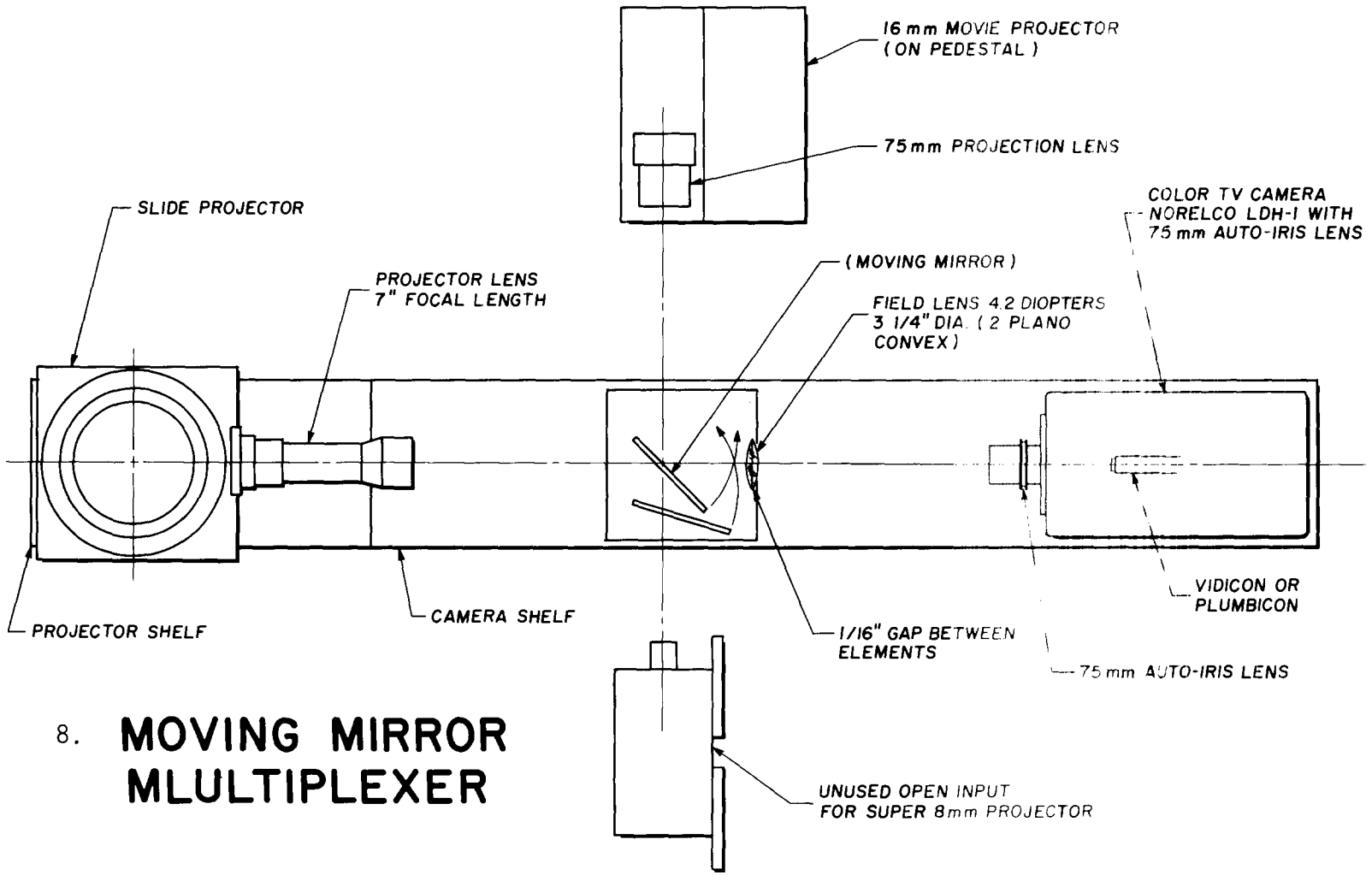
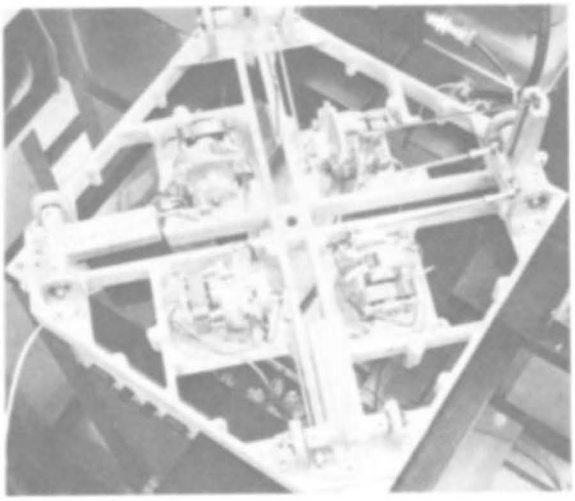


