This defocusing which occurs in general when an electron beam is deflected, is dependent on the field distribution of the deflecting fields. One may construct the deflection coils in such a way that the errors are a minimum, but it is impossible to eliminate them entirely. The magnitude of these errors is, however, also dependent on the cross-section of the electron beam in the deflecting fields. The narrower the beam the smaller the errors will be.

The result of the combination of the projection tube and the deflection coils in the Philips projector is such that a rather uniform spot size is attained over the entire face of the tube making a dynamic focusing superfluous.

Another item worth mentioning is a small built-in monitoring, tube, giving an as close as possible control of the image on the projection tube. To this purpose this monitoring tube is fed with a part of the video signal fed to the projection tube. The deflection coils of the monitor are also fed by the generators which drive the deflection coils of the projection tube. The purpose of the monitor is that most of the necessary adjustments can be made while the projection tube is kept cut off. Therefore, if the projected picture appears by removing the bias of the projection tube only a few additional adjustments or none at all have to be made and a well adjusted picture appears on the screen.

It has to be mentioned that precautions have been taken to safeguard the projection tube for the results of possible defects in the apparatus. If one of the deflection currents would fail the face of the tube would be damaged rather instantaneously. Therefore a device has been added which biases the projection tube immediately beyond cut-off, if one of the deflection currents would be failing.

All parts of the equipment have been assembled in one unit, the total weight being about 350 kg. In order to make it possible to remove the projector the two « wings » can be taken off by simple operations. The centre part of the apparatus being the most heavy part is mounted on wheels and can, therefore, easily be removed.

The development of this projector took place in the Philips Research Laboratories at Eindhoven. A prototype has already been working there for over two years. The work was achieved by the collaboration of several workers in different fields. The final engineering of this Philips projector which is now commercially available under the name Mammouth was done by a group of workers under the guidance of Mr. C. J. van Loon.

Il dott. SCHROTER chiede quale sia la dinamica dei contrasti che si ha sullo schermo di proiezione.

HAANTJES risponde che da misure effettuate presso i laboratori Philips proiettando una figura composta di 4 striscie verticali nere alternate con altrettante verticali bianche si è potuto misurare un contrasto massimo di uno a quaranta.

Mr. MANDEL fa osservare che questa misura non si riferisce al contrasto dei dettagli e perciò non è di molta utilità. HAANTJES è d'accordo su ciò e dice che le misure del contrasto dei dettagli sono molto difficili da effettuarsi, e comunque è molto facile fare delle confusioni e deduzioni erronee. Comunque HAANTJES conferma che con un rapporto di contrasti dell'ordine da lui citato (1 a 40) si possono ottenere buone immagini.

Mr. KAROLUS chiede alcuni dati informativi circa la vita del tubo da proiezione Philips con 50 KVolt di anodo.

HAANTJES risponde che dopo molte prove di laboratorio il tubo non ha dato particolari difficoltà di funzionamento e ritiene che la vita di esso sia intorno alle 1000 ore.

Sistemi ed apparati per proiezioni TV in locali cinematografici

RALPH V. LITTLE

Dopo aver esaminato il problema generale della proiezione televisiva su grande schermo, l'Autore illustra con dettagli tecnici il proiettore TV tipo PT 100 costruito dalla RCA ed attualmente installato presso numerose sale cinematografiche americane.

Après avoir examiné le problème general de la projection TV sur des grandes écrans cinematographiques, l'auteur donne une description téchnique du projecteur PT 100 construit par la RCA, et largement repandu les salles cinématographiques americains.

After having examined the outlines problem of the large screen television projection, the Author gives a detailed technical description of the PT 100 Television Projector made by the R.C.A. now extensively used in U.S.A. moving theaters.

Theater Television is now being tried by the jury of public acceptance. To date, we find seventy-five theaters interconnected to show special sporting and news events by television on their regular full theater screens. The results have been excellent and the theaters' television programs have been sell-outs.

Theater television programming and technical operations present many new problems. The first theater television programs used regular television broadcasts of high public interest, but it was not long before it was realized that exclusive theater programming would be necessary to obtain a satisfactory box office. The pattern for programming has now doveloped to the point where an organization (Theater Network Television, Inc.) has been formed by theater interests, to provide a service for the procurement and distribution of exclusive and timely programs. In order to meet the needs of the theater network, the broadcaster's camera equipment originate the special programs which in turn feed the common carrier facilities for distribution to the theaters.

The operational problem is to determine how the theater may be connected into a satisfactory interconnecting network. Such a network must reach a large enough box office to justify the cost of the program material and its distribution. The facilities of the common carrier were the only method presently available for theater interconnection.

Fig. 1.

TELEVISION RESOLUTION

LINES				
SCANNING*	525	625	735	819
VERTICAL	485	580	680	760
HORIZONTAL				
4.25 MEGACYCLE	340	283	240	216
8.0 MEGACYCLE	640	539	453	.407

*60 FIELDS / INTERLACED

Existing facilities are inadequate because the present inter-city ad intra-city facilities are being used to near capacity by the expanding broadcast television industry.

One of the technical problems of interest to the engineer, is of the transmission requirements involved.

The standards used, at present, for theater television are based on broadcast television; as such have the limitation in bandwidth of 4 1/4 megacycles. A theater television system using these standards is not considered adequate, but to date the theater industry has not been able to agree on desired standards.

The specifications for an adequate theater television system will be determined by the desire of the industry to have results on the theater screen equal to the quality of 35 MM motion picture film. A controlled experiment using a camera (special large image orthicon), closed circuit transmission, and proper television projector adjustment has demonstrated that attainment of such quality is entirely possible.

