

Amateur Sound Film Equipment

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Most amateur movie makers will welcome the availability of a thoroughly workable 8-mm sound film equipment of exceptional picture and sound quality. This new Zeiss-Ikon system from Western Germany can be compared favorably with most 16-mm equipments.

JUST AS OLD as the film technique itself are the endeavors to give more life to the pictures on the screen by adding sound. With the earliest films, a person had to explain the action while a piano player took care of the background music. Later, several decades of developments had passed, the implements of the sound film technique became established. This made possible, on the one hand, the reproduction of the sound which belonged to the picture and was recorded together with it. Furthermore, a "silent" film could be produced much more effectively by means of explanatory texts, music, and corresponding noises.

The advantages of the sound film in comparison with the silent film are so outstanding that, after overcoming the initial difficulties, all motion picture theaters acquired the equipment required for the reproduction of sound films. Film amateurs, too, endeavored right from the beginning to enhance their films by means of sound. Most amateurs are, due to financial considerations, limited to film sizes which are smaller, and therefore less expensive, than the standard 35-mm films. In consideration of this, the introduction of sound films to amateurs was hampered chiefly by technical difficulties. Today, however, we have a number of processes permitting the

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amateur to augment his small films of a width of 16 or 8 mm with music and explanatory talks. It is true, of course, that only in the rarest occasions there will be a desire or a possibility to record sound on a film in the same manner as it is done in a studio producing professional films. There, with some exceptions, the associated sound is recorded at the time the picture is taken. The film delivered to a moving picture theater always contains the picture and the sound on the performance copy. As a sound recording process, the optical method technique proved itself to be adequate right from the beginning. The advantage of this process lies in the simple production of the release prints, with the picture and the sound both being recorded at the same time in the printing machine.

The introduction of multichannel sound reproduction in the moving picture theaters required the placing of several sound tracks on the 35-mm film, without taking up any room in the space which, until now, had been reserved for the picture. The reduced dimensions of the resulting sound track area prohibited the use of the optical technique for reasons of quality. However, endeavors to place the four channels (which were considered to be necessary to obtain sufficiently the stereophonic effect) on four magnetic sound tracks were crowned with success. We shall, however, not dis-

cuss here any details concerning the technique of optical and magnetic sound.

Synchronizing Problems

The machinery required for the production of films with synchronized sound is extensive. In addition, there are difficulties of production in producing a good job of shooting the picture and recording the sound. Thus only very few amateurs will have the opportunity of using this technique. However, this should not be considered as an absolute disadvantage. If we take into consideration that culture films, weekly news reviews, and even feature films often have sound added subsequent to shooting, an amateur, too, can enliven his performances greatly in comparison with purely silent films by the same method. For this purpose, there are now a number of recording processes, differing from each other in price as well as in their operational characteristics.

It is desirable to reproduce the sound immediately after the recording without any further treatment so that faulty sound effects can be easily corrected. Neither the optical technique nor acetate disc recording fulfill both of these requirements and should, therefore, not be considered. But these requirements are perfectly fulfilled by the magnetic sound process. Among others, the raw films used by the amateur make a difference.

A prerequisite for the reproduction of used by the amateur make a difference.

A prerequisite for the reproduction of recorded amateur films is that the film projector is suitable for sound film performances with regard to its operational noises. It is usually placed in the same room in which the recording is done as well as in the same room in which the reproduction takes place when projecting the films.

Projector Problems

In this connection, we wish to stress a few points. An amateur film projector is expected to reproduce bright pictures which are well-focused. The brightness of the screen picture depends on a number of factors, among other on the reflection capacity of the screen, on the efficient opening of the projection objective, and on the capacity of the source of light. Disregarding the characteristics