8. **MOVING MIRROR MLULTIPLEXER**



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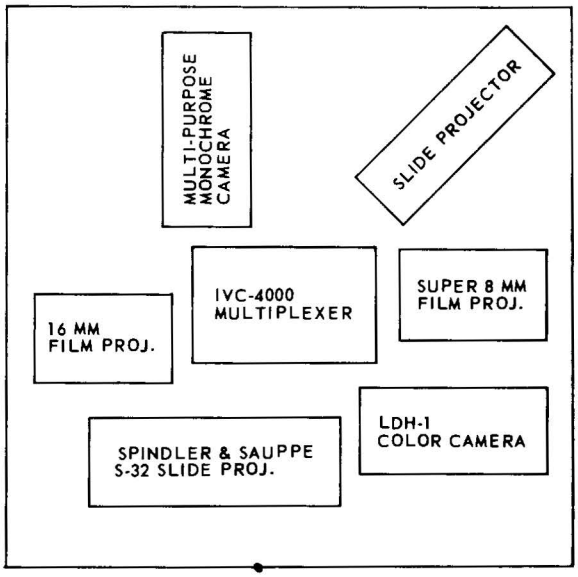
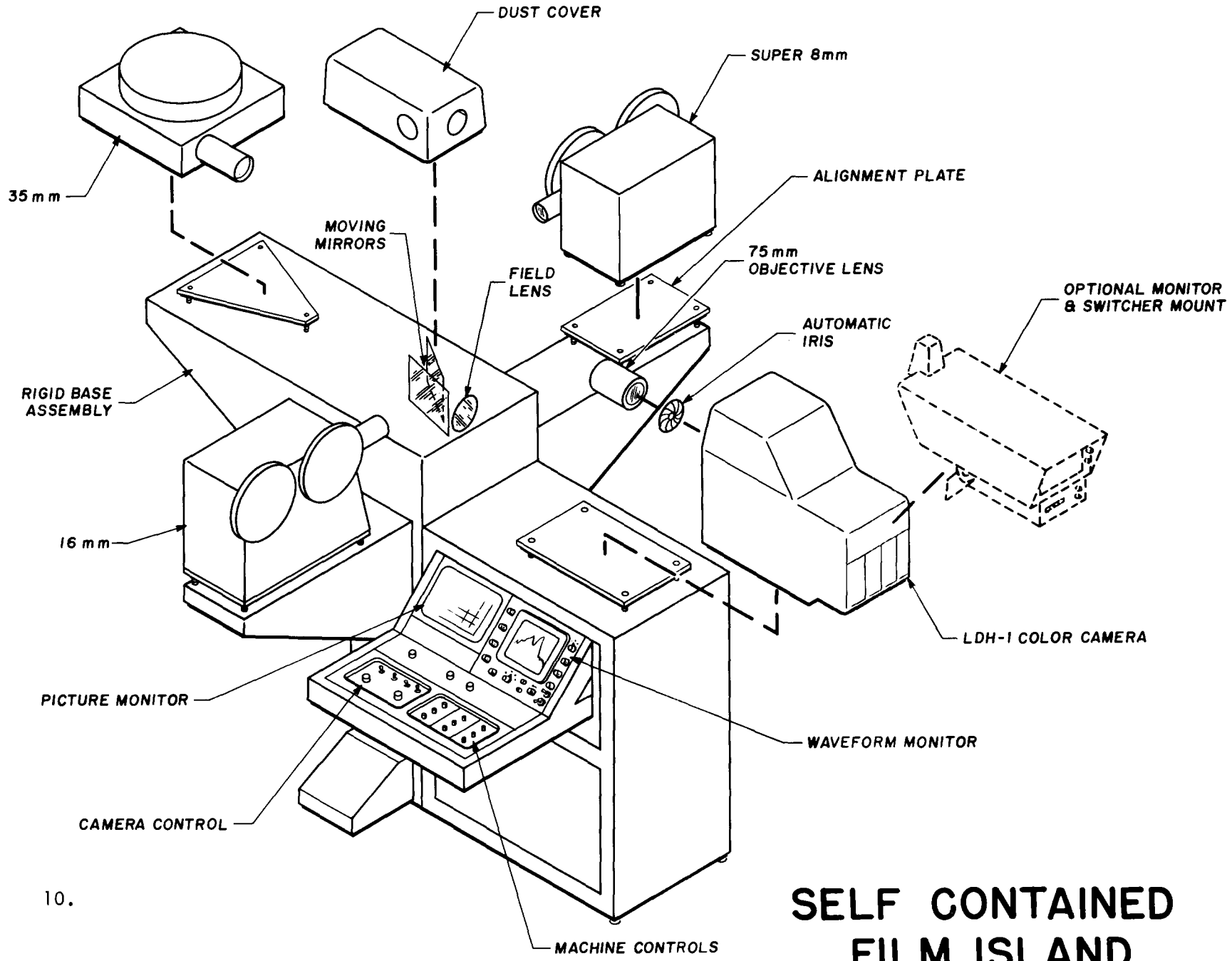
I.V.C. MULTIPLEXER HEAD