The Society of Motion Picture and Television Engineers and other industry committees are studying the technical requirements for the theater service. Industry members on the Distribution Facilities sub-committee of the SMPTE Television Committee have expressed themselves as believing an 8 megacycle video bandwidth or even more may be required, but there is not an adequate fund of experience available at present to set an industry standard specifically tailored to the use of theater television.

Theoretical evaluations have shown that an eight (8) megacycle video channel, used under ideal conditions of equipment adjustment, including correction for proper tone scale rendition, and having a high signal-to-noise ratio can reproduce all the information from a frame of 35MM motion picture film. The factors which require attention in order to produce the ultimate in picture acceptability, are 1) picture detail, 2) freedom from line structure, 3) signal-to-noise ratio, 4) tone scale rendition.

Picture detail and line structure must be discussed together as they have to do with the transmission bandwidth available. The present television broadcast channels limit the practical bandwidth, via air transmission, to approximately 4 mc. The number of scanning lines is now 525; permitting a resolution of 340 lines horizontally and 485 lines vertically. At a 4:1 viewing distance, which is considered the minimum for acceptable home viewing, the scanning lines are not readily resolved by the eye so that the standards are considered adequate for a television broadcasting service. Theater seating is usually arranged to begin at two times the picture

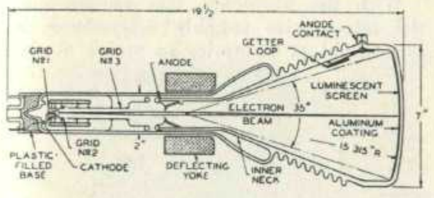


Fig. 2.

height, which is considerably closer to the screen than for home television viewing, then it follows that more picture detail and a greater number of scanning lines will be desirable. The selection of the number of scanning lines is a compromise between visibility of line structure, the resolution of the picture elements in the horizontal direction and the given bandwidth. Figure 1 indicates the resolution which is possible for various choices of scanning lines and transmission bandwidths. For an example, with an 8 mc video band, we can determine the resolution capabilities of such a system when the number of scanning lines become the variable.

***TELEVISION RESOLUTION**

Scanning Lines	*525*	*625*	*735*	*819*
Vertical	485	580	680	760
Horizontal				
Bandwidth 4.25 mc.	340	283	240	216
8 mc.	640	539	453	407

It is to be noted that the present 4 1/4 mc broadcast standard permits a greater vertical than horizontal resolution, the compromise being the direction to minimize line structure. If the bandwidth is fixed, an increase in the number of scanning lines reduces the horizontal detail as shown. The data indicates that an 8 mc system will give a balanced resolution when using 625 lines. The RCA PT-100 equipment has been designed to utilize the capabilities of a full 8 mc video channel.

The signal-to-noise ratio is an extremely important factor, probably the most important, if emphasis is to be placed on any one item. Motion picture film noise level, which until recently has not been quantitatively measured, should be the basis for an acceptable noise figure. The value of 42 db for the electrical peak-to-peak signal-to-noise has been suggested as being a representative value. The type of noise is also important; impulse type can be extremely troublesome because of its effect on the keyed d.c. setting circuits. Single frequency noise can be noticeable even though low in level because it will beat with the scanning frequency to form interference patterns, hence any frequencies which are a multiple of horizontal scanning frequencies are to be avoided.

The fourth factor, tonal rendition, is also important and is dependent on the operating conditions of the camera in particular and on the operation of the projector as a secondary effect. When the camera characteristics are well standardized, correction circuits can be introduced to enable the theater television projector to produce pictures comparable in quality to those produced by the standard 35MM motion picture projector.

Transmission standards then must meet the criteria of 35MM quality. This means that an adequate video bandwidth be available and the transmission facilities must be capable of high signal-to-noise ratios so that high definition pictures will not be masked by noise or deteriorated by interfering signals of a beat frequency or impulse noise nature.

In view of the need for the possible use of radio frequencies to accomplish theater interconnections, the Federal Communications Commission has scheduled hearings to determine the rights of the theater interests in radio spectrum space.

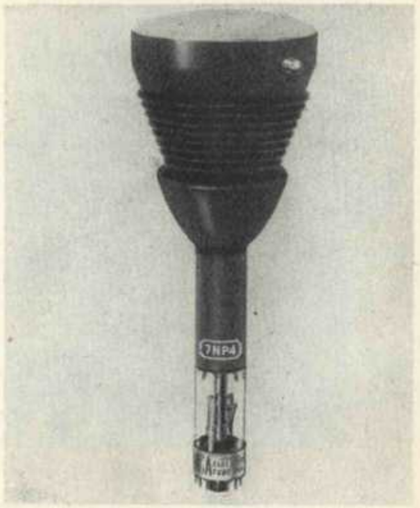


Fig. 3.

