ciò non bisogna trascurare il fattore esclusivo della sala cinematografica, cioè la maggiore visibilità dello schermo.

Il giorno in cui tutte le sale di prima visione di un mercato saranno attrezzate per la proiezione su grande schermo di film trasmessi per televisione, con una sola copia sarà possibile presentare in prima visione su tutto un grande circuito lo stesso film, mentre attualmente la distribuzione di film in prima visione richiede mesi e mesi.

Ecco, dunque, un impiego della televisione, che richiederà un ordinamento complesso, di cui non è illusorio prevedere l'avvento a non lunga scadenza, che potrà essere di fondamentale importanza per l'industria cinematografica.

Impiego della televisione utile anche all'esercizio cinematografico, il quale attrezzandosi per presentare su grande schermo film teletrasmessi, raggiungerà attraverso questa evoluzione la sicurezza del suo domani.

Infatti, anche qui sarebbe antieconomico e, in linea di principio, assurdo che organizzazioni di televisione pensassero di fare a meno dell'esercizio cinematografico, sostituendosi ad esso con la costruzione di nuove sale.

Resta un ultimo aspetto da esaminare: quello dei locali pubblici, come i bar, i caffè, le sale d'aspetto, che possono impiantare apparecchi telericeventi.

Anzitutto, questi locali si attrezzeranno con telericeventi su piccolo schermo. Inoltre, dovrà essere studiato un adatto ordinamento legislativo a loro riguardo, così come le altre attività similari sono regolamentate da ordinamenti che tendono a stabilire un equilibrio degli interessi convergenti nello stesso campo.

La produzione cinematografica, considera quindi, la televisione come un mezzo che avrà fondamentale importanza nel suo prossimo avvenire e, nello stesso tempo, come un mezzo che dovrà servirsi della cinematografia sapendo inserirsi in essa nel modo più adatto per un'armonica evoluzione reciproca.

Si tratta, dunque, di stabilire una intima collaborazione tra cinematografia e televisione, nell'interesse di entrambe, sapendo guardare lontano, al di sopra degli interessi contingenti, verso l'inevitabile assetto definitivo.

Proiettore di televisione su grande schermo

J. HAANTJES

La relazione illustra tecnicamente un tipo di proiettore televisivo per grande schermo, costruito dalla Philips. Con tale apparato si possono ottenere delle proiezioni TV delle dimensioni di m. 4 x 3 di sufficiente luminosità, impiegando un tubo catodico speciale con 50 Kilovolt d'anodo, sistemato in un'ottica Schmidt con specchio di 40 cm. di diametro.

Particolari informazioni tecniche sono fornite circa le più importanti parti dell'apparato, quali il tubo da proiezione, il complesso ad alta tensione ed il sistema ottico.

L'Autore tratta poi del problema tecnico generale della brillanza delle immagini proiettate con sistemi del genere.

Le rapport donne une description technique d'un projecteur de télévision pour grand écran developpé par la Philips.

Ce projecteur peut donner des images sur écran cinéma de m. 4x3, avec une luminosité satisfaisante. Il employe un tube catodique de projection alimenté à 50 Kilovolt placé dans une optique Schmidt avec miroir de 40 cm. de diamètre.

On donne des détails techniques au sujet des plus importantes parties de ce projecteur, comme le tube de projection, le redresseur haute tension et le système optique.

L'Auteur examine enfin le problème général de la quantité de lumière nécessaire dans les systèmes de ce genre pour obtenir une brillance suffisante aux images projetées.

This paper gives a description of a large-screen television projector developed in the Philips Laboratories at Eindhoven (The Netherlands).

Television pictures of sizes up to 3 by 4 m. of adeguate brightness can be obtained by a projection tube of 13 cm. diameter working at a voltage of 50 kV which is placed in a Schmidt optical system containing a mirror of 40 cm. diameter.

A survey is given of the most important parts of the apparatus in which most attention is paid to the projection tube, the optical system and the high tension unit.

Some considerations are also given on the amount of light which have to be generated in systems of this type in order to obtain television pictures of sufficient brightness.

The attainable size of the projected pictures suggests that this apparatus should find its application in clubs, schools and the like.

Nowadays there is nobody who can deny that television has developed itself considerably in a few parts of the world. The United States with an estimated number of receivers of nearly 20 million and Great Britain with some 2 million receivers are there to prove this.

