

March 18, 1941.

C. C. TOWNE

2,235,126

MAGNETIC TELEGRAPHONE

Filed July 13, 1939

4 Sheets-Sheet 1

FIG. 1

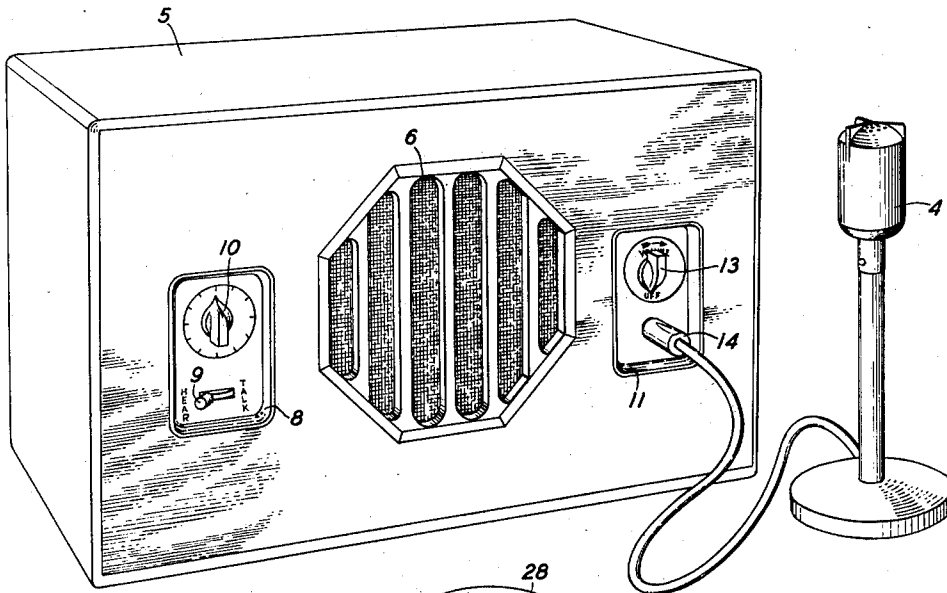
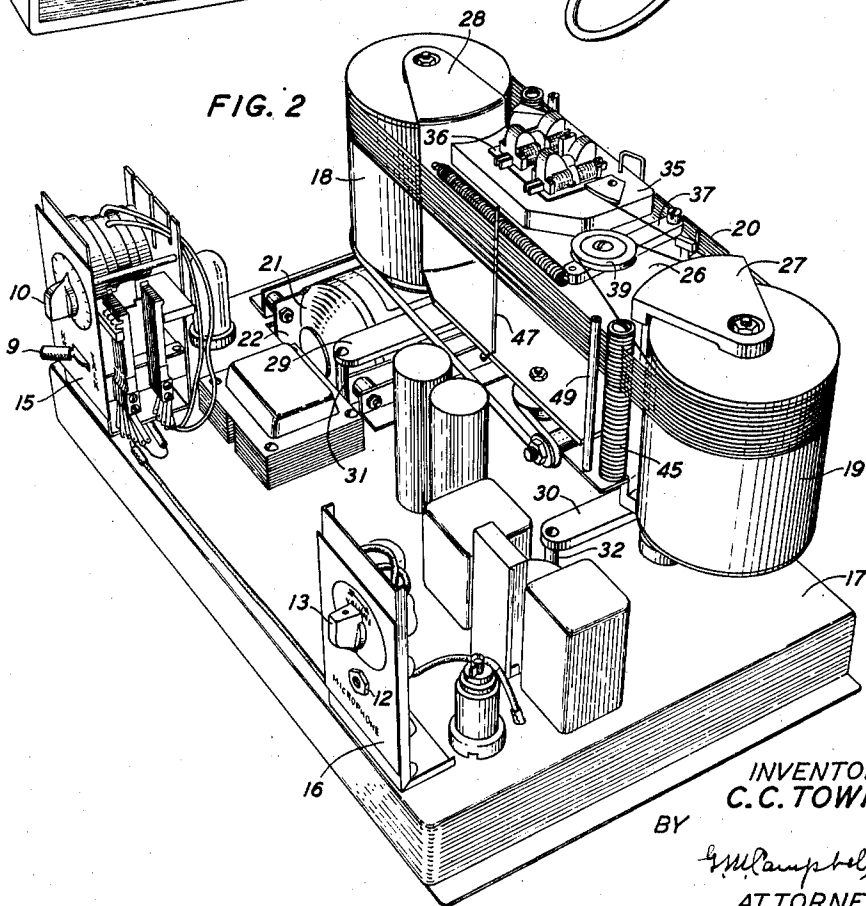


FIG. 2



INVENTOR
C. C. TOWNE

BY

W. R. Campbell
ATTORNEY

March 18, 1941.