TYPICAL 2-CAMERA TELECINE LAYOUT



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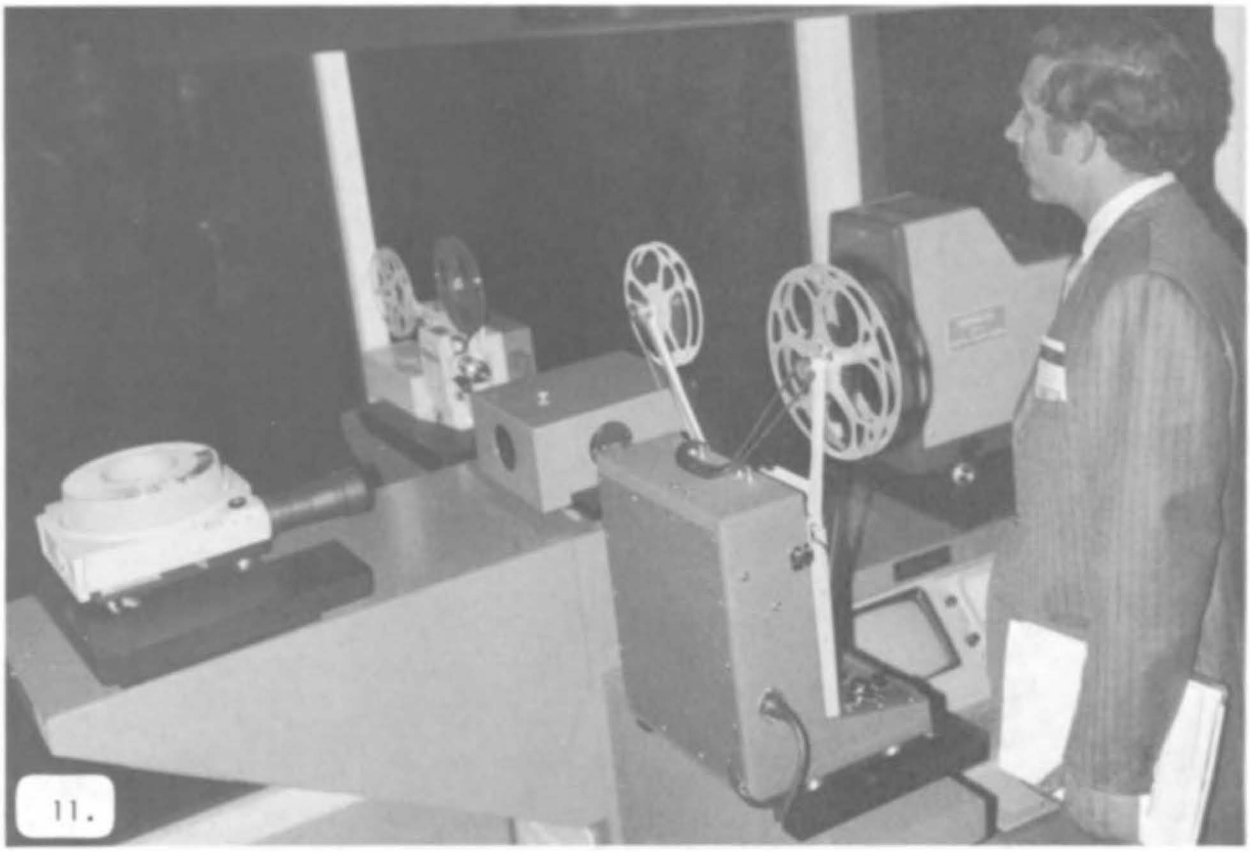
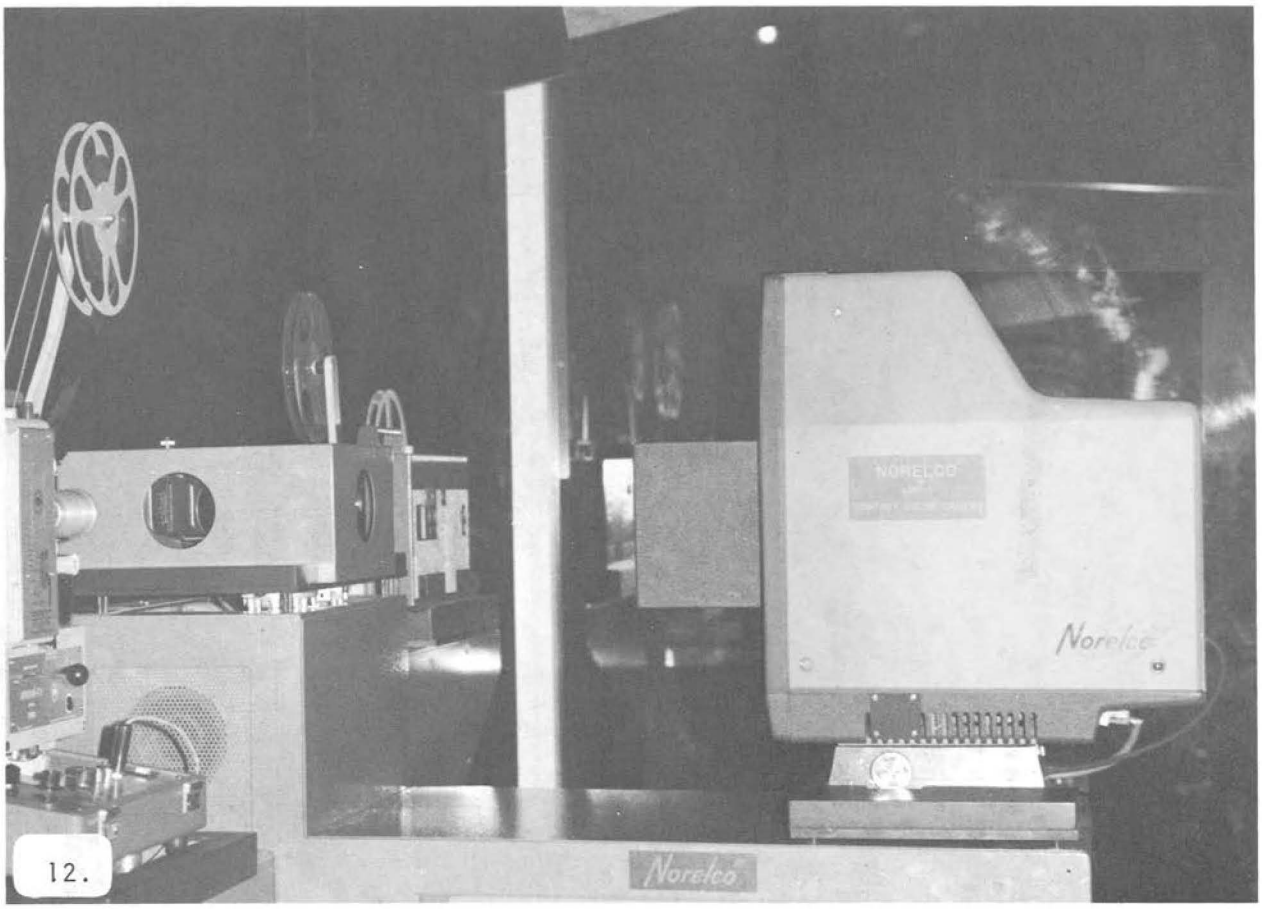
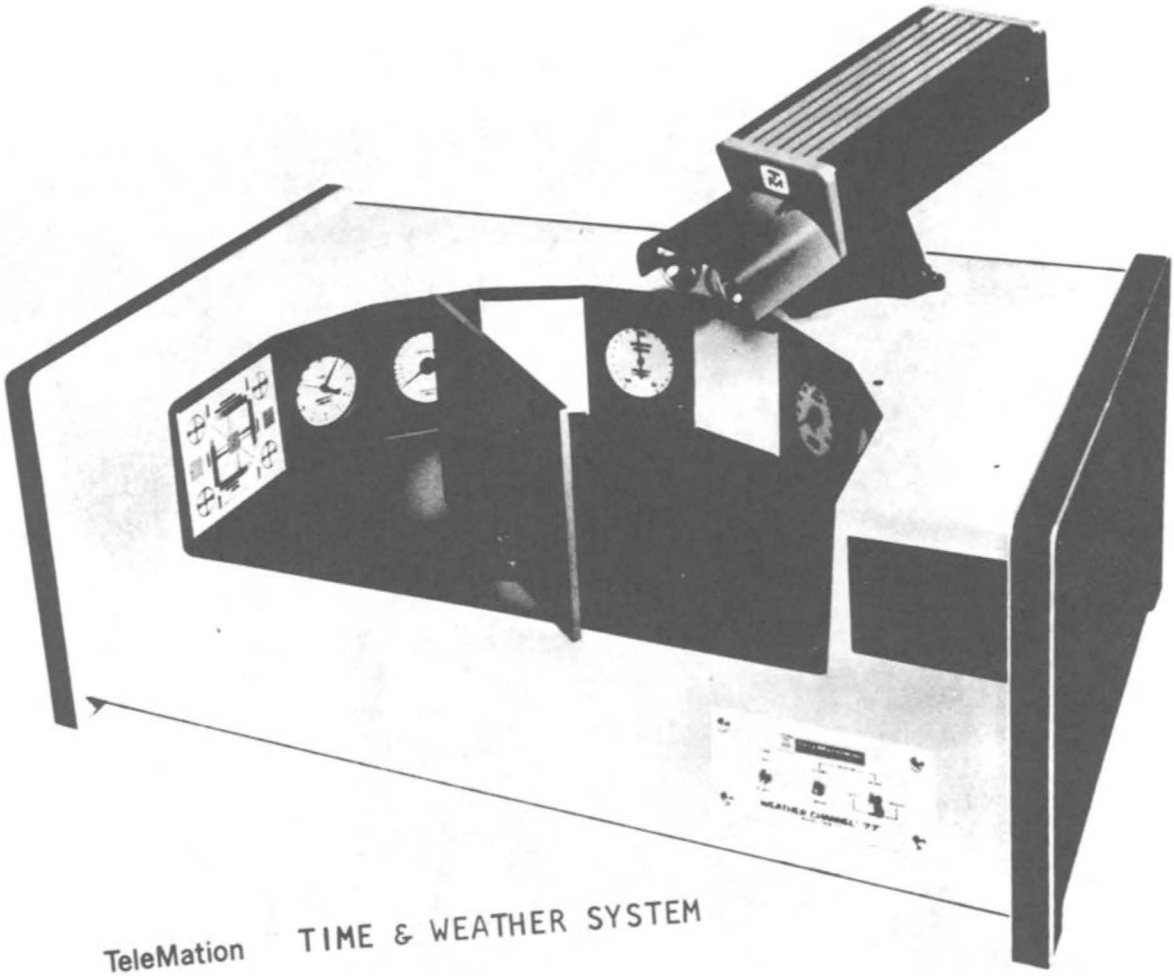
SELF CONTAINED FILM ISLAND