Nor is there anybody who doubts that other countries will follow this rapid development and that in not too far a future, television will grow to such an extent that it will play there also an important role in the field of the home entertainement.

There is no technical reason why the application of television should be restricted to the home and introduction of television in the cinema for instance has been considered. It is again in the United States that a special television service with its own distribution network, bringing all kinds of topical events to the cinema, has been planned. It is difficult to predict whether these ideas will be realised in the future as many problems of different nature present themselves. As most of these problems are of a non-technical nature we will in this paper refrain from further comments on this subject.

When we focus our attention again on the home receiver and watch the development of the last few years with regard to the picture size we find that even in 1948 the largest tube used for the home receiver had a diameter of 30 cm. A strong desire for larger pictures did, however, exist. In the United States this has led to cathode-ray tubes with face diameters up to 75 cm, the size of 50 cm being at the moment the most current size in new receivers.

The biggest tube which at the moment in some quantities is available in Europe has a diameter of 43 cm. It has to be mentioned that the demand for bigger pictures has been met in Europe also by the introduction of projection television.

It is not yet sure in my opinion that the development of the cathode-ray tubes in Europe will proceed along the same lines as in the United States. The reason might be that large capital investments are needed to equip factories for the manufacturing of these large tubes. It is questionable whether these investments can be made profitable with a view to the economic structure of Europe. The European answer to this demand may, therefore, differ from the American solution. There are already examples of different technical solutions in other fields. The European car differs considerably from the car manufactured in the States, the difference in size being one of the most striking.

The future will reveal in which way the European industry finally will meet the desire for larger pictures in the home receiver, but there is a good chance that projection may give the right solution.

If the statement that projection television will find wide application in the home receiver may seem somewhat imprudent at the present, there is, however, no doubt that an application field for projection television exists in those cases where pictures are needed of a size bigger than can be used at home. It is clear that if for instance television would be used for educational purposes pictures are needed which can be watched by a good many observers at the same time. One can think of other applications such as clubs and possibly small theaters where pictures of a few meters' size would be required.

In order to fulfil the demand of this field Philips have developed a television projector which is able to give pictures of adequate brightness of a size of maximum 3 by 4 m.

It was the object of the designers to make the equipment as simple and small as possible without being detrimental to the performance of the apparatus.

The projector has been built in the classical way. A bright picture is generated on the face of a small cathode-ray tube and this picture is projected on a screen by means of an optical system of large aperture.

Now one of the difficulties of such a projecting system is to obtain a sufficient amount of light and we will, therefore, start by giving some considerations on the required amount of light.

Our starting point will be the assumption that pictures should be generated with a maximum size of 3 by 4 m which have to be watched in a darkened surrounding.

It is reasonable to require that the brightness of these pictures has to be comparable with the brightness of the projected pictures in the cinema. Now in the cinema the projector is considered to give the standard brightness if the running projector without film in the gate gives a brightness on the screen of 10 ft lamberts (108 a.s.b.) ($\frac{108}{\pi}$ nits). In order to know the actual brightness in cinema pictures we have only to multiply this figure with the transmission coefficient of the film. Now according to Mr. Cazalas ([1]) who has carried out measurements on this subject the transparency of a film in its brightest parts seldom exceeds 50%. A television picture with a top brightness of 54 a.s.b. is therefore a picture which is in this respect equivalent to cinema pictures.

An estimate can now be made of the total amount of light which has to be generated. If a perfect diffusing screen would be used, a quantity of light of $3 x 4 x 54 \cong 650$ lumens would be needed to give a screen of 3 by 4 m the top brightness of 54 a.s.b. Now a picture never has the top brightness all over the screen, the average brightness being approximately one third of the top value. It is also somewhat more appropriate to calculate with mean values because they are better accessible for measurements.

An average light stream of $\frac{650}{3} \cong 215$ lumen is therefore required.

The possibility exists to increase the brightness of the screen by using screens showing a selective scattering. These screens show, however, a limitation in viewing angle depending on the degree of selectivity. According to our experiences a selectivity resulting in a gain of a factor 3 in the direction perpendicular to the screen gives rather satisfactory results. If such a screen is applied the amount of lumens needed is again reduced by a factor 3 and the required amount of light on the screen drops to 72 lumen. These are lumens to be delivered on the screen and it will be clear that the amount of lumens which has to be generated on the face of the cathode-ray tube will depend on the properties of the optical system.

