Magnecord Ink

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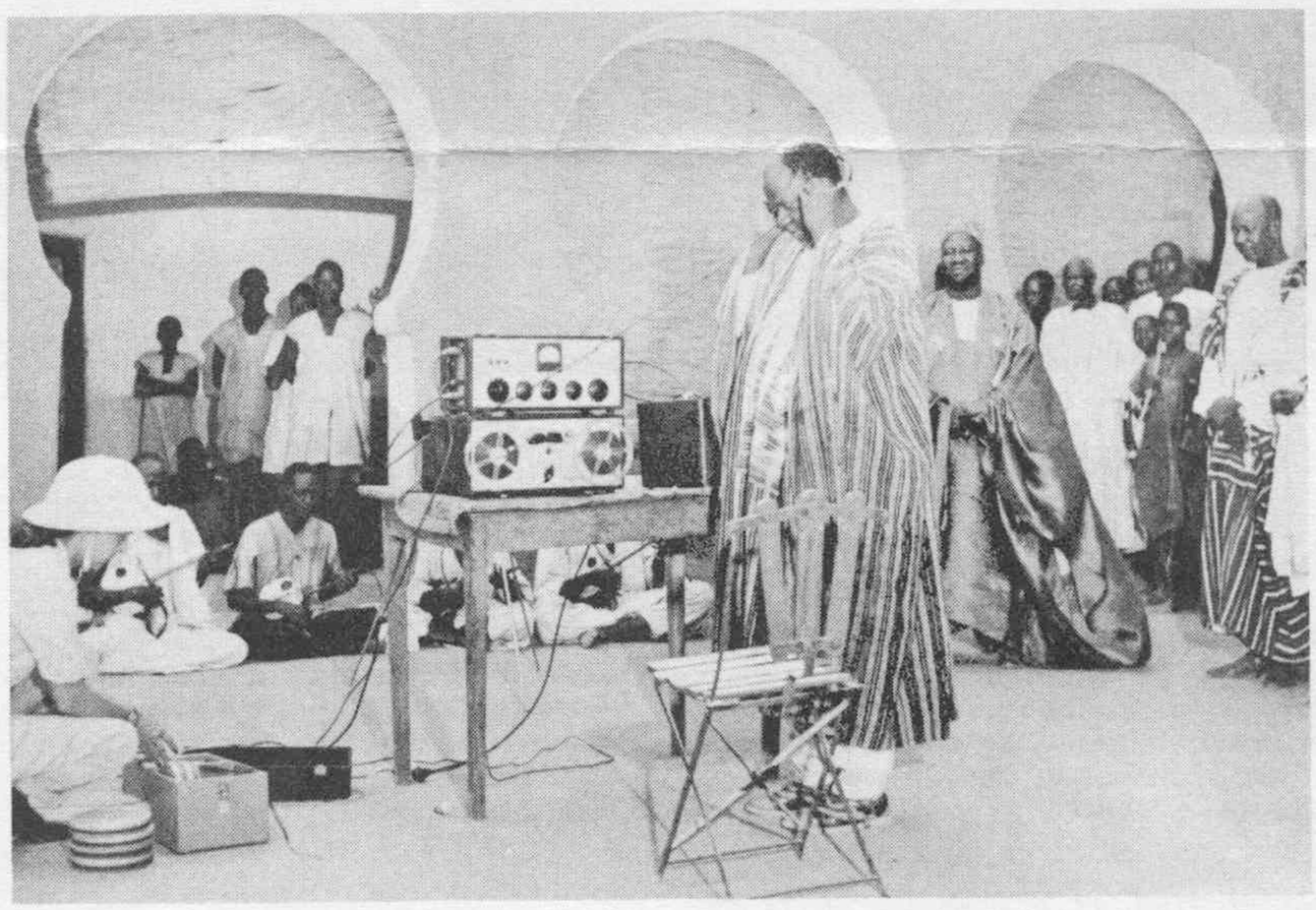
Here's the 1st!

. . . edition of Magnecord's new monthly publication designed to bring you news and information about the magnetic recording industry. Filled with articles of interest to everyone in the high fidelity recording field, it will be sent to all TV and broadcast stations as well as Magnecord distributors and customers.

We'd like your contributions for this publication too (new ideas, uses or technical data) . . . just send them to the Editor, "Magnecord Ink" at our Chicago office.