NORELCO LDH-1 COLOR TELECINE ISLAND

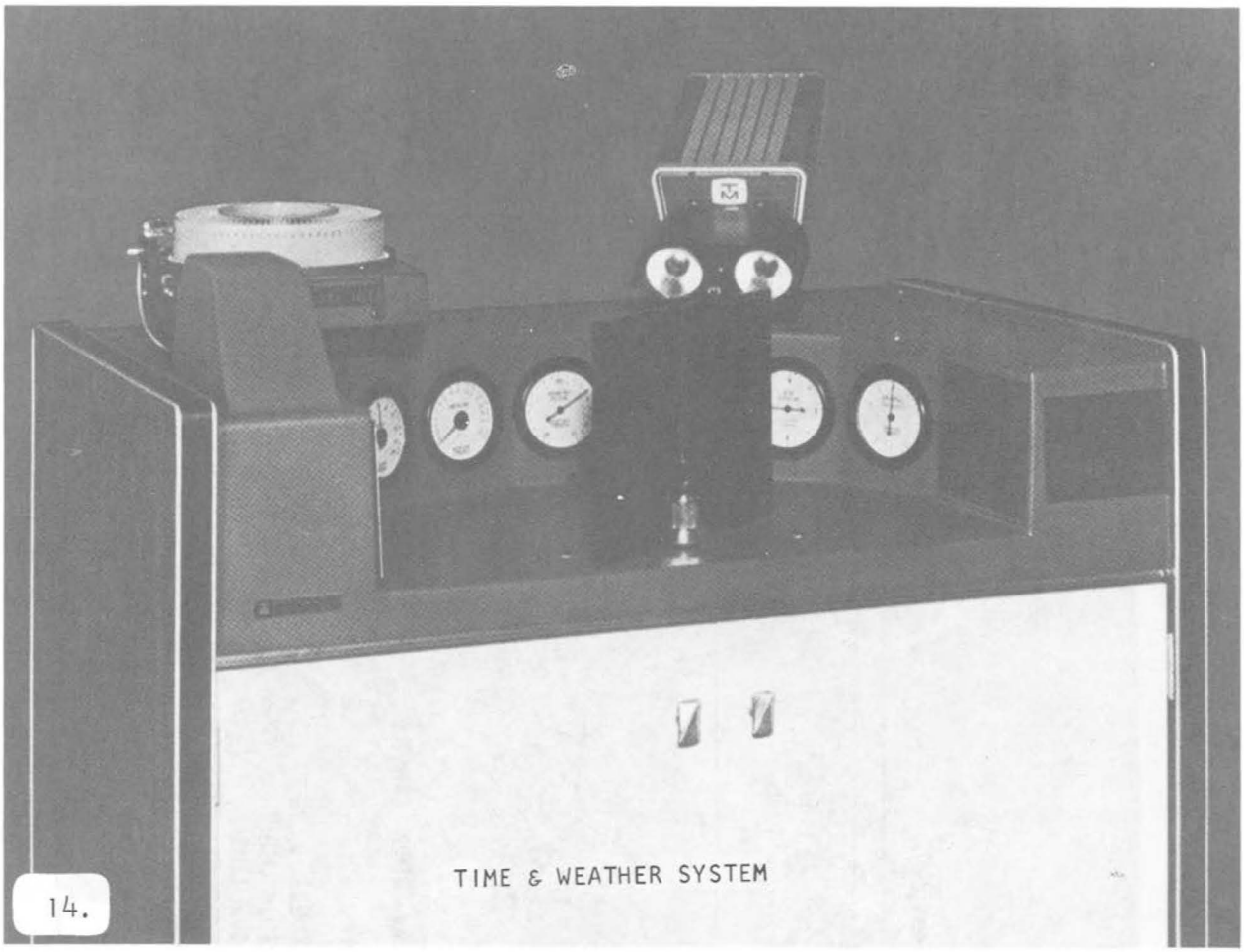


NORELCO COLOR CAMERA IS REMOVABLE FROM
TELECINE ISLAND



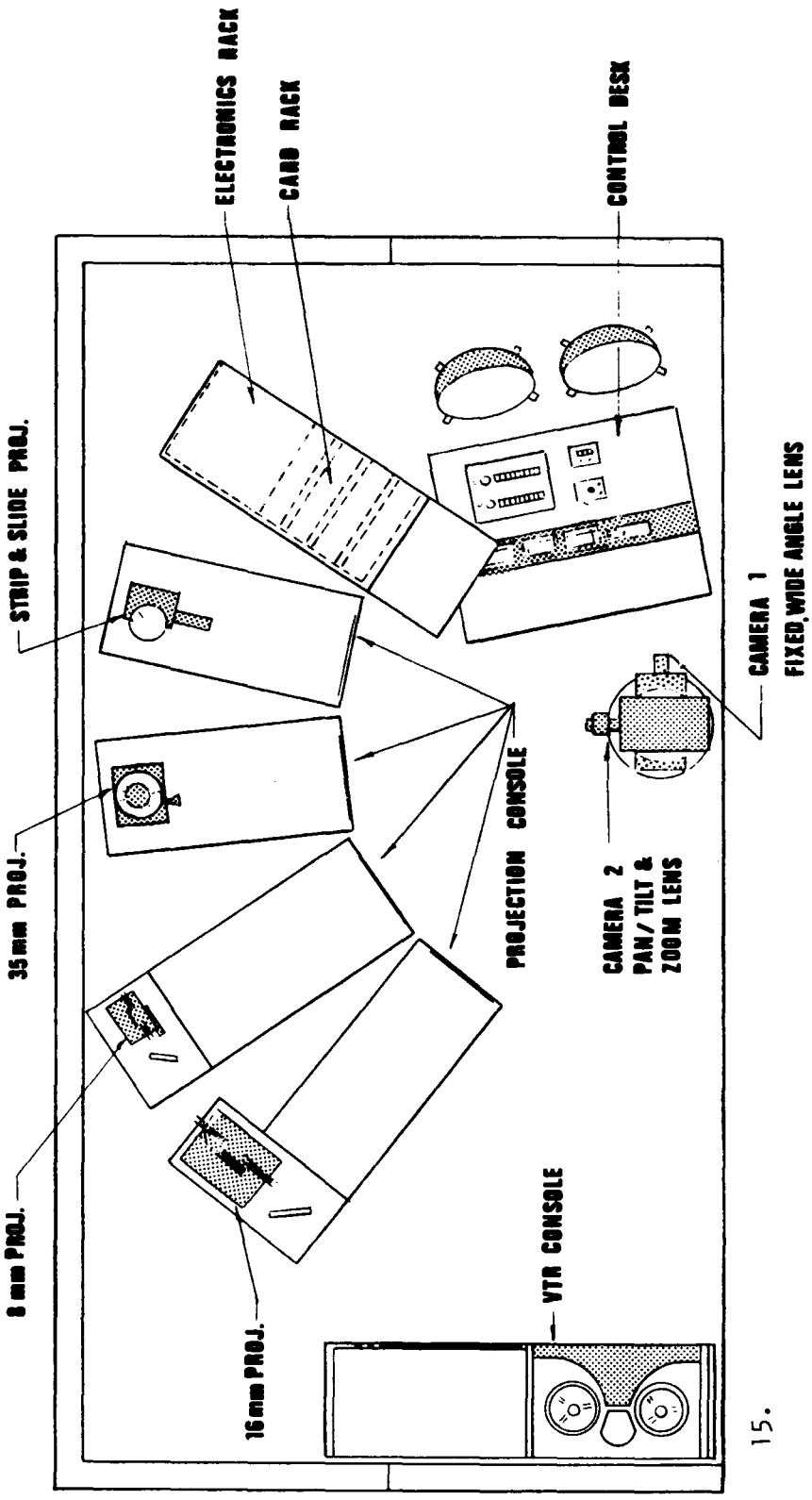
TeleMation TIME & WEATHER SYSTEM

13.