It is of course mandatory to use a system with a large aperture in order to gather as much light as possible on the screen. Such a system is found in the Schmidt optics. If a Schmidt system is well dimensioned it may have a light efficiency of 30%, that means that 30% of the total amount of light generated on the face of the cathode-ray tube is projected on to the screen.

We conclude, therefore, that if we want to project pictures of 3 by 4 m on to a selective screen with a gain of 3 a tube will be needed that can generate an amount of $\frac{72}{0.3} \cong 240$ lumen with the average beam current.

I did not go into these considerations in order to be able to continue my paper and to tell you triumphantly that the Philips tube exactly meets these requirements. It was my desire to make an honest estimate of what reasonably could be required of a projection system. We shall see later on to which extent the Philips projector can approach this estimate of its requirements.

The cathode-ray tube.

I will treat now in some detail the most important parts of the equipment and will start to give some details of the projection tube. This tube, indicated by the type number MW 13-16 is a tube with a face diameter of 13 cm. It has been designed to work with a tension of 50 kV on the final anode and it is capable to deliver a beam current of 2 mA. This current, however, may not flow continuously. The allowed average current is 0.5 mA. The maximum load in the tube face is, therefore, 25 Watt.

The phosphors which are nowadays applied in projection tubes, therefore phosphors who can stand a high load, have when the so-called metal-backing technique is employed an efficiency of 2.5 cd/Watt. This figure holds for a mixture of silicates of which the components emit light of different colours but who are mixed in such a ratio that white light results. The tube, therefore, is able to generate in the average an amount of $25 \times 2.5 \times \pi = 196$ lumen of white light. In a limited part of the picture the beam current may, however, rise to 2 mA. In this case the yield in lumens is not quite proportional to the beam current because the phosphor shows some saturation. At the top current the light output corresponds to approximately 600 lumen.

From these data it follows that we fall short to an amount of about 20% in the light output needed for a picture of 3 by 4 m of standard brightness. Experience showed, however, that it is possible to give pictures of this size of very good quality. There exists moreover a simple means to increase the brightness of the picture by a decrease of the picture size. The brightness of the picture will increase nearly proportionally with the decrease in picture area.

Apart from the amount of light to be generated by the tube there are other requirements which have to be fulfilled. The tube has to have a sufficiently small spotsize in order to be able to reproduce a 625 line television image with the desired detail.

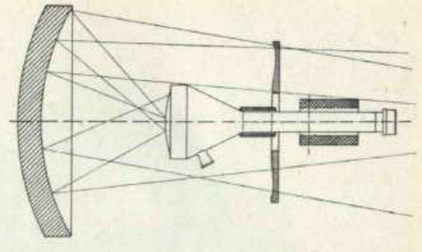

Fig. 1. - Schematic lay-out of Schmidt System.

Moreover there is the desire that the errors in the spot-size caused by deflection, the so-called deflection defocusing, shall be small.

These errors are apart from the behaviour of the deflecting fields also dependent on the cross-section of the electron-beam in the deflecting fields and may considerably be reduced by using beams of a small cross-section. This puts high requirements on the construction of the electron gun and especially on the emission capacity of the cathode, but this problem has been solved in a satisfactory way.

It is necessary to cool the face of the tube during operation because otherwise the temperature rise due to the high specific load would cause cracking of the tube face. A moderate jet of air blown against the face of the tube causes already a sufficient cooling.

The optical system

In our considerations on the required amount of light the remark was made that a well-dimensioned Schmidt system is able to gather about 30% of the total amount of light. The question arises what is meant by the expression: a well-dimensioned Schmidt system.

It is known that a Schmidt system consists of a concave spherical mirror and an aspherical correcting lens, the correcting element being placed in the centre of curvature of the mirror. It is also known that the correcting lens

Fig. 2. - The entire projection equipment at the right projection distance from the screen.

([1]) Ann. de Télécommunications 5, 298, 1950.