Wonders never cease. At court of Mossi Emperor, south of Timbuktu, imperial prime minister listens to Magnecorder. Emperor stands behind him while Mrs. Alberts prepares another reel for the emperors ears. (Photo © A. Alberts, 1950)

. . . EVEN IN *Timbuktu*

MAGNECORD PROVES TOPS IN RUGGED DEPENDABILITY

Withstands 5000 Miles of "Jeep-Jolt" at 140 Degrees

Not even a rugged army jeep was able to withstand the punishment given the Magnecorder shown above at the court of the Mossi Emperor at Ouagadougou, a small town south of Timbuktu. On a 5000 mile trip through French West Africa, Arthur and Lois Alberts used this unit to make high fidelity recordings of African tribal and coastal music. For six long months they bounced and twisted over brutal desert roads and jungle trails with the Magnecorder in the back of their jeep . . . Even after breaking four springs in the jeep, Magnecorder operated perfectly and required only routine maintenance.

The Albert's tour was the acid test for *any* machine . . . and especially for a delicate eletronic instrument. Frequently the temperature hit 140 degrees and the Magnecorder was subjected to humidity extremes found nowhere else in the world—From a relative humidity of *8* in the desert to *99* in jungle areas. In these same desert areas the Alberts fought severe dust storms and although their Magnecorder was covered with a gritty film that had seeped through heavy plastic coverings, it continued to give perfect service.

For this job, Albert and Lois had selected Magnecorder models PT-6A, and PT6-P. Powered by 115v 60 cycle AC source in the jeep, the Magnecorder was used daily and they were able to secure a full series of native music never before recorded. Talking drums, flutes, stringed instruments, war and finger drums . . . all were faithfully reproduced by Magnecorder. The first album of this music made from the original Magnecordings will be released by Folkway Records of New York this month.

The Alberts have planned other trips such as this that will take them to the four corners of the earth for unusual recordings. As Mr. Alberts has said, "You can be sure our Magnecorder goes with us. It's one machine that can really take it and the realism of reproduction is beyond compare."

WHO'S WHO AT MAGNECORD

Not the finalists in a Miss America contest but Magnecord's top echelon: Left to right: R. L. Landon, Production Manager; J. S. Boyers, Chief Engineer; R. J. Tinkham, President and C. G. Barker, V.P. Chg. of Sales.

Company publications usually devote a column such as this to anyone of importance in the organization whose face most resembles a convicted murderer, the corpse after execution, or a character study from the book, "White Collar Zoo."

Magnecord, Inc. is a young organization and led by four young men too enthusiastic about their work and the things to be done to have sufficient time to acquire dyspepsia—generally necessary to start this column in the traditional manner.

But since doing the *new* is a basic tenet at Magnecord (regardless of tradition) printed above are the founders . . . *smiling!* This will also prove that they are no more photogenic, intelligent or two-headed appearing than you have imagined them.

THE MAGNECORD ORGANIZATION

Prior to its organization, all four of Magnecord's "top echelon" were actively engaged in the original development of magnetic recording at the Armour Research Foundation. Having been associated with the recording and broadcasting industry in the past, this new art held a fascination for them far in excess of normal research projects. Magnetic recording offered a wonderful new tool for the recording industry; *high* fidelity never before approached.

With this in mind, Magnecord, Inc. was formed through the help of a small group of individuals in Madison, Wisconsin, as a closed corporation in May, 1946. The plant and offices were originally located in a third floor walk-up at 304 West 63rd Street, where all concerned had every title imaginable—from President to janitor, stock clerk or clean-up detail.

THE FIRST MAGNECORDER

Here the first product was conceived . . . the Magnecorder SD-1. It was the first commercial magnetic recorder made available in this country that would compete with disc recording for fine, high fidelity and unusual performance. Wire was used as a medium since the development of tape did not, at that time, compare favorably with wire. Many of these Magnecorder SD-1 units are still in use in radio stations, recording studios, and government agencies. They continue to give high quality reproduction and service.

THE COMING OF TAPE

However, with the advent of good tape, it became obvious that wire had too many inherent disadvantages. Having contacted the professional user for some time, past experiences enabled Magnecord to compile basic requirements for a tape recorder designed specifically for this field.

Four things were evident:

1. Reproduction must be above comparison . . . regardless of past techniques or methods — on any medium or machine.
2. Equipment must be flexible enough to meet the ever changing and varied demands of the industry.
3. It must not cost more than the industry can afford.
4. It must *work!* . . . under all conditions.

The resulting equipment, the Magnecorder PT6 series, must have the requirements, for today, the PT6 is the world's most widely used professional magnetic tape recorder and outsells all other competitive units combined.

The 63rd Street walk-up was outgrown long ago . . . even the present plant at 225 West Ohio and the sales office at 360 North Michigan in Chicago are much to crowded.

