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TEST REPORT

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THE SIMON SP4 AUTOMATIC TAPE RECORDER

Manufacturer: Simon Sound Service Ltd., 46-50, George Street, Portman Square, London, W.1.

Price 95 gns. plus 3 gns. for remote controller.

If you visited the 1958 R.E.C.M.F. private exhibition, or the Audio Fairs at London or Harrogate, I am confident that you have been anxiously awaiting the time when the new *Simon* tape recorder would be in quantity production. The demonstrations given indicated the very high order of reproduction that was possible with this British conceived and manufactured machine. In view of the excellent S.P.2 machine that was fully reported some two years ago, and the outstanding mechanical design and electrical performance, it was difficult to forecast the improvements that could be made. For some two years the research group at Simon Sound Service have worked on a project in conception quite different from the S.P.2. and building into it facilities that collectively do not exist in any other current tape recorder.

It is with particular pleasure that the MUSIC TRADES REVIEW publishes this review, for not only is it the first to be published but for some months I have been privileged to watch the progress in the design of the recorder, and gain an intimate knowledge of the care and skill employed in the production models. Let it be recorded immediately that in my opinion based on a wide knowledge and handling of most current recorders that the new Simon S.P.4 is one of the most outstanding developments for several years, and is unlikely to be superseded for years to come. It is extremely simple to operate, has facilities only found in truly professional machines costing £350 and upwards, has an outstanding technical performance, and by no means least has a design and styling commensurate with its technical performance.

MANUFACTURERS SPECIFICATION

Simon Automatic Deck. Full push-button operation. Power operation by synchronous motor of 1/100 h.p. for accuracy of running speed with high torque at constant speed.

Automatic reversal with momentary break at track change giving up to three hours continuous recording or replay with long play quarter inch tape with standard metal foil insert.

Continuous replay given by automatic reversal at each end of tape. Under recording conditions the machine automatically stops at end of second track.

Manual track change by pushbutton or by remote control, also indication of track in use.

Record safety button to prevent accidental erasure.

Remote control facilities enables the operator to start, stop or change track up to any distance. The remote control unit has 10 yards of cable.

Tape speeds 7.5 and 3.75 inches/sec.

Playing times: at 3.75 in./sec. long play tape, 1800 ft., 3 hours; standard tape, 1200 ft., 2 hours; at 7.5 in./sec. long play tape, 1800 ft., 1.5 hours; standard tape, 1200 ft., 1 hour.

Tape position indicator gives accurate cueing position.

Tape capacity up to 7 inch spools.

Mains supply 110, 125, 200, 220, 245 volts 50 c/s (60 c/s to order) A.C.

Fast forward or reverse 1200 ft. tape in two minutes.

Braking system gives firm, fast braking without snatch or stretch.

Wow and flutter content—better than 0.2% peak to peak.

Mixing facilities—Inputs: high impedance microphone, sensitivity 2.5 mV.; low impedance microphone, sensitivity 40 uV.; radio or gram. pick-up ,sensitivity 350 mV.

For recording or public address purposes any or all of the above can be

mixed with individual volume controls. On playback the tape signal can be mixed with radio, gram., etc.

Output. The ultra-linear high fidelity amplifier provides 10 watts undistorted output. Output to internal loudspeakers limited automatically but full output to extension loudspeaker. Amplifier distortion less than 0.5% at 1 Kc/s at 10 watts.

Tone controls. Independent bass and treble controls operating only on playback or P.A. Treble control provides 6 dB lift at 12 Kc/s and cut of 18 dB. Bass control provides 6 dB lift at 50 c/s and cut up to 18 dB. Controls marked for re-playing C.C.I.R. recordings.

Frequency response: Amplifier only (P.A. condition) 30-18,000 c/s ±2 dB; Tape at 7.5 in./sec. 30-12,000 c/s ±3 dB, 30-15,000 c/s ±5 dB; Tape at 3.75 in./sec. 30-7,000 c/s ±3 dB.

Push-pull oscillator reduces background noise to minimum.

Amplifier hum and noise level at 10 watts minus 52 dB.

Erase level: At 1 Kc/s better than 70 dB; At 300 c/s better than 60 dB.

Internal loudspeakers: main unit 10 in. by 6 in. elliptical. High note reproducer 4 in. with diffuser.

Technical Description

It must be stressed that the whole of this design and machine was done in the laboratories of the company which has one of the finest machine shops in the industry. Every part is made to extremely close tolerances, and in many cases special machines were designed to produce various component parts of the Simon automatic deck.

The whole of the mechanical assembly is built around a cast aluminium base plate which is very accurately bored and tapped by precision methods. On this is mounted not only the whole of the mechanical assembly, but below it the various electronic sub-chassis. The basic power to operate the machine is a 1/100th h.p. synchronous motor that is checked for dynamic balance and mechanical noise before it is assembled on the base plate.

