

# Sound Talk



Bulletin No. 33

PRESENTED BY  
**SCOTCH** BRAND  
**Magnetic Tape**

LAMINATED MAGNETIC TRACKS FOR MOTION PICTURE FILM

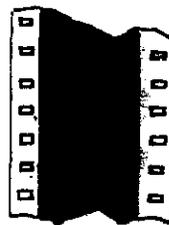
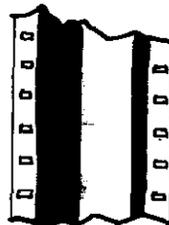
by

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Until recent years, the motion picture industry relied upon photographic recording techniques for sound-on-film movies. When magnetic recording was commercially introduced the industry saw many advantages in the magnetic method, including improved sound quality, ability to monitor and play back "takes" without processing delays, and simplification of the recording

equipment.

Since sound and picture most commonly are recorded separately, then later combined, perforated magnetic recording film is employed to insure perfect synchronization of sound and picture. Minnesota Mining and Manufacturing Company makes a wide variety of these films to serve the industry (Fig. 1).



(1) 35 mm full coated

(2) 35 mm stripe

(3) 35 mm clear edge

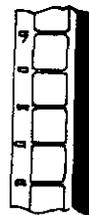
(4) 17 1/2 mm full coated

No. 115  
No. 125: "High Output" oxide

No. 118

No. 119

No. 117  
No. 127: "High Output" oxide



(5) 16 mm double perforated

(6) 16 mm single perforated

(7) 16 mm

(8) 16 mm

(9) 16 mm

(10) 8 mm

No. 116  
No. 126: "High Output" oxide

No. 116  
No. 126

100 mil  
full track

50 mil  
half track

30 mil  
track

30 mil  
track

PHOTOGRAPHIC FILMS LAMINATED WITH  
"SCOTCH" BRAND NO. 121 LAMINATE TAPE  
("HIGH OUTPUT" OXIDE)

FIG. 1



This bulletin is concerned primarily with laminated magnetic tracks (Fig. 1, 7-10) where magnetic sound and photographic picture are combined on one film.

The conventional method of applying a magnetic track to film has been by a liquid coating or striping method. In this process a liquid magnetic dispersion flows through a small orifice onto the film. The film is then passed through an oven and the strip is dried.

One of the difficulties inherent in this system is to obtain a track with a sufficiently flat surface to insure optimum contact with the recording head (Fig. 2).

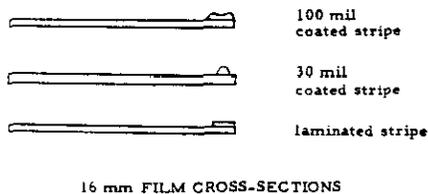


Fig. 2: Drawing illustrates "bead" effect resulting from use of coated stripe on both 100 mil and 30 mil tracks as compared to flat surface of laminated track regardless of width.

In the laminating process, considerable improvement in output, frequency response, and uniformity is possible (Fig. 3 and Table 1).

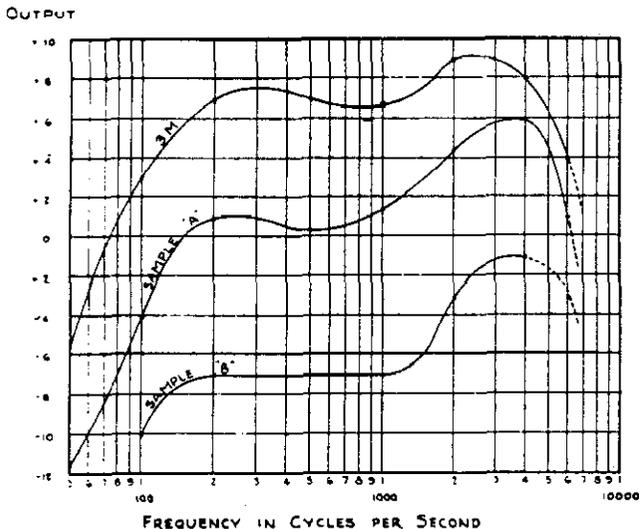


Fig. 3: Frequency response and relative output of magnetic stripe made by laminating process compared with two samples of commercial liquid striped film made on a Bell and Howell Model 200 projector.