Regardless of the network method chosen the basic television standards should be the same. It therefore follows that the choice of interconnecting means and facilities will be independent of the final method of television picture presentation. The methods which have been under development in the search for an adequate projection systems consist of the following types:

A. Direct Projection - High Intensity Kinescope

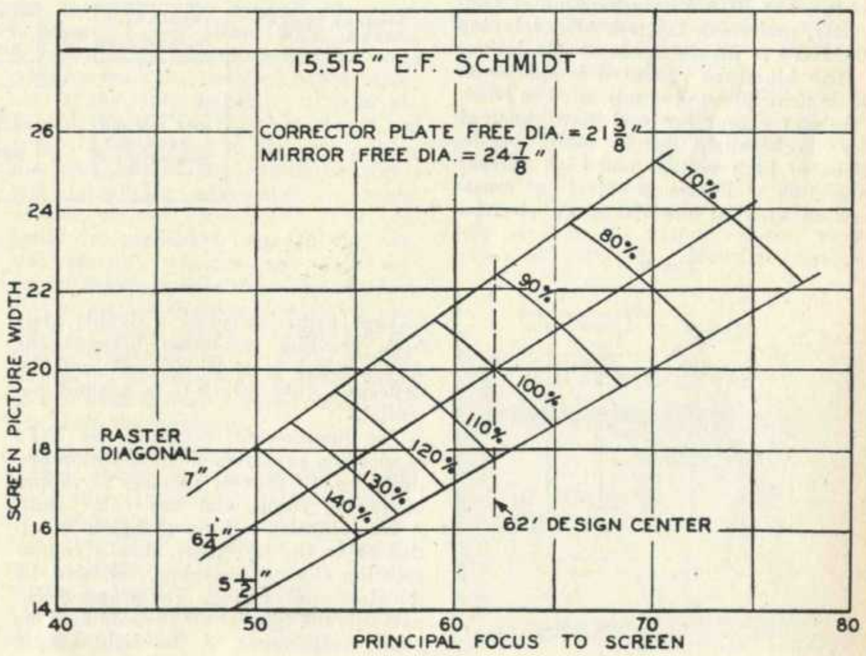
1) Reflective optical system (Schmidt Type)

2) Refractive optical system.

B. Light Source Modulation - Carbon Arc Source

1) Intermediate film system:

Fig. 4.



([1]) Scanning lines/60 fields, interlaced.

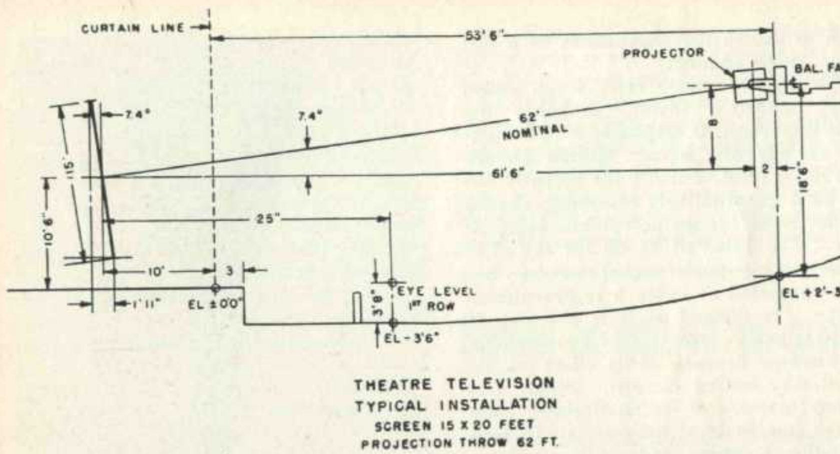


Fig. 5.

a) Film recording of images; then rapid film processing for projection in standard film equipment.

2) Eidophor; method using electrostatic scanning of an oil film to modulate by light refraction.

3) Scophony; polarized light modulation with mechanical scanning.

4) Skiatron; light valve - density variation, electronic scanning.

The method use for the RCA PT-100 is the use of the Direct Projection Kinescope in combination with a highly efficient « Schmidt type » reflective optical system, and chosen on the basis of simplicity of operation, low operating cost, and ease of maintenance.

Details of the PT-100 Equipments:

The design of the equipment PT-100 projector is predicated on the choice of two elements of the projector; the kinescope and the optical system. The projection kinescope chosen was a 7" tube to be operated at 80,000 volts, it was desirable to choose the smallest tube consistent with high performance in light output, in resolution, and in detail contrast. The RCA Victor Division at Lancaster, undertook the task of developing the 7NP4 to fill the needs of this design.

The kinescope produced is similar in basic principles to the tube used in home receivers except for variations required for its highlight output under conditions of high voltage and high current operation. Figure 2 gives a cross-section view of the 7NP4; an electron gun, with usual control elements, originates the beam which is accelerated by 80 kilovolts at the anode and luminescent screen. The focusing is electrostatic and is accomplished by variation of the Grid 3, voltage. The magnetic scanning is used with the deflection yoke as shown. High voltage operation requires special attention to the internal as well as the external insulation (and leakage path) internally a double glass neck provides insulation between the Anode which is at 80 kilovolts and the deflection yoke which is a ground potential.

The luminescent screen of the 7NP4 is specially prepared, in composition and thickness, to provide pictures of proper brilliance, color, and low color shift. A blue-emitting silicate phosphor is settled on to the face plate, then a yellow-emitting silicate phosphor, followed by the aluminum coating. The proper thickness of the phosphors determines the color temperature of the light output and the layer settling reduces the color shift to a minimum. The aluminum also serves to keep the screen material at a constant potential and also serve as a reflective surface to ensure that all of the light emitted by the phosphors leaves the kinescope as useful light.

The face plate of the 7NP4 is an element of the optical system and is therefore ground to optical quality; its radius is determined by the specific projection system design in combination with the mirror and lens. Figure 3, pictures the 7NP4 kinescope in its commercial form.

The reflective optical system chosen requires a careful design analysis because it is the most costly group of elements of the equipment. The components selected had to be predicated on available manufacturing techniques for volume production of the glass blanks, the final grinding, and the aluminizing. The cost of the optics and their mounting increases approximately as the square of the diameter therefore practical considerations indicated that a 26" mirror would present a good compromise.

With the kinescope size chosen and the mirror size roughly determined, it is a problem of optics to arrive at the proper design center which includes the faceplate of the kinescope as an element of the optical system.