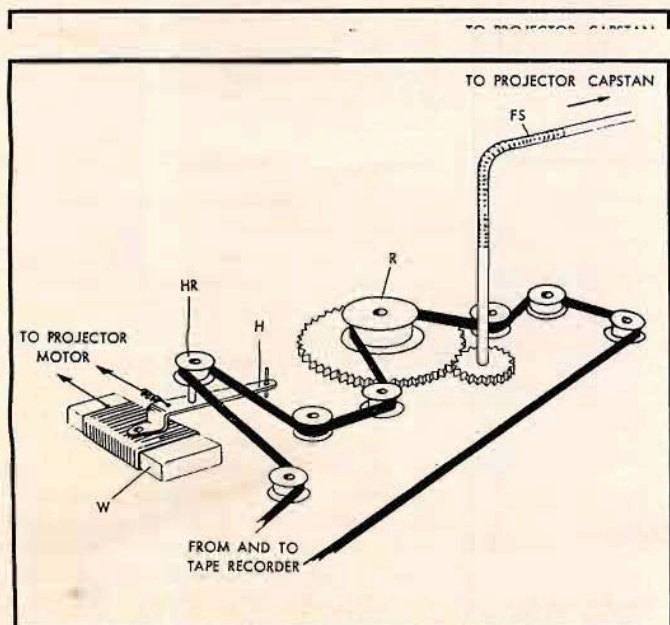


Fig. 1. Diagram of a synchronizing Device.

operational speed of the film. Wound around this roller is a loop of the sound tape which is taken from the recorder. The tape is also guided over a roller *HR*, arranged on a lever *II*, so that, in case the speed of film deviates, said lever is effecting a rotary motion. This lever is connected to a slider on resistor *W* which is included in the motor circuit of the projector, and thus regulates the speed of the film so that it always maintains a constant relationship to that of the tape, and thus the picture and sound always remain synchronized. There are also projectors permitting a direct assembly of the synchronizing device, so

that the flexible shaft can be eliminated.

Other types of construction provide in the projector a commutator rotating with the speed of the film. In the synchronizing device there is also a commutator rotating with the speed of a tape-driver roller. The two commutators are electrically connected. If the speeds differ, current flows through a relay, which in turn varies the current through the projector motor, thus synchronizing the speed of film to that of the tape.

With these processes, a device additional to the projector and the recorder must therefore be available. The sound tape must be guided in the form of a

loop from the recorder to the synchronizer, and the synchronizer and the projector must be coupled mechanically or electrically.

Improved Method

These disadvantages are eliminated in another construction of the machine. If the projector is equipped with an efficient "Asynchron" motor, the latter can drive a special tape recorder, which has no motor of its own, directly. Thereby, not taking into consideration the negligibly small slip of the tape, there are no relative speed differences between the film and the tape. Thus good synchronization between the picture and sound can be obtained, in this manner, without any additional attachments. The Zeiss Ikon 8-mm film equipment Movilux 8B and Moviphon B have been constructed on this principle. *Figure 2* shows the details of this equipment.

The projector had been placed in a handy case, containing all individual parts required for the projection of pictures. A driving motor, whose speed cannot be regulated, drives the projector mechanism over a belt transmission with the securely adjustable picture frequencies of 16, 18 and 24 pictures per second. A precision gripping device and a secure guiding of the film in the aperture guarantee a good position. The projector accommodates 400-ft. reels. As a lighting system, a 50-watt, 8-volt special lamp with a concave mirror has been provided. Condensers or auxiliary mirrors are not required. The light flux or beam, when the three-blade aperture is in operation, is approximately 60 lumens.

The "Cetar" projection objective has an aperture of $f/1.5$ and renders very bright pictures with sharp edges. In order to make it possible to connect the machine to all standard a.c. line voltages, it is equipped with tapped power transformer. The total power input is approximately 100 watts so that the Movilux 8B can also be connected to direct-current sources by means of a vibrator. The Moviphon B can also be connected to direct-current sources by means of a vibrator. Moreover, the power transformer supplies also an a.c. output of 30 volts, which is required for the operation of the Moviphon B. This sound mechanism is driven by the projector motor over a flexible coupling. It can be seen in *Fig. 2* that the Moviphon B has the same case form as the Movilux 8B. During operation, it is placed behind the projector. It contains all parts required for transporting of a standard sound tape at a speed of $3\frac{3}{4}$ ips. (with 16 frames per second of the projector), and a large flywheel mass regulates the necessary synchronization. The tape can be played in one direction on two tracks, one after the others. Either track 1 or track 2 can be reproduced selectively, or both tracks can be reproduced together. This ar-