Table 1. Relative Output of Several Types of 16mm Magnetic Stripes for 1% Harmonic Distortion, in db.\*

Type of track	Track width in mils (approx.)		
	100	50	30
3M Laminate	64	57	47
Liquid Stripe "A"	53	45	33
Liquid Stripe "B"	59	52	40

\* All tracks measured at "peak" bias, i.e., the bias that gives the maximum output of a low-frequency signal.

The higher recording quality possible with the laminated track is due to: (1) use of "High Output" oxide, (2) orientation of oxide particles, and (3) extremely smooth, flat surface of the track.

In the laminating process a special magnetic tape (Fig. 4) sub-

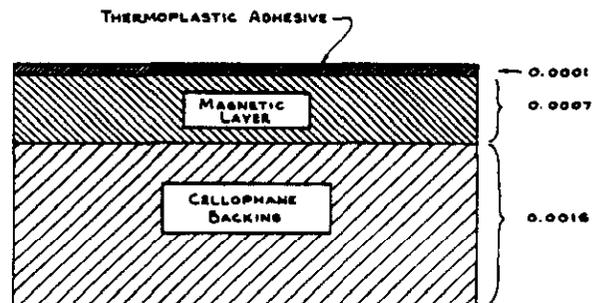
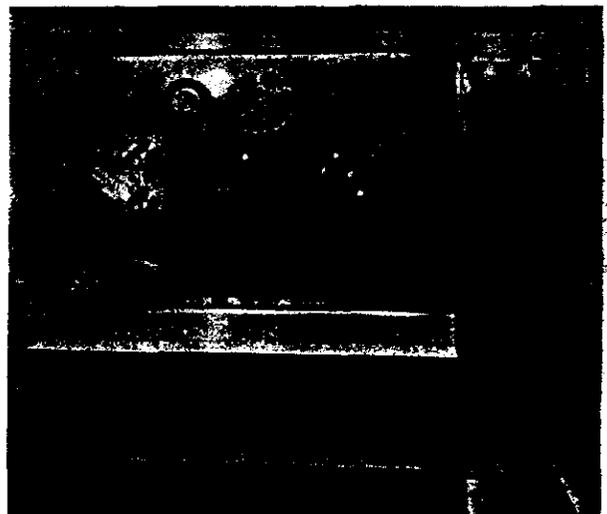


Fig. 4: Cross-section through laminating tape.

ject to the rigid quality control standards of professional recording tape, is applied along one edge of photographic film by a laminating machine (Fig. 5).



The tape -- "Scotch" brand no. 121 magnetic laminate tape -- is supplied in 1/4-inch widths and employs the 3M company's patented "High Output" magnetic oxide.

Since the uniformity of the tape is carefully controlled, films laminated at different times or by different processors can be interspliced without changes in the recording quality.

The laminator machine performs the following operations:

1. Slits the laminate tape to the correct track width.
2. Heats the laminate tape to activate the adhesive.
3. Presses the laminate tape into contact with the motion picture film which securely bonds the oxide to the film surface.
4. Passes the laminated film through a humidity chamber, past a stripper roller, onto a take-up reel. When the film passes through the humidity chamber, the special cellophane backing of the laminate tape picks up moisture. It is then removed at the stripping roller, leaving an exceptionally smooth oxide surface of the film.

The lamination process, therefore, involves transferring the oxide coating from the special tape to the photographic film, similar to the application of a decal.