How could anyone here possibly pose as the "traditional" picture of gloom?

The acceptance of Magnecord products by the industry has been indeed gratifying—and has created enthusiasm among everyone at Magnecord to improve present and develop new products for the industry.

Know of someone else you want to receive "Magnecord Ink?" Send the enclosed post-card today!

STANDARDIZATION VITAL TO MAGNETIC RECORDING INDUSTRY

Standardization is a prime concern of all equipment manufacturers and users in a new and growing industry such as magnetic recording. Since the end of the war, with the advent of magnetic recording, various committees have been formed to establish standards for magnetic recorders, both for home use and for the professional recording industry.

N.A.B. STANDARDS COMMITTEE

Notable among these committees is the Magnetic Recording Subcommittee of the National Association of Broadcasters under the chairmanship of S. J. Begun of the Brush Development Company. This group is endeavoring to avoid the chaos in the tape recording field which has long existed in the disc recording business. Although much progress has been made, and almost all equipment now being manufactured for the professional user conforms to the existing standards, much still remains to be done.

TAPE SPEEDS AND REEL STANDARDS

To date, the standards adopted apply to tape speeds, reel and hub sizes, tape width, and overall frequency response.

The first tape recorders for the professional user were designed to operate at a tape speed of 30 inches per second. With the appearance of the first Magnecorder, it was shown that 15 KC recording was practical at 15 inches per second. This effected a considerable saving in tape and spool size as well as making possible the construction of smaller and less complicated machines. *The NAB Committee adopted this speed as the primary standard for the professional user.* Where 15 KC response was not especially necessary as for AM radio, it was found that a tape speed of 7½ inches per second was satisfactory (7500 cps.). This was adopted as the secondary standard. The 30 inches per second was kept as a tertiary standard.

The 7 inch reel diameter, used on the first home tape recorders, and later on portable professional tape recorders, was originally borrowed from the 8 mm movie projector. This reel had sufficient capacity for a half hour of recording time at 7½ inches per second, was convenient and readily available. The NAB and RMA (primarily concerned with standards for home recorders) have adopted this size reel, with minor modifications, for the tape recorder industry.

A larger reel was, of course, necessary where longer playing times were required. A 10½" reel, with a large center hole, has been adopted by the NAB Committee. This reel fits interchangeably all presently available professional tape recorders. These reels had to fit a variety of conditions: reels with no sides, reels with one side, and reels with two sides—to run vertically and horizontally—and to fit *all* machines. A "knockdown" reel with separate flanges and hubs has been the solution, and requires only a screwdriver for assembly into any type of reel.

Over-all frequency response was set early in the game by NAB. The standard was set at flat from 50 to 15000 cps, with maximum deviations of 0 db down at 100 or 10,000 cps and down 5 db at 50 or 15,000 cps.

Signal to noise ratio standards have not

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TAPE TALK ON

MECHANICAL SYSTEMS FOR MAGNETIC TAPE RECORDING

Within recent years considerable literature has become available on the *electrical* techniques of magnetic recording but very little has appeared concerning the *mechanical* systems necessary for good magnetic recording.

This is the first of a series of articles intended to acquaint the reader with the many aspects of a seemingly simple operation such as unwinding tape from one spool, across a series of heads and then winding it onto another spool. To accomplish this apparently simple function, dozens of different types of drives, controls, reeling systems and interlocks have been devised and tried.

The purpose of these articles is to explore and examine the difficulties of these mechanical ideas and the necessary manufacturing compromises involved. Some of this information may not be new to some of the readers, but it will point out reasons behind the design and manufacture, not only of Magnecord products, but others as well.

DRIVING THE TAPE

I. CAPSTANS

The basic considerations in the mechanical drive system are:

1. To move the tape past the heads at a uniform velocity.
2. Control the tape without spilling, under all the conditions of starting, running, stopping and power failures.

It would seem that the easiest way to drive tape would be to merely wind it or pull it over the heads from one reel to the other, but a quick glance shows us that the results would be unsatisfactory since the speed of the tape would be governed by the increasing diameter of the tape on the reel. This would result in wide differences in frequency response and output, and would also make it impossible to splice a part of one tape to another.

The only answer is, of course, a mechanical control or capstan which always travels at a uniform rate of speed. It controls and drives the tape at this same uniform rate. The reels merely act as paying off and taking up members which will vary in speed to allow for the changing reel diameters. The capstan then, is of primary importance to the tape drive system.