The effective focal length finally chosen was 15.515", and Figure 4 shows a chart of the operating conditions; the nominal projection throw is 62 feet from the face of the kinescope to the screen for a 20 ft. wide picture. Since the « Schmidt » type system, like any other optics is a fixed magnification device, the only variable is the picture size on the face plate. Arbitrary limits are shown in the figure to indicate a degree of flexibility. The diagonal lines represent the diagonal raster sizes on the kinescope; the nominal size being 6 1/4 inches and shown as the center line.

The percentage figures show the relative screen brightness for various conditions of operation with 100% for the nominal light output at the design center. The efficiency or speed of the optical design selected is equivalent to an « f » number of 75. Contrast this with refractive optics of f 1.5; a gain of 4 times is realized.

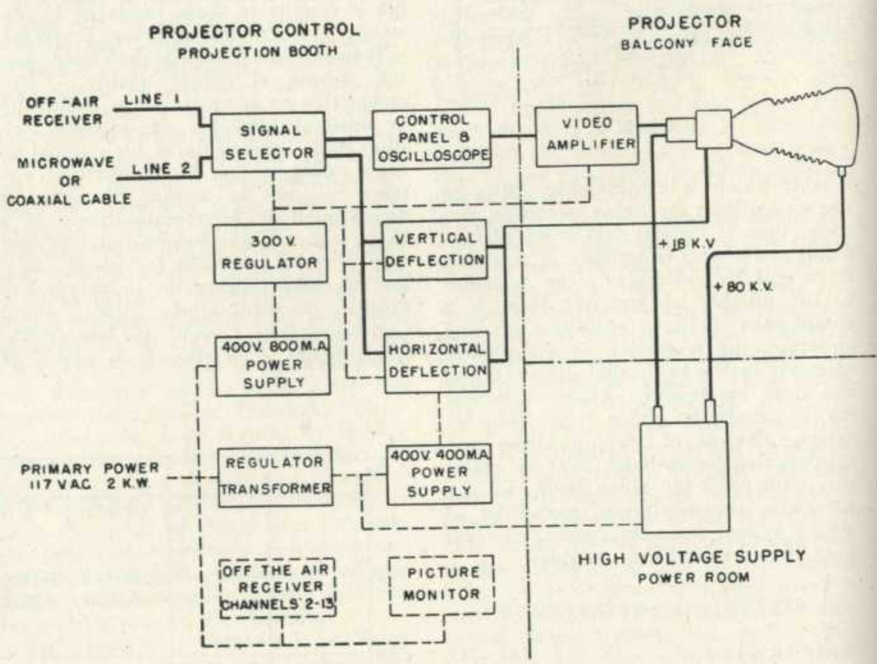


Fig. 7.

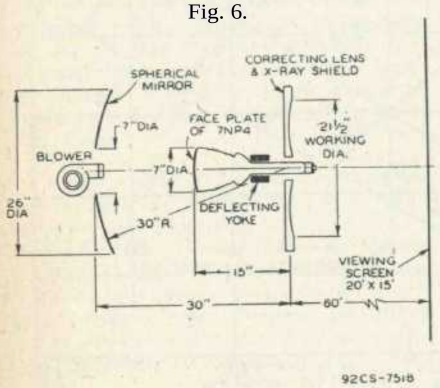


Fig. 6.

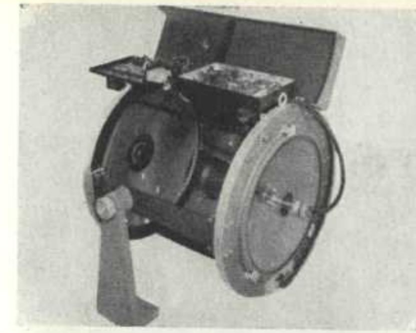


Fig. 8.

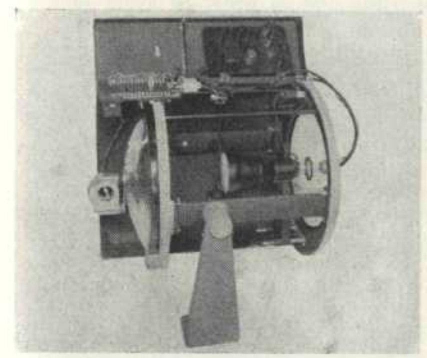


Fig. 9.

The next Figure, 5, gives a typical theater cross-section showing how the projector would fit into a balcony type house. The screen, due to the shallow depth of focus of the projector, is mounted normal to the projection axis. The arrangement in non-balcony or stadium house would require systems of long focal length or the placement of the projector at floor level with a shorter focal length system.

Figure 6 combines the basic elements of the projector to show their inter-relationship. The projection kinescope is located and supported to permit the object which appears on its face plate to be imaged on the screen by the use of the combination of the mirror and lens. The blower shown keeps the face plate at a suitable operating temperature for efficient use of the phosphor.

Mechanical and Electrical Considerations:

With the limitation of the optics determined and the balcony location of the projector established, it was decided that a very minimum of equipment should be located in the theater auditorium.

The block diagram, Figure 7, show the location of the various parts of the system. There are the three logical divisions of the equipment with their respective locations; the projector located in the theater, the projector control in the Projection Booth, and the High Voltage Supply in the Power or Generator Room.