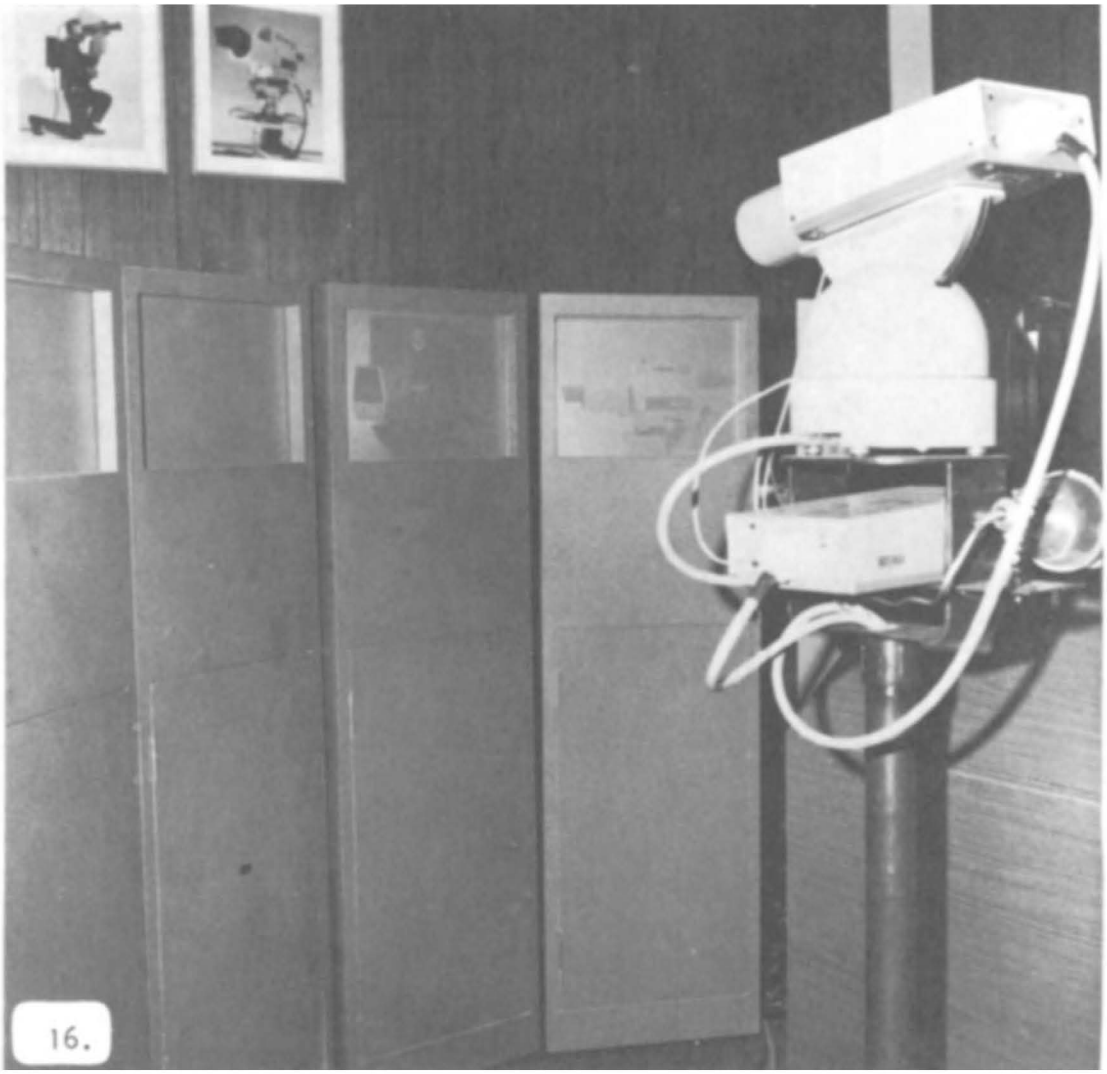


14.

TIME & WEATHER SYSTEM


ELECTRONICS RACK
CARD RACK
CONTROL DESK
STRIP & SLIDE PROJ.
35mm PROJ.
8 mm PROJ.
16mm PROJ.
PROJECTION CONSOLE
VTR CONSOLE
CAMERA 2
PAN/TILT &
ZOOM LENS
CAMERA 1
FIXED, WIDE ANGLE LENS

15.



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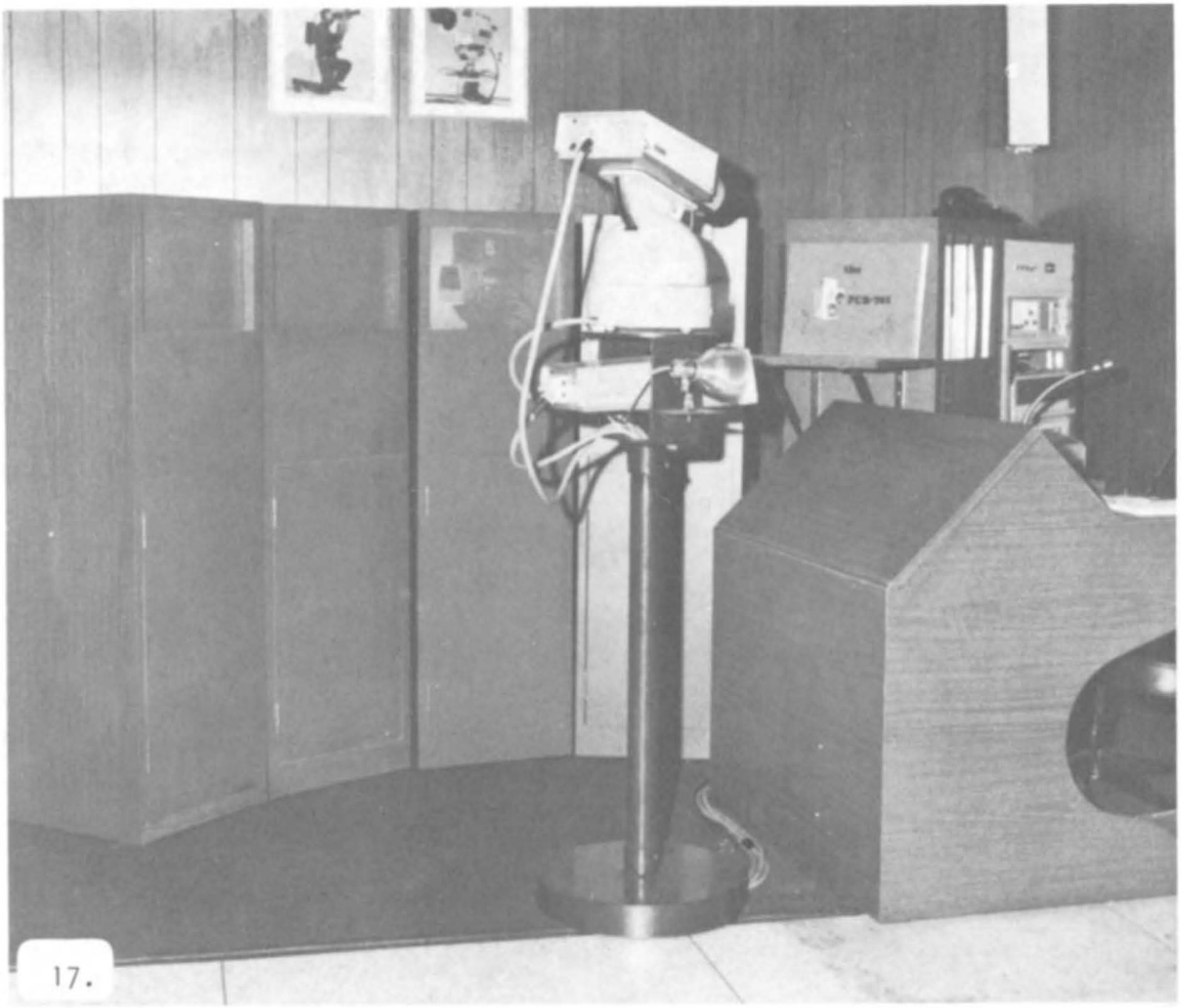
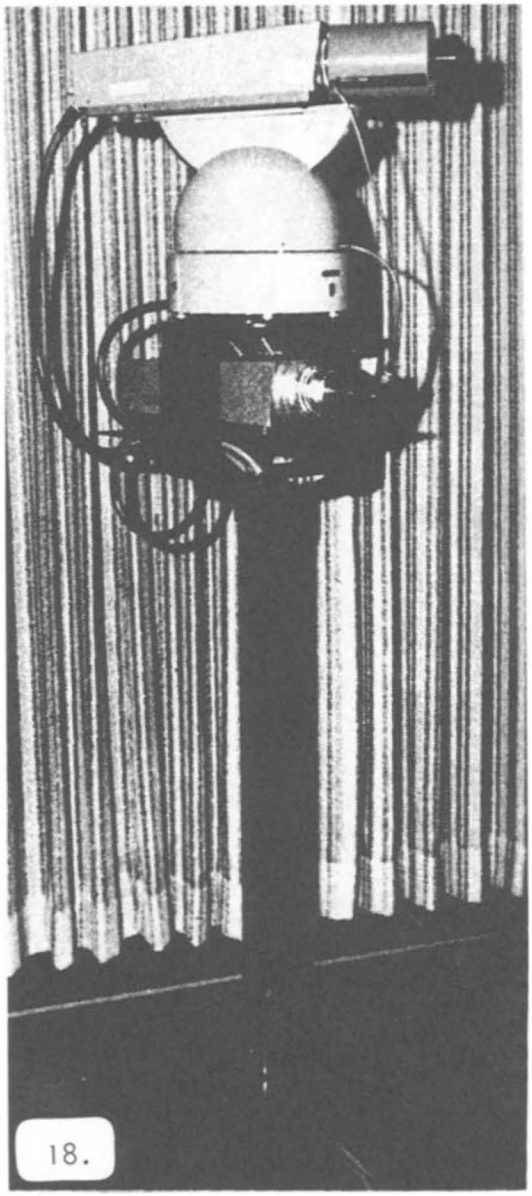