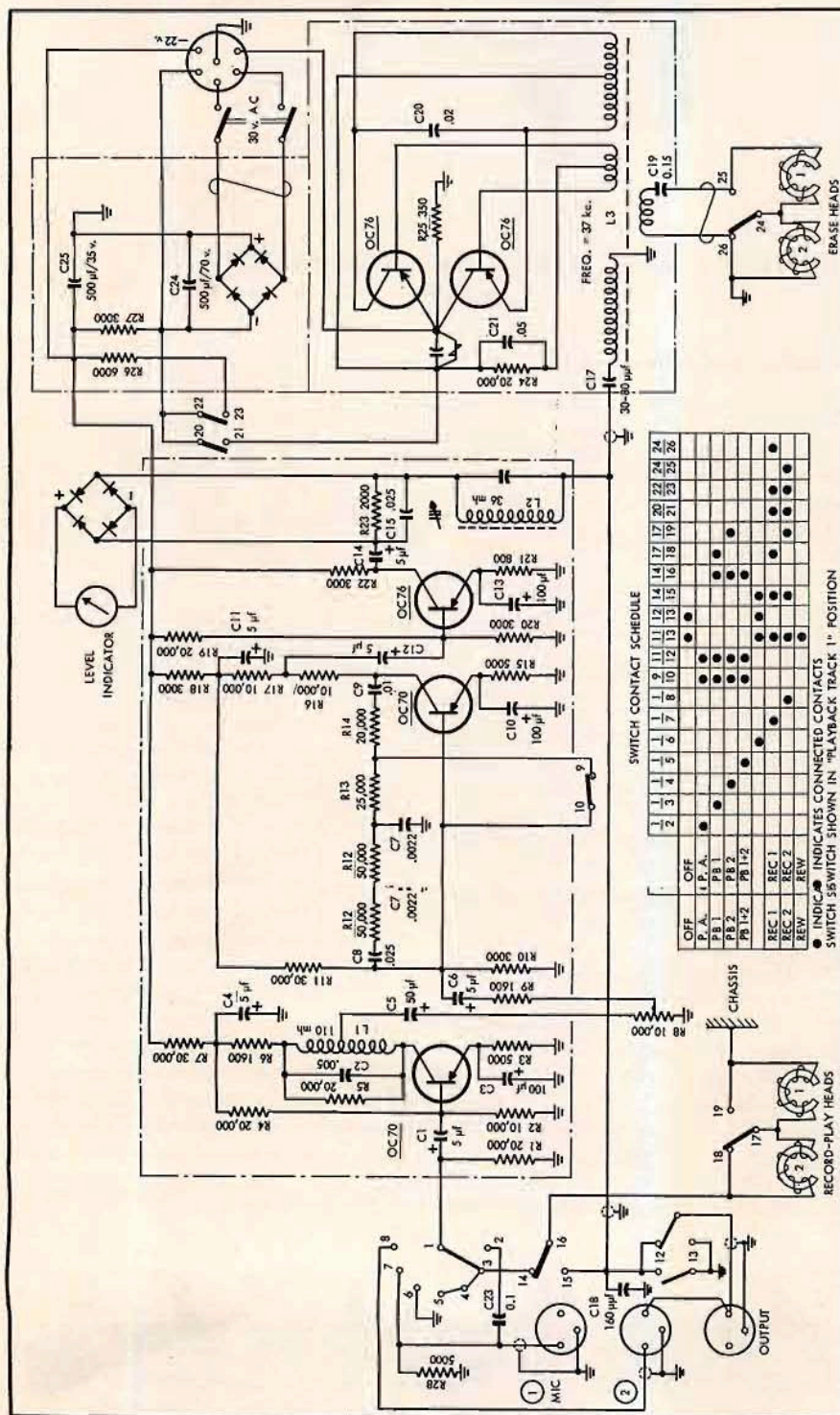


Fig. 4. Schematic of amplifier and associated electrical circuits of Moviphon B.