The motor runs continuously immediately the tape recorder is switched on. This in turn drives a massive capstan through intermediate rubber driving wheels. The capstan is 6 in. in diameter and nearly 1 in. deep. The shaft is ground and made from stainless steel, and individually mated with its bearing housing. The whole assembly is dynamically balanced and the driving rim turned with diamond tools, thus ensuring absolute concentricity.

The push-button mechanism is the result of a long study in direct mechanical operation or electrical methods. In those tape decks that use purely mechanical operation the effort required on the push-buttons is considerable. In the ultimate Simon design a combination of electrical and mechanical methods is used. Mechanically latching electrically initiated relays are used thus ensuring that a light finger touch on the press-buttons achieves a considerable mechanical effort. By using mechanical latching a small relay power can be used, and only used to operate the latching. Immediately this is achieved, the electrical power is automatically cut off. The overall result of this unique approach is that light finger operation ensures very positive mechanical movements.

The Simon Service Sound Company must be one of the very few manufacturers in the tape recorder business who produce their own recording/replay and erase heads. As it is possible in this machine to record on either track without reversing the tape spools it is necessary to duplicate the record/replay and erase heads. I spent a considerable time studying the method of manufacture of both forms of heads, and the continuous testing as each step in manufacture proceeds. For this purpose it was necessary for the designers to produce their own grinding and lapping machines which in themselves are high precision instruments that one usually associates with precision watch-making. The heads are completely encased in an insulated moulding and the record/replay head screened in a mu-metal box to eliminate hum. The heads are adjustable for azimuthal alignment and each is checked within stringent limits before assembly on to a deck. Considerable thought has been given to the material used for the spring loaded tape pads that maintain an intimate contact between the tape and the tape-head. Too high a pressure will rapidly wear the head whilst too low a pressure will reduce sensitivity and alter the frequency response. The normal felt pad often employed was found to have various deficiencies and a new material was found that overcomes all previous wear problems.

The tape spools automatically drop into position on the driven spindles and are neatly locked into position by lifting a small central boss and rotating it a sixth of a revolution. The tape feeds

through a straight line entry and it is automatically located by guiding flanged rollers. The mechanical braking system is very positive in action, operating on both diamond-turned brake drums simultaneously. Although one does not expect any mechanical disrangements with precision equipment of this quality, special care has been taken in the design that all parts are readily accessible. The whole of the equipment is easy to remove from the outer cabinet by removing the plastic covers. The whole deck and amplifiers can be then removed by releasing four sprung bolts.

The amplifier consists of a *Mullard* UF86 R.C. coupled stage for use with the high impedance input socket. The low impedance input is a two conductor and earth screened connector feeding a centre earthed balanced transformer. The secondary winding is connected through switching to one half of a *Mullard* ECC83 which is also used as the amplifier under replay conditions. Between this half of the valve and the second half are the tone correcting networks for replay only at 7.5 and 3.75 inches per second. The output is R.C. coupled to a phase splitter stage using a *Mullard* ECC81 which in turn is R.C. coupled to a pair of *Mullard* EL84 operating under ultra-linear push-pull conditions. Negative feedback is provided the secondary winding of the massive output transformer and the driver phase splitter.

In order to maintain the quietest background experiments have shown that a push-pull bias oscillator has many technical advantages, not the least of which is the cancellation of even harmonics of the fundamental oscillator frequency. Also greater power can be obtained for a given size valve and a pure sinusoidal wave generated. Hence the Simon tape recorder uses a *Mullard* 12BH7 push-pull oscillator stage with a balancing control to ensure linearity.

Power for the amplifier is provided by a large mains transformer and valve rectifier using a *Mullard* EZ81. R.C. smoothing is used with large capacity electrolytic capacitors. Power to operate the various electro-mechanical relays is obtained also from the mains transformer and a full-wave bridge rectifier. This circuit also provides a D.C. power to operate the filaments of the UF86 and the ECC83, thus greatly reducing background hum.

Under recording conditions a *Mullard* EM81 magic eye indicator is used for recording level purposes, and it is switched out of operation for replay purposes. There are a number of muting switches in the various input and tape circuits so that all forms of unwanted clicks are eliminated.

Presentation

The whole equipment is housed in a rectangular cabinet with rounded corners. The design of the cabinet was left in the capable hands of Peter Bell, M.S.I.A., who is accepted as one of the leading industrial designers. The cabinet measures 16.5 in. wide 15 in. deep and 10.5 in. high including the removable lid. It is finished in two-tone grey Rexine with a neat anodised gold surround to the loudspeaker grille. The loudspeakers are mounted at the front of the cabinet together with the level indicator and indicator lamp. Substantial locks and carrying handle are mounted on the right hand side of the cabinet, and rubber buffers raise the cabinet above table level to allow free ingress of air.