VERSATILE NORELCO "VIDEO DISC JOCKEY"
SYSTEM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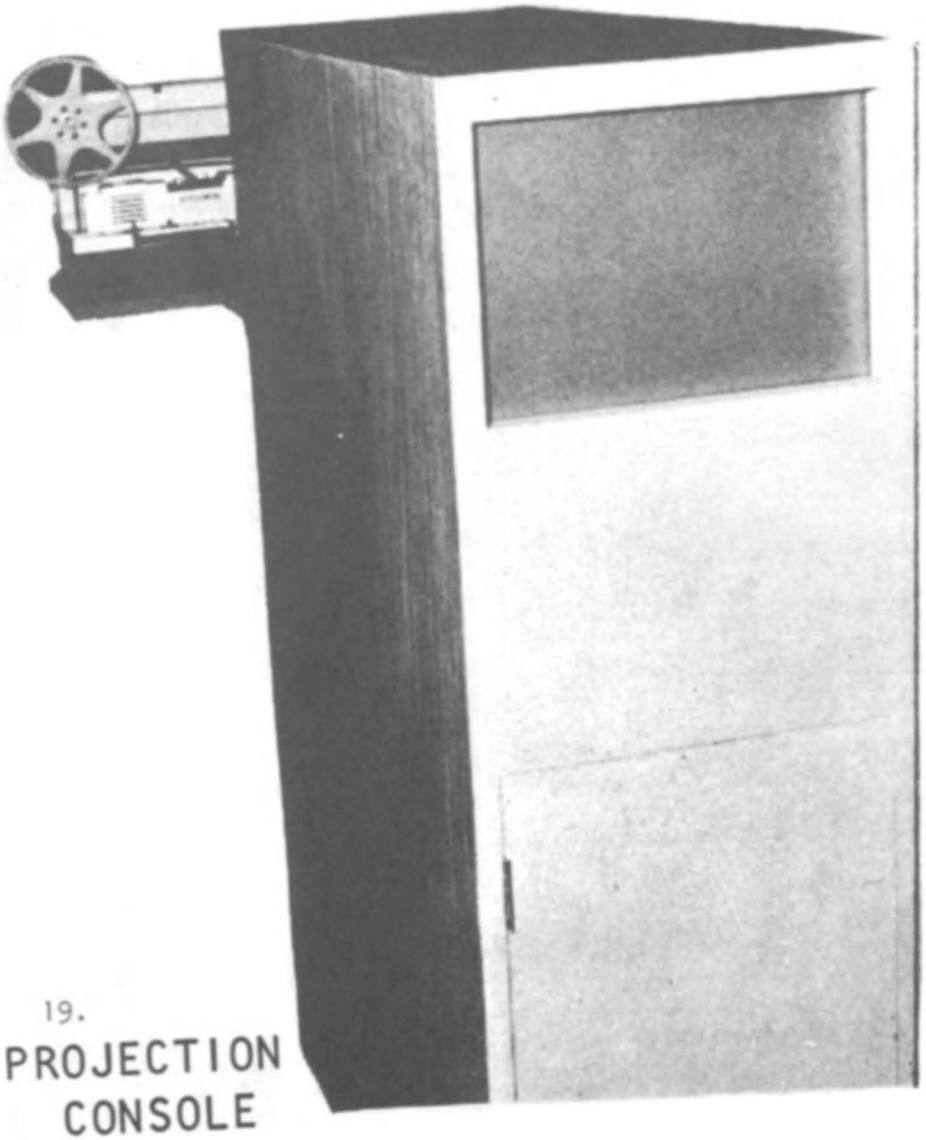