UNIFORM VELOCITY OF TAPE— A CAPSTAN FUNCTION

The capstan's function is to provide as nearly as possible a uniform and constant velocity of tape motion over the heads. This does not mean only a uniform rate of speed from one end of the tape to the other. Although the speed of the tape may seem to be the same throughout a reel, the instantaneous velocity may change considerably. These changes cause a variation in the pitch of a constant tone recording and are loosely referred to as "flutter" or "wow."

"Flutter" is considered to be a non-linear motion of higher frequency or change of pitch, say from 15 to 200 or 300 deviations per second, and may be caused by capstan or drive motor ripple, gear tooth ripple, uneven speed reducer system, "violining" of tape over heads, or rough pressure rollers, etc.

"Wow" is generally considered to be a slow pitch change or low frequency phenomenon and is usually associated with the periodic rotation of the capstan, flywheel, reels, or some other slowly revolving portion of the mechanical system. "Wow" patterns have a frequency of from 1 to 10 or 15 deviations per second.

Uniform velocity then is not just moving the tape at a particular constant speed, but it is also tape motion with the least possible non-linearity of motion from instant to instant.

TAPE SPEED

The speed of the tape is governed by the capstan, but at what speed should the tape travel? In professional requirements, it is assumed that the tape must travel fast enough to record and reproduce all frequencies from 40 or 50 to 15000 cps.

In the first tape recorders of German origin and design, a tape speed of 30 inches per second was necessary to achieve the desired results.

Nearly two years ago Magnecord produced units that used tape newly developed by Minnesota Mining and Manufacturing Company. It was proven conclusively that the results formerly obtainable only at 30 inches per second could be obtained at one-half the speed or 15 inches per second. This effected large savings in tape and made smaller spools and machines possible. As a result, the National Association of Broadcasters (NAB) standard tape speed was set at 15 inches per second with a secondary standard of 7½ inches per second. The Magnecorder was the first machine available with both of these speeds as a standard feature.

The choice of these slower tape speeds was certainly advantageous to the user, but it didn't simplify the design problems of the mechanical drive.

SIZE OF THE CAPSTAN

When a tape speed of 30 inches per second was used, it was possible to drive the capstan directly from the motor shaft. In professional work uniform velocity demands that a synchronous motor be used to obviate variations in the motor speed due to line voltage fluctuations. The more or less standard synchronous motor for this type of work has a speed of 1800 RPM. At the 30 inches per second tape speed, this direct driven capstan would then have a diameter of 0.318 inch which would seem fairly adequate from a manufacturing standpoint. However, when a 15 inch per second tape speed is desired a similarly driven capstan would have to have a diameter of only 0.156. This small a capstan tends to become impractical from a manufacturing standpoint because of the extremely critical tolerances involved. Tolerances or eccentricities of a given amount become twice as effective at the slower tape speed causing increased "flutter" or "wow." As a result it is obvious that the diameter of the capstan should be increased at the slower tape speed.

It is known that the larger the capstan the less a given amount of eccentricity will cause non-linearity of tape movement and consequently smaller amounts of "flutter" or "wow." Also, the larger the capstan the slower must be its speed to still drive the tape at 15 inches per second. It is here that a compromise must be made.

As the speed of the capstan decreases, the weight of the flywheel must be increased to smooth out the uneveness of motors and speed

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NEW PRODUCTS AT Magnecord INC.