The characteristics of the modulation, or video amplifier made it necessary to place this element adjacent to the kinescope. In past it had also been necessary to include the horizontal scanning amplifier near the kinescope deflection yoke, but this requirement is no longer necessary; therefore, a premise of the present design was to place all of the deflection equipment in the booth racks. The only electronic element of the equipment now remaining in the projector housing is the video power amplifier. The projector consists then of the Projection Kinescope, the 7NP4; the optical elements, a 26" Mirror with a 22" Ogee Lens together with the mounting or support of these elements. The electrical equipment is kept to a minimum with the required video amplifier, blower for cooling the kinescope face plate, and the necessary terminal boards to facilitate inter-connecting wiring.

The equipment location can be seen in Figure 8, which is a photograph of the projector with one-half the outer housing removed. The wiring is accessible by lifting the top protective cover which reveals the terminal board wiring side of the video amplifier. The amplifier, as shown in Figure 9, is hinged to be tilted up and to the side making the tube side of the chassis accessible and permitting adjustment or replacement of the kinescope. The projector is interlocked through the control panel; removing the high voltage if the cover is raised. The interlock also actuates a shorting arm which contacts the high voltage feed-through bushing connecting the circuit to ground. A lock on the cover gives added safety so that unauthorized persons cannot tamper with the equipment.

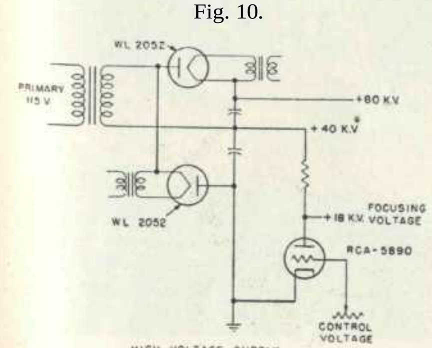
High Voltage Supply:

High voltage is supplied from a unit designed to furnish the 80,000 volts for the accelerating anode and also to furnish the focusing voltage of approximately 18,000 volts. The High Voltage supply is designed for remote operation and can be placed in a power or generator room near or adjacent to the Projection Booth. Two high voltage cables lead from the supply directly to the projector and the control circuits are connected to the control rack in the Projection Booth.

The block diagram Figure 10 shows the elements of the supply consisting of a 40,000 volt transformer in a voltage doubling rectifier circuit; the rectifier tubes are type WL5860 tubes. A special feature of this supply is the shunt regulator tube developed for remote adjustment of the focus voltage about its mean value of 18,000 volts.

The tube for focusing is the RCA 5890, its use eliminates variable resistors with their attendant difficulty of insulation and stability at these high voltages. In addition to the basic elements, the high voltage supply contains protective circuits to short the output voltages when power is romoved. Metering circuits

Fig. 10.



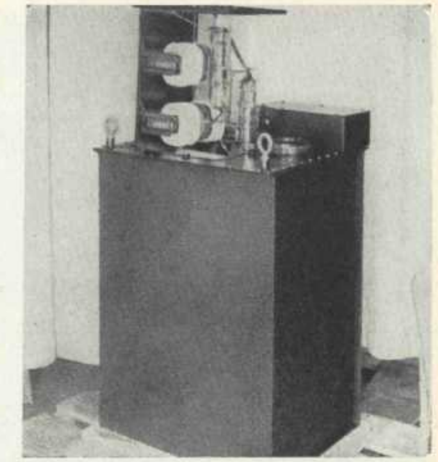


Fig. 11.

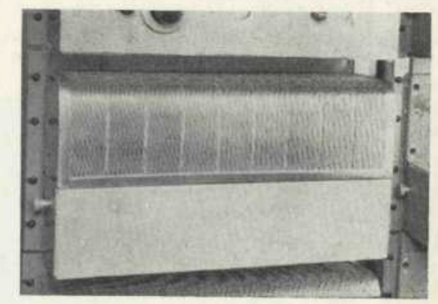
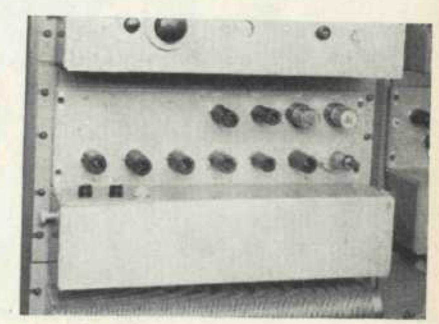


Fig. 12.

Fig. 13.



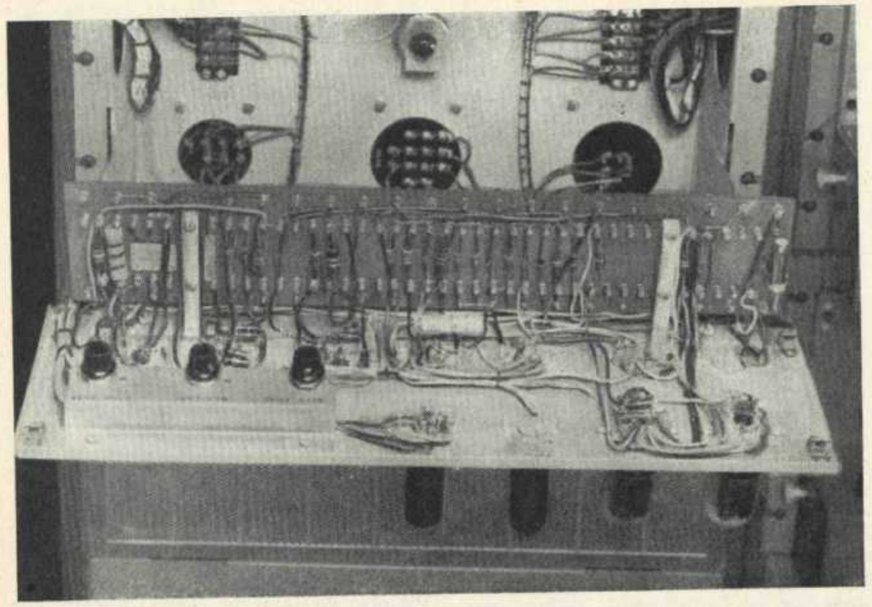


Fig. 14.

are provided with remote indication on the control panel to show the proper functioning of the equipment.