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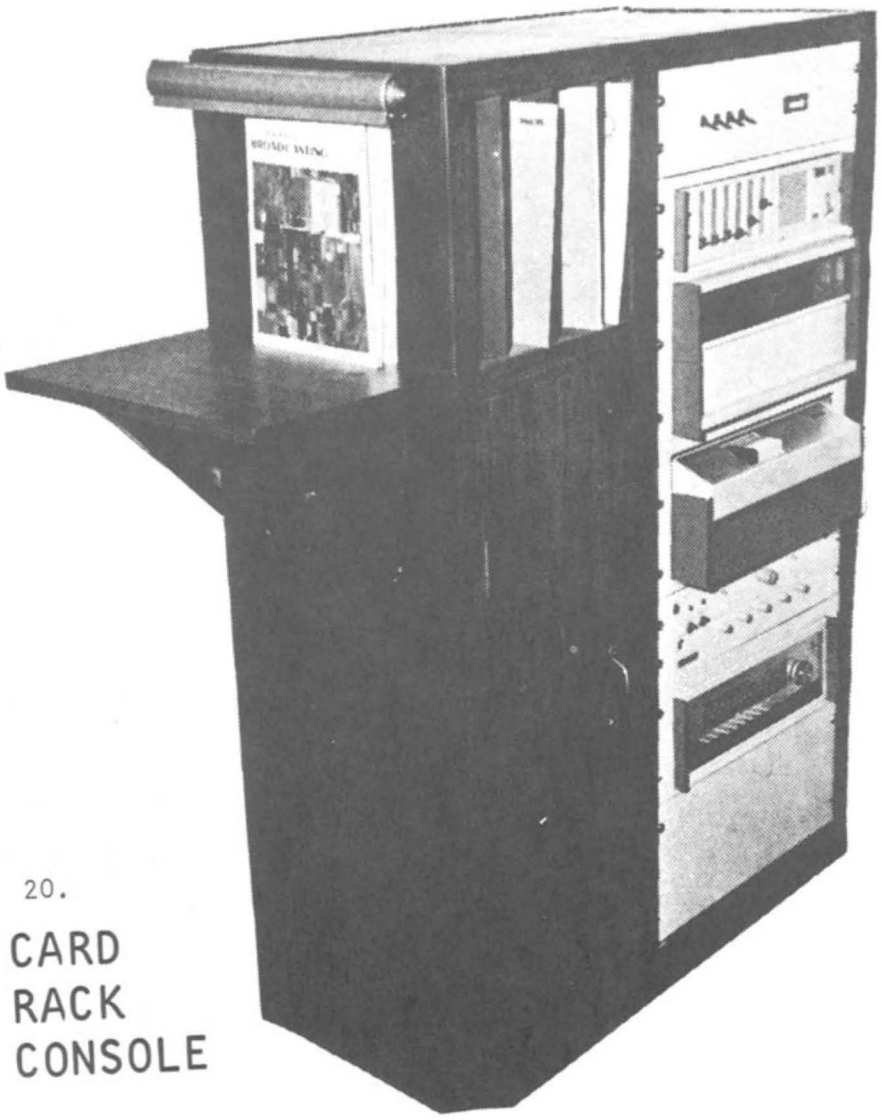
PROJECTION
CONSOLE

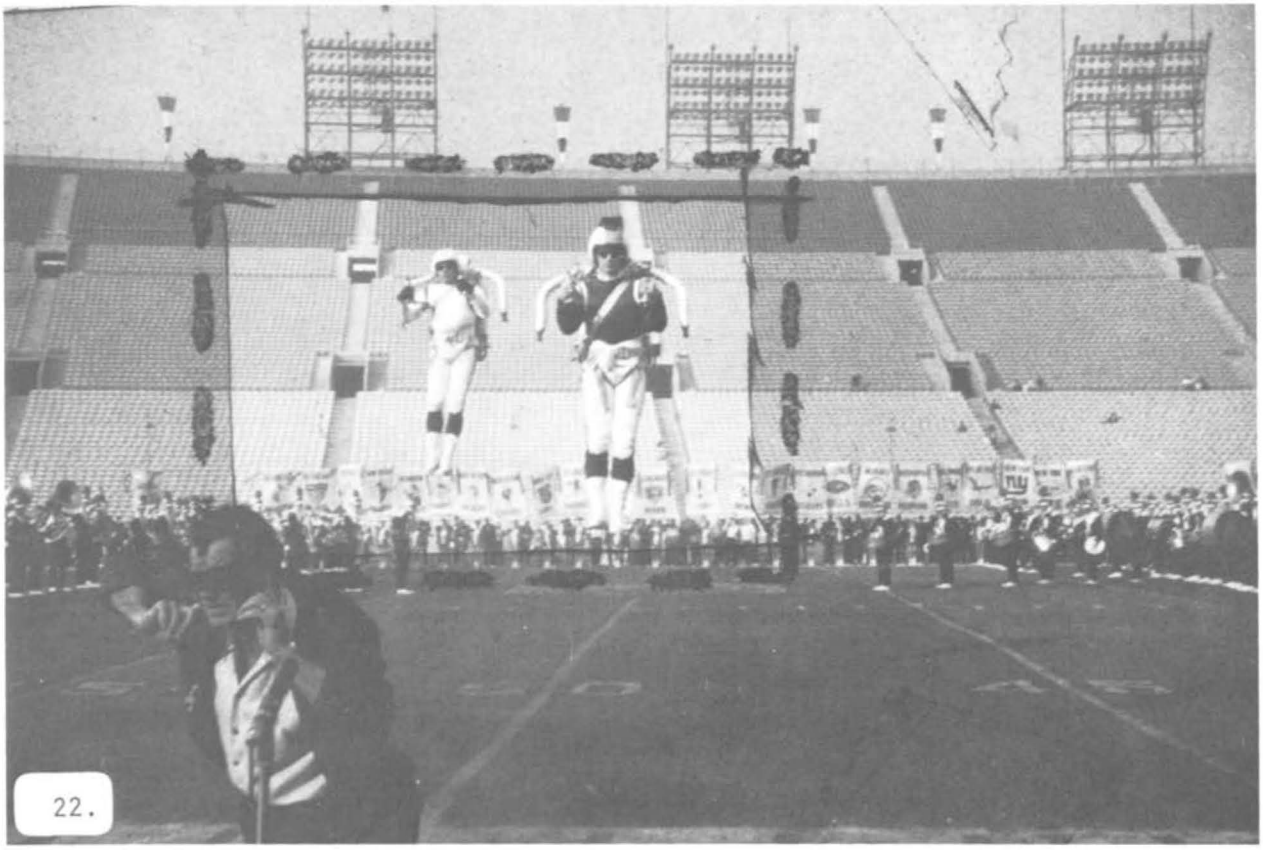


20.

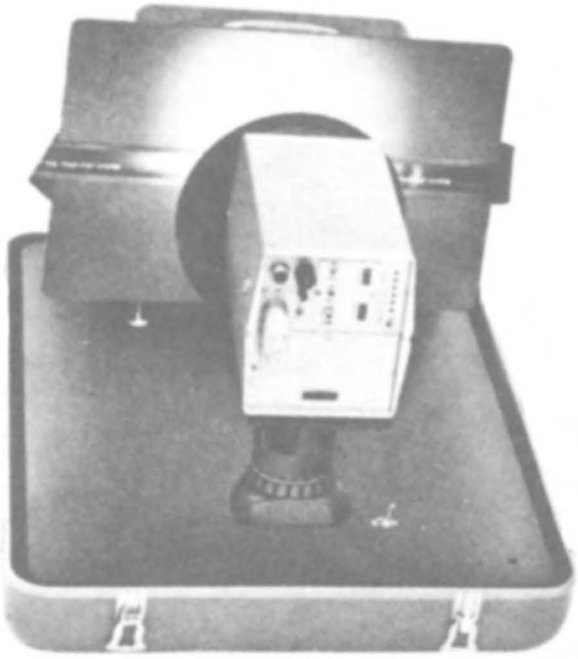
CARD
RACK
CONSOLE

CONTROL CONSOLE

21.