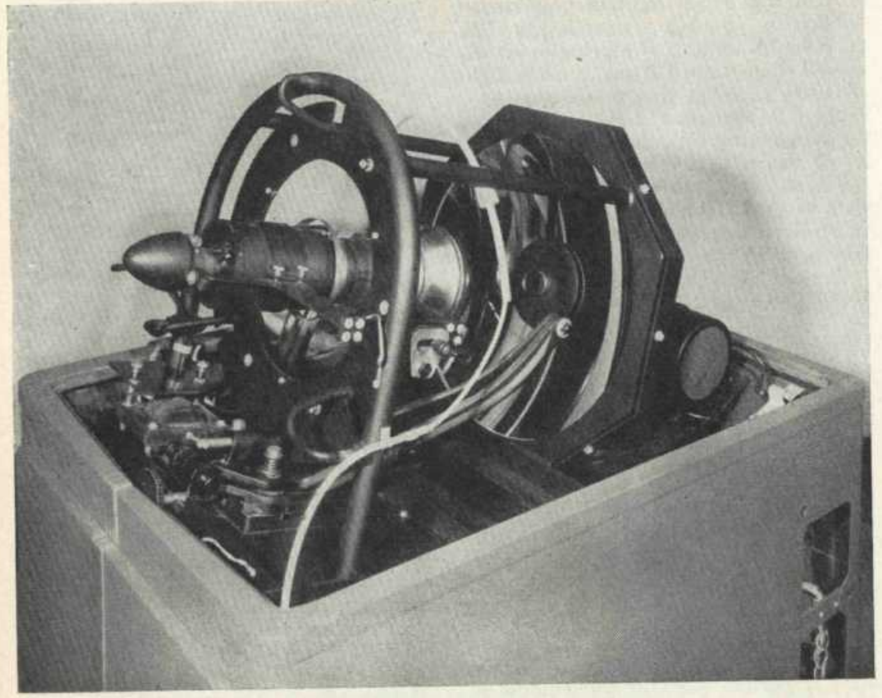

Fig. 3. - Central part of the equipment with top cover removed. The photograph shows the optical system and the position of the projection tube in this system with the adjusting means of tube and system. The central part of the mirror is blackened in order to avoid reflection of the light towards the face of the projection tube as this would spoil the contrast. The tube face in covled by a jet of air through a hole in the centre of the mirror.

corrects for the spherical aberration introduced by the mirror. As the other errors of the third order do not exist we dispose here of an optical system of good quality at a large aperture.

One may formulate the requirements of the system for this special application as follows:

1) The optical system has to gather as much light as possible.

2) The imaging quality of the system should be such that it will not cause any noticeable loss of detail and contrast to a 625 line television picture.

3) It has to be considered as an advantage that the dimensions of the optical parts are as small as possible because the cost of these parts increases very rapidly with the size.

If we try to evaluate the amount of light gathered by the optical system we are guided by the optical law that if one watches an optical system from the position of the image one sees the entire exit aperture of the system with a brightness equal to the brightness of the object. If the optical system shows some absorption losses or as in our case an imperfect reflection we have to correct for these losses. We will neglect these losses to start with.

If therefore, the projection tube has a surface brightness B and the correcting lens has a diameter of a x f, f being the focal distance of the system and a being a proportionality factor, we find for the illumination B of a screen at a distance d of the corrector lens:

$$b = \frac{B \cdot \pi \frac{a^2 f^2}{4}}{d^2}$$

In this formula the masking effect of the tube and its accessories is also neglected.

If the area of the image on the screen is S the entire quantity of light falling on the screen is equal to:

$$b \times S = \frac{B \pi a^2 f^2}{4 d^2} S$$

New if N is the magnification ratio of the system and s is the surface area of the object, therefore of the image on the projection tube we have the relation:

$$S = N^2 s,$$

whereas from application of simple optical laws follows that:

$$d = (N - 1)f.$$

If we substitute these values in our expression for the total amount of light on the screen and consider $\frac{N}{N-1}$ to be unity as N always has to be a rather large number we find:

$$b \times S = B \frac{\pi a^2 f^2 N^2 s}{4 (N-1)^2 f^2} \cong B \frac{\pi a^2}{4} s.$$

We see, therefore, that as far as this result depends on the optical system only the parameter a is involved and that this parameter therefore should be chosen as large as possible. There is, however, set a limit to the value of a by the imaging quality of the system, this limit being according to our experience approximately 1.4.

Another interesting conclusion can be drawn from the above formula. As the total amount of light generated by the tube is equal to πBs lumen we find that the fraction of the light gathered by the optical system is equal to $\frac{a^2}{4}$. In the case that $a = 1.4$ which has been realised in our projector, this fraction would be 0.5. The fraction of light transmitted by the optical system is, however, less. The mirror has a reflection coefficient of about 0.85, whereas the centre of the corrector lens does not pass light due to the masking effect of the projection tube that intercepts a part of the light reflected by the mirror. If these factors are taken into account it is found that the optical system transmits 30% of the total amount of light generated.