Figure 11, photograph of the High Voltage Supply shows the unit with the rectifier tubes exposed for servicing. By loosening four nuts this panel may be raised to the position shown. Through very conservative design it is expected that the rectifier tubes will last from three to five years, in fact, the entire unit will give years of uninterrupted service.

Operating Equipment:

The location of the operating equipment in the Projection Booth gives precedence for equipment design to conform to time tested procedure of front servicing of the equipment for theater work. The major electrical considerations, of course, are the Underwriters' requirements, and in addition, the utmost in component reliability due to the economic necessity of installing single channel equipment with no standby or emergency service available.

A typical chassis unit is shown in Figure 12 as it is mounted in the rack and ready for operation. A removable cover can be taken off to check the tubes or the fuses, Figure 13. All individual chassis have the primary power fuse, as are the plate voltages which have neon indicators on their circuits. The unit shown is the vertical deflection amplifier; Figure 14 shows the interior exposed for servicing or adjustment of the infrequently used internal controls; the Vertical Hold, Vertical Size, Vertical Linearity, and on the rear panel the Vertical Centering.

Miniature tubes are used whenever possible and in order to avoid mounting of parts on those small tube sockets, and to make the unit more accessible for manufacture and servicing, resistor boards are used to produce this trim design. The mechanical design was so proportioned to permit standardization of the chassis blanks and the covers, in addition, it presents a uniform overall appearance.

Fig. 16.

Fig. 15.

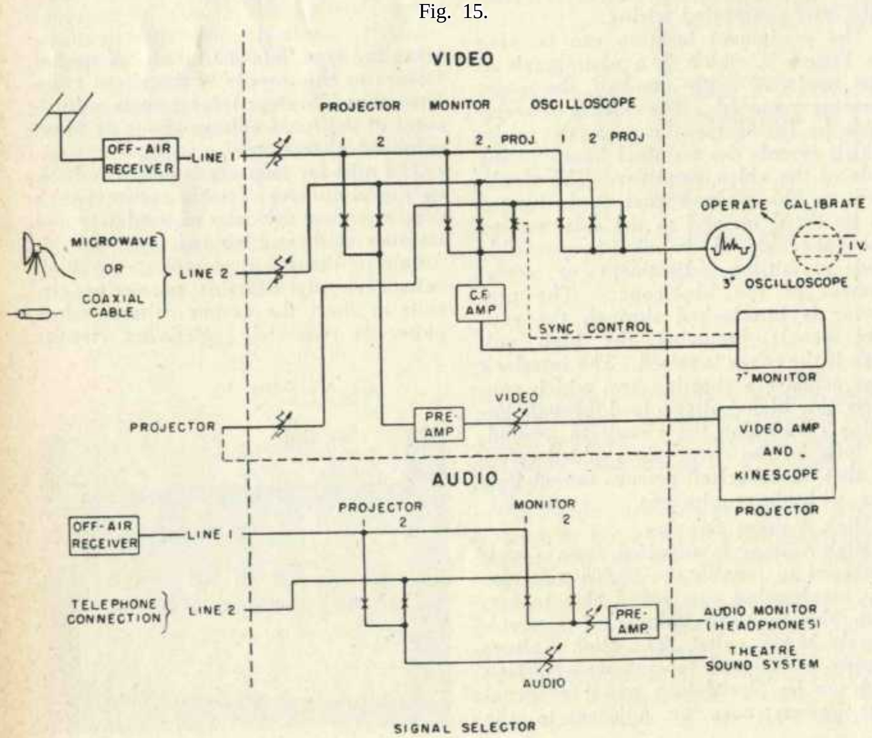


Fig. 17.

Fig. 18.

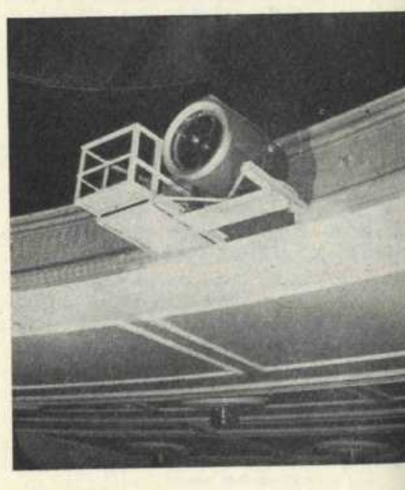


Fig. 19. - I pannelli amplificatori-ricevitori del complesso di proiezione televisiva per grande schermo cinematografico, tipo PT100-RCA.

Circuit Operation:

Electrically, the protection of the 7NP4 kinescope required a major part of the design effort. The expense of the kinescope and the necessity of ensuring that the tube fulfill its life expectancy made electronic protection a must item. Scanning failure could cause the face plate of the tube to be burned so as to make it unusable and in the extreme case with High Voltage beam concentrated on a single spot, that is without either vertical or horizontal scanning, it could melt a hole in the face plate of the tube.

Protection to the kinescope has been provided for the following contingencies:

1) Open or shorted deflecting yoke;
2) Lack of drive due to tubes;
3) Loss of supply voltages;
4) Overdrive of kinescope (positive grid).