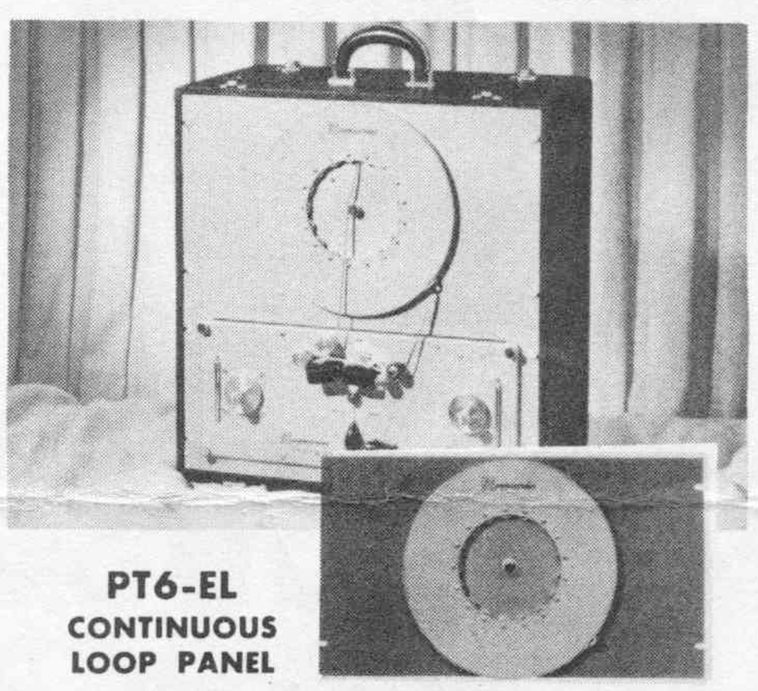
PT6-IM4
MULTI-CHANNEL MIXER

Greater use of the PT6-J Amplifier is made possible by the new low level multi-channel mixer box pictured in use with the PT6-J. This unit fits snugly into the rear cover of the PT6-J case, where it may be permanently mounted. Simultaneous mixing of either 3 or 4 microphones in place of the single mike input on the standard PT6-J is featured.

The mixer, which plugs into the mike input of the PT6-J, uses 2 db per step ladder attenuators calibrated in db. Sufficient gain is available in the amplifier to compensate for mixer loss.

The mixer is available with either 3 or 4 positions and is designated and priced as follows:

PT6-IM3	3 channel mixer	$67.50 net
PT6-IM4	4 channel mixer	74.00 net



PT6-EL
CONTINUOUS LOOP PANEL

In response to the need for a machine containing a continuous loop of tape with more than a few seconds capacity, Magnecord announces the addition of the PT6-EL, Continuous Loop Panel.

The panel is used in conjunction with the present PT6-A Basic Recorder Mechanism and makes possible the repeating of messages without having to rewind the tape and start again. The beginning and the end of the tape are joined together in an endless or continuous loop. The tape feeds on to the outside of the big stationary reel on the PT6-EL panel and is pulled out of the inside center of the reel, down through the normal tape path, over the erase and record/reproduce heads, through the capstan and pressure roller and back up onto the outside of the large reel. The reel remains stationery and the tape itself goes around inside the reel in a slipping fashion.

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MECHANICAL SYSTEMS FOR TAPE RECORDING (Cont'd.)

reducer which must be used to accomplish the slower speed. The practicality of capstan size versus flywheel weight and size then becomes the design criteria.

Magnecord uses a 0.750 inch diameter capstan for 15 inches per second tape speed. Simple calculation shows that, theoretically at least and disregarding all factors other than the capstan, an equal eccentricity on the 0.318" capstan direct driven from an 1800 RPM motor (for 30 inches per second tape speed) gives a theoretical flutter 2.4 times as great as that of the 0.750 capstan (Magnecorder 15 inches per second).

In conclusion then, in designing the capstan it would appear that within certain limitations the capstan should be as large as compromises and end use considerations will permit.

To utilize this theoretical improvement in the capstan, brought about by the larger capstan design, a speed reducer system with a minimum of non-linearity of motion is also necessary or the capstan design will have little end result.

(The next article in this series will deal with speed reducer systems.)

STANDARDIZATION (Cont'd.)

been set as to value, but are to be measured in a prescribed manner. The ratio is taken between erased tape noise as reproduced, to a reproduced signal in which the total harmonic content does not exceed 3% as measured by a rejection type meter.

The most important problem before the industry is the standardization of recording or equalization characteristics. There have been no standards set to date, but manufacturers have traded tapes on which standard frequency runs have been recorded. From these, they are able to compare and analyze the various differences in equipment. This will give the information required before anything positive can be done toward setting acceptable standards.

Whenever standards are set, Magnecord users may be assured that their equipment will not be made obsolete in the slightest. Plug-in equalizers and unit construction make necessary modifications a simple matter.

In summary, it is the purpose of those providing the tape recording equipment and those using it to formulate standards of quality and interchangeability which will make for its successful and widespread use.

NEW PRODUCTS AT MAGNECORD (Cont'd.)

The PT6-EL will hold enough tape to have a play-back time ranging from a few seconds to 15 minutes (600 feet), depending on the length of tape used.

Broadcast station call letters and commercials can be recorded for play-back on the air. There is no chance of a slip-up since the message always returns to the beginning.

A continuous tape loop is especially valuable to school teachers as it permits rapid repitition for critical analysis of speech and music passages.

Advertisers also find the unit invaluable for describing continuous displays or repeating announcements.

The fidelity of reproduction is unaffected as this panel is merely a substitute for regular spools and the recording and playback are still done by the PT6-A Basic Recorder Mechanism in conjunction with a Magnecord Amplifier.

Price of this PT6-EL Continuous Loop Panel is $64.50 net and deliveries are now underway.

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