The "Scotch" brand magnetic laminators are operated by various film laboratories throughout the country.<sup>1</sup> The magnetic laminate tape can be applied to existing films, new prints, or unexposed raw stock in three widths: 100 mil full track and 50 mil halftrack for 16 mm films or a 30 mil width for use either on 8 or 16 mm film.

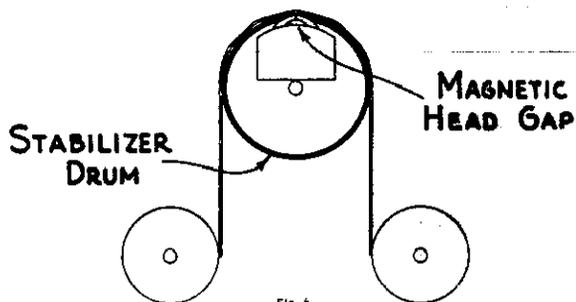
The 100 mil full track is used on single perforated 16 mm film and provides best sound quality. Al-

though most cameras are designed for double perforated film, several can now use single perforated film without modification and many can be easily modified for use with single perforated film.

The 50 mil halftrack is generally used when it is desirable to have both an optical and a magnetic sound track on the same film. For example, one film might carry both an English optical track, and a foreign language magnetic track.

The 30 mil track is used when striping existing films that were taken on double perforated film. The sound quality on this width track can be excellent. However, the results, especially when recording music, are sometimes disappointing. Since the 30 mil track is immediately adjacent to the sprocket holes of the film, the track tends to be more easily next to the perforation than does between perforations. This polygoning effect (Fig. 6) causes a

#### LOSS OF HEAD CONTACT FILM POLYGON EFFECT



loss of head contact to occur each time a perforation passes by the head. It is therefore advisable to use single perforated film if one intends eventually to have it striped.

Standard position for all magnetic tracks is on the side of the film towards the light source during projection and the recording takes place 28 frames in advance of the picture.

The magnetic laminate can be placed either on the emulsion or

base side of the film and on many types of unexposed and unprocessed films. The magnetic oxide does not affect normal photographic processing solutions, nor do they affect the track. However, the film processing laboratory should always be alerted to the presence of a magnetic track.

Certain cleaning solutions, such as trichloroethylene, will damage the track's bond. When in doubt, one should test a short section of leader in the cleaner, and watch for any sign of track loosening. "Freon" 113\* is recommended as a cleaner for films with "Scotch" brand magnetic track.

The recordings on the track are, for all purposes, permanent. Magnetic fields in excess of 200 oersteds are required to erase the recording even partially. These fields ordinarily do not exist; however as a

precautionary measure, one should avoid storing films with a magnetic track next to the speaker magnet in the speaker case of a projector.

Magnetic sound-on-film for 16 mm is capable of a considerable increase in sound quality over presently available 16 mm photographic soundtracks. Generally between one and two additional octaves of high frequency response are possible with a market improvement in signal-to-noise ratio and lower distortion.

Magnetic recording cameras now are available for recording high quality sound on pre-stripped magnetic film. The majority of projector manufacturers have combination optical-magnetic projectors available.

\* Obtainable from E. I. duPont Company

## <sup>1</sup> PROCESSORS EQUIPPED TO LAMINATE FILMS

ANSCO FILM LABORATORIES  
2299 Baux Hall Road  
Union, New Jersey

BAY STATE FILM PRODUCTIONS  
35 Springfield Street  
Agaqam, Massachusetts

THE CALVIN COMPANY  
1105 Truman Road  
Kansas City 6, Missouri

CAPITAL FILM LABORATORIES, INC.  
1905 Fairview Avenue, N. E.  
Washington 2, D. C.

COLOR REPRODUCTIONS COMPANY  
7936 Santa Monica Boulevard  
Hollywood 46, California

E.D.L. COMPANY  
5929 East Dunes Highway  
Gary (Miller Station), Indiana

SHELLY FILMS LIMITED  
Toronto 14, Ontario  
Canada