The most important consideration in the design of the protection system is the speed with which failure can be detected and corrective measures taken and in addition the circuits must fall safe. The circuits operate in such a manner as to drive the kinescope to beam cutoff (and this must be accomplished in a matter of less than 50 microseconds) and then the relays operate to remove the high voltage power.

Equipment Operation:

A signal Selector Panel was designed to facilitate the complete checking of the equipment prior to projection of the picture to the screen. Experience gained had shown the value of a system of checks to be made by the operator prior to show time.

The switching system shown schematically in Figure 15 will take care of two incoming lines each of Video and Audio signals, and also monitor the projector video signal before the H. V. power is applied. The video and audio lines to the Projector and to the theater sound system respectively, as well as to an oscilloscope and a monitor, are provided for level setting and quality control.

An off-the-air receiver is provided as a signal source during the initial period of use or as a source of test signal if the normal signal is to come via microwaves or coaxial cable. The receiver is normally connected to Line 1 and an alternate signal is connected to Line 2. As auxialiaries to the signal selector a 7" picture monitor and a 3" oscilloscope are used to check the projector functions without projecting a picture on the screen.

The projector video amplifier has a cathode follower video return which supplies a signal, attenuated by a ratio of 100:1 from the kinescope drive. The return signal is marked, « projector », on the signal selector and the incoming signals marked, Line 1 and Line 2.

The oscilloscope is a 3RP1 provided with a 60 cycle sine wave sweep, d.c. setting for the vertical deflection, and a calibration circuit. Marker lines, 1 volt peak-to-peak, are displayed when its switch is set on calibrate position.

In operation Lines 1 and 2 are adjusted for level using the oscilloscope. When normal level is provided to the kinescope, by operation of the video attenuator the level for the projector can be set by adjustment of the return line from the projector.

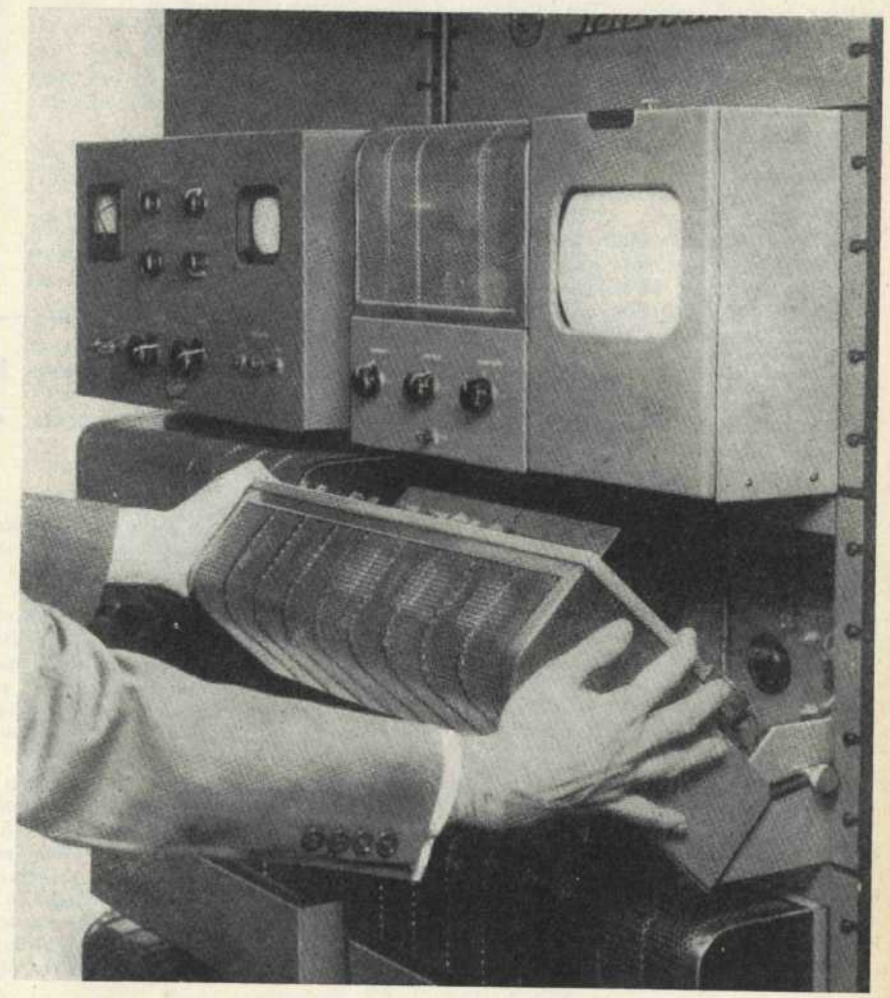
The 7" monitor can likewise be switched to view the pictures on the incoming lines or from the Kinescope in the Projector; when on the projector a complete system operation check is obtained without requiring the picture on the theater screen.

The monitor is provided with driving pulses from the Projector scanning circuits, it then shows the operation of the scanning lock-in as well as the picture quality, otherwise the monitor is synchronized from the incoming signal.

The Audio signal can be obtained from either Line 1, which is the off-the-air receiver, or Line 2 which may be a telephone line connection. Projector Audio would normally be connected to the theater motion picture sound system and is provided with an attenuator for level setting.

Figure 16 shows the Projection Booth equipment installed, consisting of the

Fig. 20. - Complesso di proiezione televisiva per grande schermo cinematografico, tipo PT100-RCA: particolare.