We will give now some attention to the size of the optical system. First of all it will be clear that the mirror should have a diameter which is larger than that of the correcting lens. If this would not be the case a strong vignetting towards the edges of the picture would result. It is for this reason desirable, to use a mirror with a diameter of about 2 f. From our considerations follows therefore that the size of the optical system is proportional to the focal distance f.

If one wants to design a compact optical system f should be as small as possible. It is very disagreeable, but the focal distance cannot be chosen arbitrarily small because this would mean that the field angle used had to be very large.

With a view to the requirement of good image quality one may use in a Schmidt system with a correcting lens of a diameter of 1.4 f a field with a diameter equal to or smaller than 0.6 f. The diameter of the field is given by the size of the projection tube. This leads in our case to a focal distance which has to be 20 cm at a minimum. The actual focal distance of the optical system in the Philips projector is 20.7 cm.

The distance from projector to projection screen was given by the relation:

$$d = (N - 1)f.$$

For a picture size of 3 by 4 m a magnification of about 40 is necessary. The projection distance is therefore 8 meter. We have to conclude that this distance is rather fixed if one wants to project pictures of a certain size by means of a given projection tube and the optical system is kept as compact as possible.

It is from the point of view of image quality only tolerable to choose f larger than has been indicated here. If this will be done the projection distance will grow proportionally, but the linear dimensions of the optical system will grow correspondingly without any perceptible gain in the amount of light on the screen.

In a Schmidt system the correcting lens has to be adapted to a certain magnification. The tolerances in the magnification with a given correcting lens are approximately $\pm 10\%$. If a larger change of the magnification is desired a different correcting lens should be used. With the Philips projector correcting lenses for other projecting distances are available. That this possibility exists.

is connected with the way the lenses are manufactured. They are not pressed in a mould but are made on a special lathe with a diamond chisel to an accuracy of about one micron. If a correcting lens for another magnification is needed only a slight modification has to be made in the equipment.

The high tension supply

Apart from the projection tube and the optical system there is another important part of the apparatus namely the high tension unit. The requirements of this unit are:

1) It has to deliver an average current of at least 500 µA at 50 kV with peak currents up to 2 mA.

2) The voltage should be practically independent from the load as otherwise the picture size would vary with the average brightness of the picture.

3) It is here again of importance to make the unit as compact as possible.

These requirements have been met in the following way. In order to avoid a bulky and heavy transformer use is made of an alternating voltage source with a frequency of 25 KHz. Using a rather high frequency has also the advantage that the smoothing capacitor may have a small capacity. In our apparatus this capacitor has a capacity of 1000 pF. The energy of the alternating voltage source is generated by means of an oscillator containing four valves. The high voltage transformer is part of the oscillating circuit. In order to obtain a low loss transformer of small size use has been made of the special magnetic core material ferroxcube. The output voltage of the transformer is about 9 kV and is rectified by means of a cascade-circuit containing six diodes to a voltage of 50 kV. The cathode heaters of these rectifiers are also fed from the oscillator by a special low-capacity transformer.

If no precautions were taken such a high voltage supply would show a considerable voltage drop with increasing load. To prevent this a regulation is applied working as follows:

The voltage on a separate winding of the high-voltage transformer is rectified and the rectified voltage is compared with the voltage over a neon-filled stabilizing tube. The difference in voltage is amplified and this amplified voltage is fed to the grid circuit of the valves in the oscillator circuit in such a sense that a rise in voltage on the transformer causes the voltage on the grid of the oscillator-valves to go in the negative direction. As a consequence these valves deliver less energy to the oscillator circuit and therefore the change in output voltage is reduced. The result of this regulation is that the variation in high tension between zero and a current of 500 µA. A is only 300 or 400 volt.

The high voltage unit is provided with several protecting devices. If for some unforeseen reason the voltage would be too high or due to some accident the current drain would be too high the oscillator delivering the supply is stopped automatically.