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angement makes it possible, in recording for the film, to record, for instance, the background music without interruption on track 1, while the spoken text and the noises are recorded later on track 2. Recording faults on track 2 do not influence the recordings on track 1. This arrangement greatly facilitates a subsequent sound recording. In order to fulfill the functions described, Moviphon B is equipped with an amplifier, which can be switched to record and to playback. This amplifier, shown on Fig. 3, employs three transistors. A rectifier-type level indicating meter serves for controlling of the modulation, since, because the maximum direct-current voltage is approximately 30 volts, a magic-eye tube cannot be used. The bias and erase high-frequency is supplied by an oscillator which employs two transistors. The d.c. voltage for the operation of the amplifier and of the oscillator is taken from a rectifier supply which, as previously men-

tioned, obtains its a.c. voltage from the Movilux 8B. To permit double-track operation, one record-play head each and one erase head has been provided for each track.

The Amplifier

The input of the amplifier is at low impedance and arranged in such a manner that the dynamic Zeiss Ikon Mikrophon ZDM II can be connected directly. Full modulation is obtained with 0.2 mv at the input. At the output, the amplifier supplies approximately 2 volts at an impedance of 2000 ohms, which is sufficient to feed a separate power amplifier or a radio receiver. The details of switching can be seen in the schematic, Fig. 4.

For sound recording the picture film is placed in the projector and the tape is placed in the recorder. Starting marks guarantee finding the proper beginning. Then the Moviphon B is switched to play the desired track and the level is adjusted, as a trial, to the desired modula-

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tion. Now the Movilux B is started, and Moviphon B runs at the same time. Now the sound recording can start. After one track is finished, the other track is recorded in the same manner.

For reproduction, the film and the tape are replaced in the machines, aligned at the starting marks, so that they will be reproduced in synchronism.

Finally, machines have been developed in which the film proper carries a magnetic sound track. There is no doubt that these machines are especially simple in their operation, because the film contains both picture and sound. Thus a different running-off speed is out of question, because the device is a unit of picture and sound. However, at the present state of the art, the reproduction quality does not yet compare with the quality of a tape machine with a speed of $3\frac{3}{4}$ ips. The reasons are these: With 8-mm films, the film speed, in case a projection of 16 pictures per second is chosen, is approximately $2\frac{3}{8}$ ips. This speed is so slow and the width of the sound track is so limited that, in comparison with the separately running tape, certain losses of frequency response and dynamic range cannot be avoided. The film measurements are shown on Fig. 5. In addition, it is disadvantageous to be forced to place the magnetic sound strip on the comparatively stiff film, in comparison with the use of a flexible magnetic tape. It is a known fact that for the recording and reproduction of high frequencies, intimate contact between the sound carrier and the magnetic head plays a decisive part.

The quality obtainable at present will,

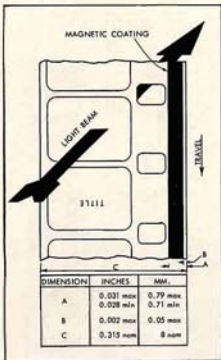


Fig. 5. Standard dimensions of an 8-mm sound film.

without any doubt, be improved for technological reasons as the years go on. Even today, it has reached the point which is entirely satisfactory for most amateurs.

In conclusion, it should be pointed out that, with picture-sound combination films, the relative locations of the picture and the associated sound track are arranged on the film at a specific distance from each other. This arises out of the necessity that, during the film performances, the film must be moved intermittently, while the sound track must, of course, run continuously. Thus, with 8-mm films, the sound spot belonging to a certain picture, is located 54 frames ahead of the picture. This leads to difficulties when it becomes necessary to cut a film which, for instance, may have become damaged at the perforations. The system described eliminates this disadvantage completely. Æ