The top of the deck is finished in two-toned non-breakable plastic so mounted that there is an air-gap between the cover and the cabinet to allow the escape of hot air.

Between the two spools is the speed selector switch and below that the mechanical counter. All the functions of recording, playback, tape direction, fast rewind, are controlled by seven push-buttons plus a safety record button. The variable controls are mounted in line and reading left to right are: (1) Radio input volume control, (2) concentric volume controls top, low impedance microphone and tape replay volume control, and bottom section high impedance microphone control, (3) concentric tone controls, top section treble cut and boost, bottom section bass cut and boost, (4) combined on/off switch with monitor control.

At the rear of the cabinet are the following sockets and connections: A.C. mains input with housing for 3-pin mains plug, mains voltage selector, 2.5A fuse holder, remote control jack, external loudspeaker jack that cuts out internal speaker, gram/radio input jack, high impedance microphone jack, low impedance twin screened microphone socket.

The remote control unit consists of a neat box housing two finger-light switches, the left hand one causes the tape recorder to stop or start and the right hand switch operates the track

change. The 30-foot multi-conductor lead terminates with a three-circuit plug. If desirable there is no reason why this control unit is not extended to considerably greater distances.

TEST REPORT

For some weeks I have had the Simon S.P.4 in constant use. I have made a considerable number of recordings of the highest quality. Much time was spent in confirming the manufacturer's claims of frequency response, power output, wow and flutter, etc. Briefly one can say that the claims are modest and free from exaggeration, a remark that cannot be applied to all machines on the market. Taking the amplifier alone a Marconi R.C. oscillator was applied to the microphone inputs and radio/gram jack. The output was measured across the internal loudspeakers which are damped by series resistors to prevent overloading. Distortion figures were taken with a Marconi harmonic analyser, and waveform inspected with a Cossor 1049 double beam oscillograph. Distortion at 10 watts output was measured to be 0.4% at 1 Kc/s, with a maximum distortion of 0.7% at 35 c/s. Frequency response was well within the manufacturers rating and, in fact, the amplifier response extends to 30 Kc/s but at reduced amplitude.

Wow and flutter measurements were made with a British Acoustics meter and gave a total peak to peak reading of 0.18% after the machine had been operating for 10 minutes.

Under recording conditions the machine was used in conjunction with both the Simon ribbon Cadenza microphone, and the A.K.G. model C.12 condenser microphone. Although I had a very high regard for the earlier Simon S.P.2 tape recorder there is a distinct improvement in recording both in frequency response, transient attack and absence of background. The facilities offered by the mixing of radio, gramophone record and microphones is a great asset, and in all cases the recorded signal is only controlled by the quality of the input signal.

Using a signal derived from a R.C.A. frequency modulated feeder unit, some excellent recordings were made of symphony concerts transmitted by the B.B.C. and it would be a very difficult task to state whether the reproduced signal was recorded or taken direct from the ether. Direct recordings were made with both microphones and the only advantage the A.K.G. condenser microphone appeared to have over the Simon Cadenza ribbon microphone was the facility of changing the polar diagram, and reducing room echos. One must admit however, that the A.K.G. microphone costs sixteen times the price of the Simon Cadenza.

For years I have tried to make good piano recordings but seldom have they been as good as pre-recorded tapes. At last with the Simon S.P.4 I have found a machine that is not only simple to use, but is capable of producing professional results. One of the most valuable features of the machines is the automatic reversal of the tape at the end of the tape. Assuming that one is starting with a new tape on the left hand spool, the tape passes to the right hand spool and when it comes to the end of the tape the metallic insert trips a switch which reverses the tape and automatically changes over the recording and erase heads. The time taken for the change of track is less than two seconds. When all the tape is rewound on the left-hand spool the machine automatically stops, and prevents the erasure of the recorded material. Under replay conditions however, the machine will constantly reverse at the end of each reel.

The operation of the various push-buttons only requires a light touch, whilst all the various controls have a very silky feeling. The remote control was found most useful when one wished to record from a distance or where it was inconvenient to have the recorder in view. A good example of its use was when a recording was made in the theatre of the Northern Polytechnic. Having the recorder in view of the audience might have spoiled their enjoyment of the concert. Therefore the recorder was housed off-stage and only the remote control was brought into the auditorium. A superbly written instruction manual in hard covers with some forty pages covers every detail of operation.

Summing up, there is no doubt that in view of the numerous facilities the new Simon Automatic S.P.4 offers, the excellence of its performance under all conditions, the complete absence of background, and a power output when used with suitable external loudspeakers for an audience of 300-400, this machine, both in performance and appearance, is unlikely to be superseded for many years. It is a remarkable contribution to the art of recording, is completely British in conception and production, and is wholly made in one factory.

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