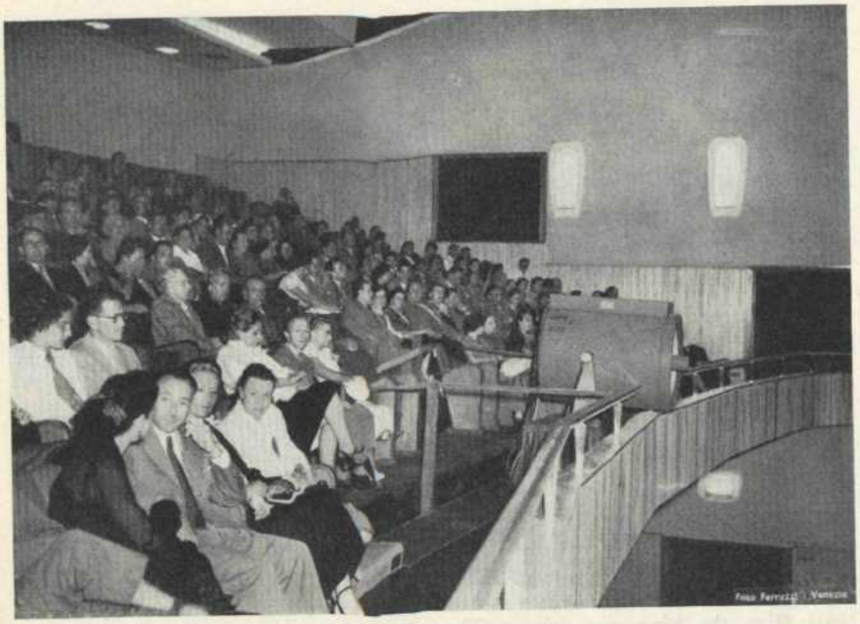


Fig. 21. - Il proiettore televisivo PT100 della RCA installato nel cinema Rossini a Venezia, durante le dimostrazioni del Festival del Cinema 1952.

Projector Control rack on the right and the Monitor rack on the left. The units of equipment from top to bottom are; the Projector Control, the Signal Selector, the Horizontal Deflection Amplifier, the 300 volt Regulator, and the High Voltage Control panel. The Picture Monitor is the top unit in its rack; below the Receiver for off-the-air reception, the Vertical Deflection Amplifier, the 400 volt — 400 milliampere Power Supply and the 400 volt — 800 milliampere Power Supply. Several of the units of this equipment have not been described because of their conventional design.

The High Voltage supply installation is pictured in Figure 17; the unit requires no attention; as its operation is entirely remote and hence can be placed in a locked enclosure.

The PT-100 Projector is shown in Figure 18 as installed on the theater balcony face complete with an access platform necessary for servicing the unit.

Theater Television as an entertainment medium has now reached the stage where a practical commercial equipment has been produced. To date, twenty (20) installations of the PT-100 equipment are in operation with 150 more equipments to follow. The problems now lie with the industry in the field application. They must determine; the best way to transmit the program to the theater, the type of programming best suited for this new medium, and most important in the long view — how will picture quality best be maintained from the program subject through the long chain of electronic events before the picture image is viewed on the theater screen? Every effort, in the design of the PT-100 equipment, has been placed on building a quality product engineered for present day use, and providing for standards which may be expected in the future as the needs of the industry are crystallized.

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APPENDICE

L'impianto di proiezione televisiva PT100 *della RCA è stato presentato in funzione al nuovo Cinema Rossini di Venezia durante il Festival Cinematografico nell'estate* 1952.

Venivano proiettate le riprese TV effettuate direttamente con telecamere della RAI nella « hall » del Palazzo del Cinema al Lido di Venezia.

Il collegamento video fra Venezia ed il Lido veniva effettuato mediante un ponte radio a 2000 *MHz.*

L'impianto del proiettore televisivo al Cinema Rossini era stato effettuato dalla Cinemeccanica di Milano con la partecipazione degli ingg. Keen (RCA) e Bozzi.

Ottimo risultato come qualità e luminosità (uguale a quella di una normale proiezione cinematografica) sono stati ottenuti sullo schermo normale del cinema delle dimensioni di m. 8x6.

Tali dimostrazioni sono state effettuate sotto la direzione tecnica dell'ing. Alessandro Banfi.

L'ing. Giovanni Bozzi ha illustrato al Congresso « Cinema e Televisione » a Torino i particolari dell'impianto di proiezione televisione PT100 *della RCA.*

Processo reversibile per la registrazione e per la riproduzione elettronica dei films cinematografici

P. MANDEL

Prendendo lo spunto dalla necessità della trasmissione differita dei programmi di televisione l'Autore esamina un processo reversibile suscettibile di utilizzazione per la registrazione e per la riproduzione elettronica dei films cinematografici.

Il procedimento proposto utilizza un film vergine svolgentesi a velocita uniforme sul quale l'immagine viene registrata mediante il sistema cosidetto « flying spot ». Lo stesso apparato pud venire utilizzato, dopo il trattamento di sviluppo del film, per la riproduzione elettronica di quest'ultimo.

Vengono esaminati successivamente i problemi relativi alla risoluzione, al contrasto, al rapporto segnale/disturbo, come pure i vari fattori aventi un'influenza limitatrice delle possibilità del complesso.

Partant de la necessité de l'emission differée des programmes de télévision, le rapport examine un procédé reversible susceptible d'être utilisé pour l'enregistrement et pour la reproduction electronique des films cinématographiques. Le procédé proposé se sert d'un film vierge e vitesse uniforme sur lequel l'image est enregistrée par l'utilisation du principe dit « flying spot ». Le même appareillage peut être utilisé après developpment du film pour sa réproduction éléctronique.

On examinera successivement les questions de la résoluttion, de la gradation, du contraste, du rapport signal/souffle, ainsi que les facteurs ayant une influence limitative sur les performances de l'ensemble.