If the apparatus is switched off the

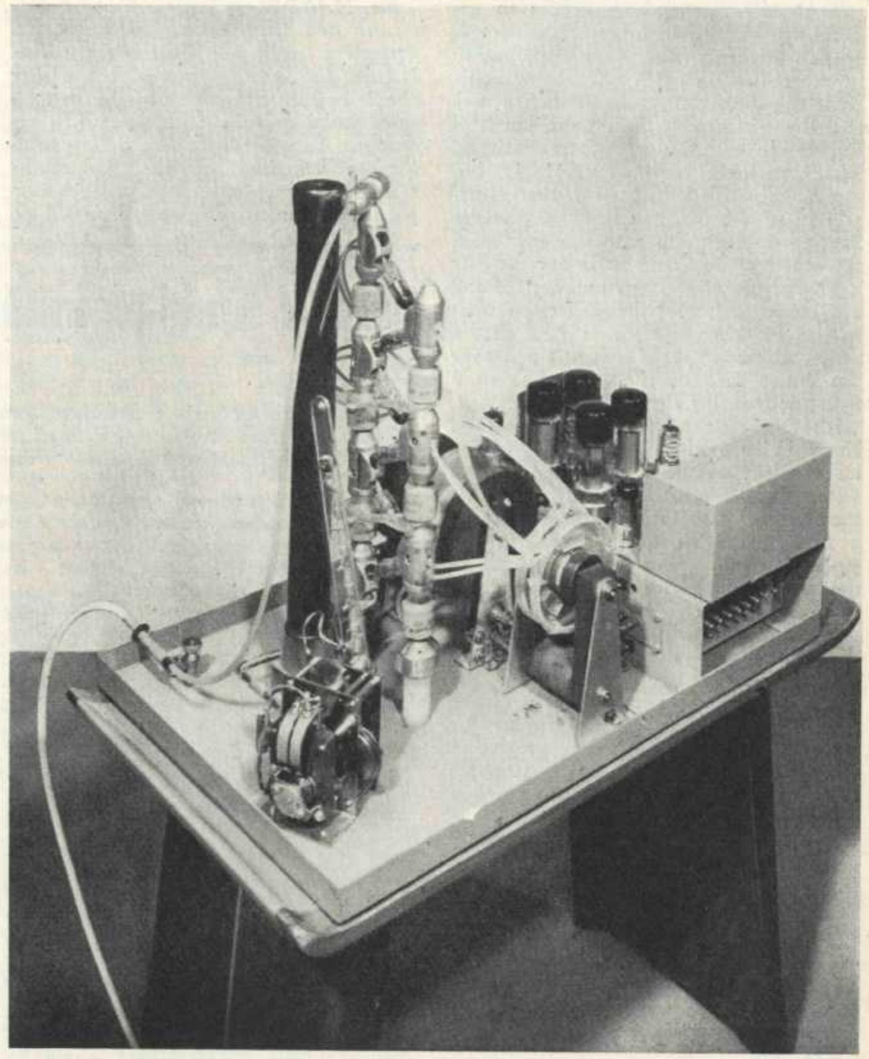

Fig. 4. - The high tension apparatus. In the back the four valves of the oscillator can beseen. In the middle are the high voltage transformer and the separate transformer for the heater supply of the high voltage rectifiers. The cascade rectifier is in front, the bas at the left being the final amothing capacitor.

high voltage capacitor is discharged by a resistor in order to prevent that accidents may occur if the apparatus were opened for servicing purposes. This resistor is removed mechanically if the apparatus is switched on.

Additional equipment

We have now dealt with the most important parts of the projector. Some additional equipment is, however, needed. In order to be able to pick up a signal from the ether a television receiver has been built in. The video signal of this receiver is fed to the video amplifier of the projector, whereas the sound signal is fed to a 25 watt sound amplifier. The sound is reproduced by two speakers on either side of the screen.

Apart from the possibility of feeding the apparatus by signals from the ether the apparatus may also be fed by locally generated signals which can be delivered to the projector by cable.

The video amplifier of the projector is capable to deliver an output voltage of 150 V peak to peak as a driving signal for the projection tube. This output level is attained by using in the final stage of the amplifier two valves PL83 in parallel.

The time base generators for the projection tube are in principle similar to those of normal television receivers the only difference being that the sawtooth currents to be deliverd are somewhat larger. Although the voltage on the tube is high, the deflection angle is only 50° which keeps the deflection power required within reasonable limits.

The line deflection circuit which is of the flywheel type has in its final stage two valves EL 81 in parallel. A so-called boost-circuit has been applied containing two diodes EY 80 in parallel, boosting the supply voltage of 250 V up to 500 V, by using the energy stored in the deflection circuit at the end of the stroke.

The point has already been stressed that the aim was to design the projection tube and the deflection circuits in such a way that no additional correction for deflection defocusing was necessary.

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 strisce 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 utilita. 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 chan-