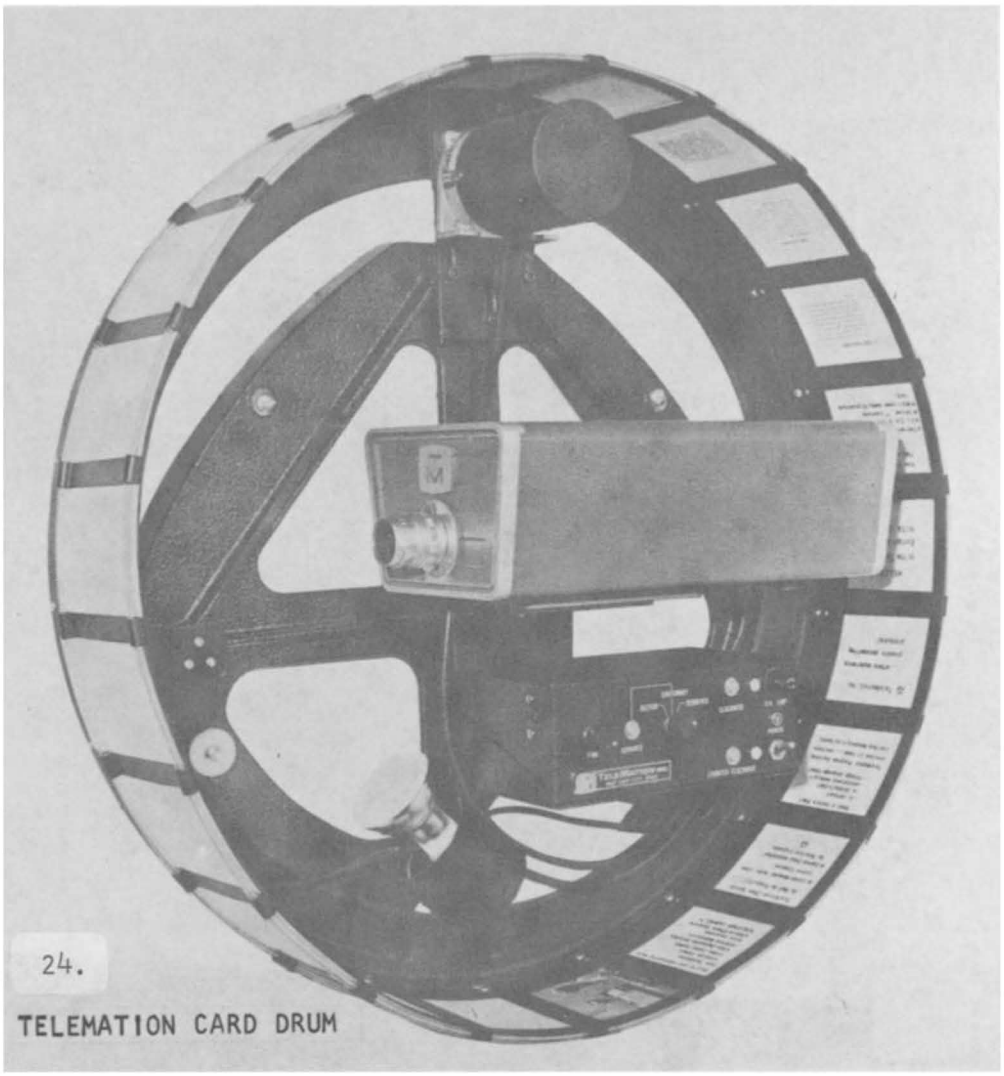


PICKING UP DESIRED PORTION OF SLIDE FROM
REAR-PROJECTION SCREEN



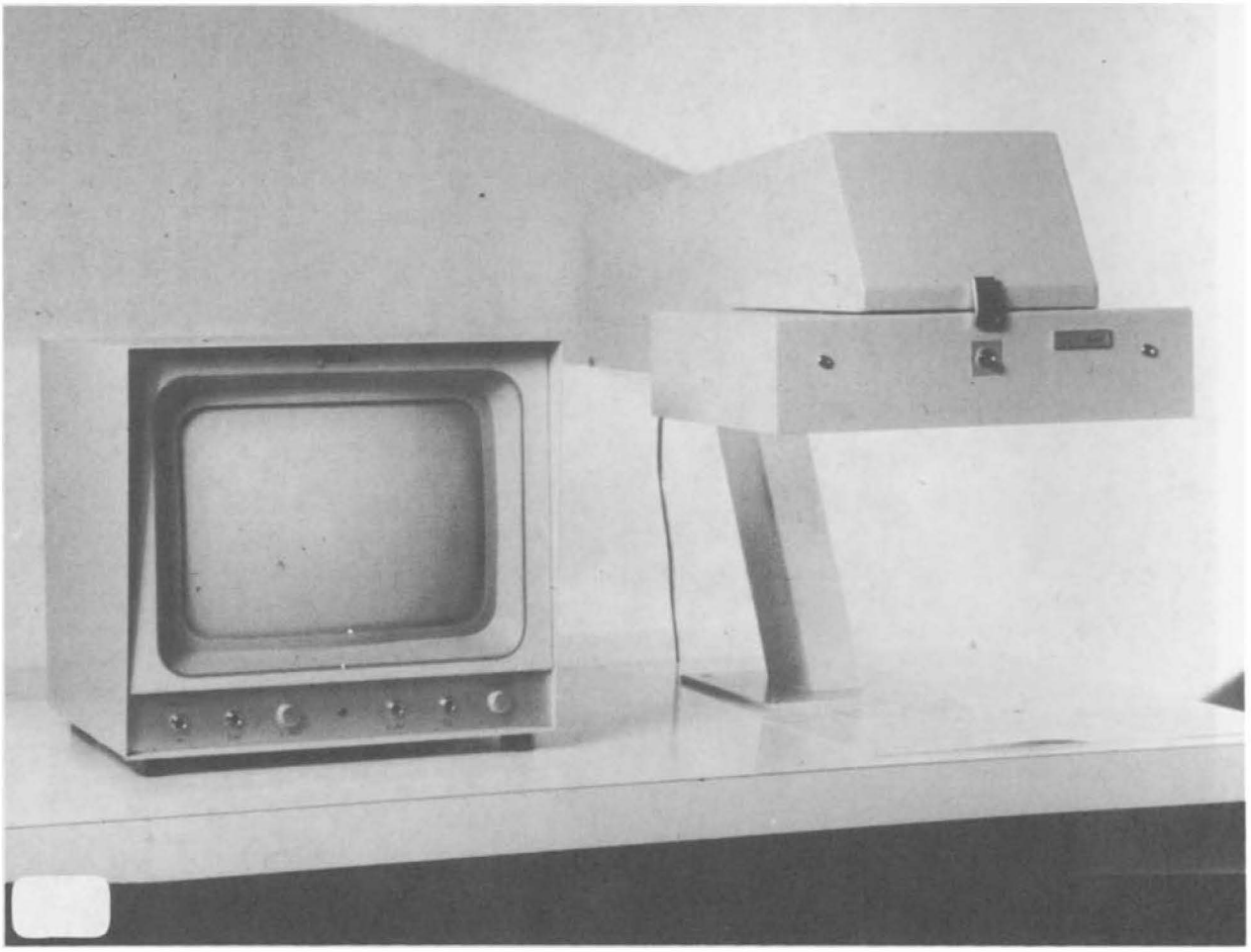
TITLE
SYSTEM

23.



24.

TELEMATION CARD DRUM



NORELCO DOCUMENT VIEWER


Norelco®