C. C. TOWNE

2,235,126

MAGNETIC TELEGRAPHONE

Filed July 13, 1939

4 Sheets-Sheet 2

FIG. 3

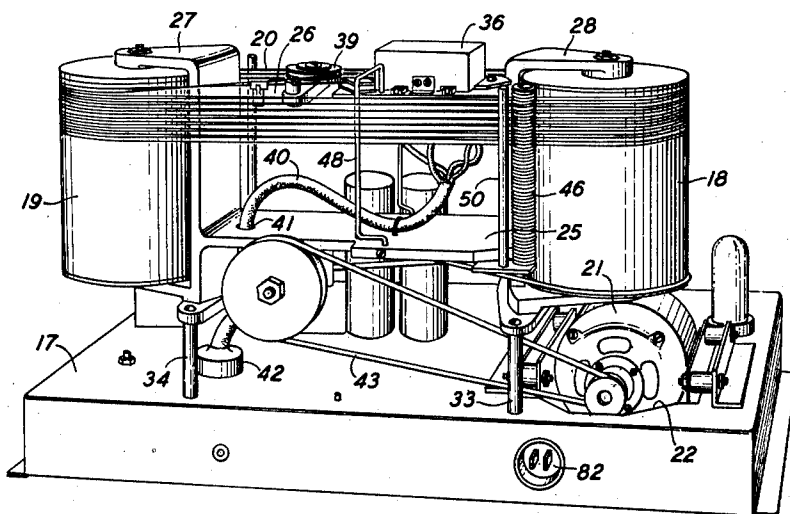
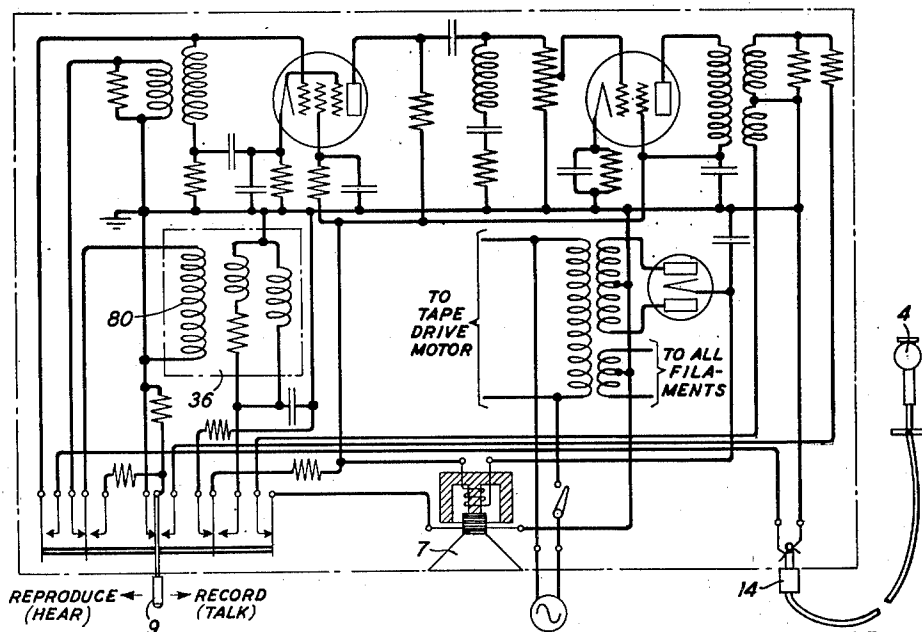


FIG. 4



INVENTOR
C.C. TOWNE
BY
W. Campbell
ATTORNEY

March 18, 1941.

C. C. TOWNE

2,235,126

MAGNETIC TELEGRAPHONE

Filed July 13, 1939

4 Sheets-Sheet 3

FIG. 5

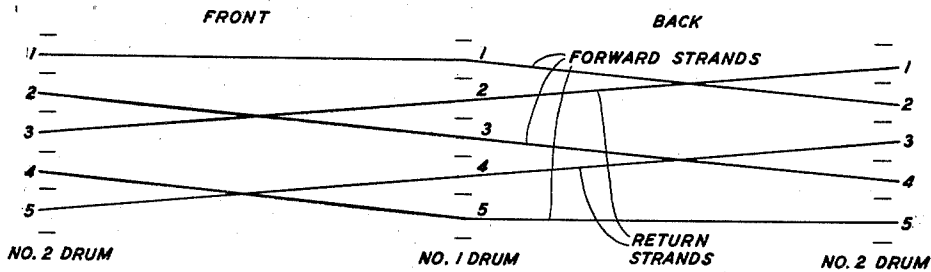


FIG. 6

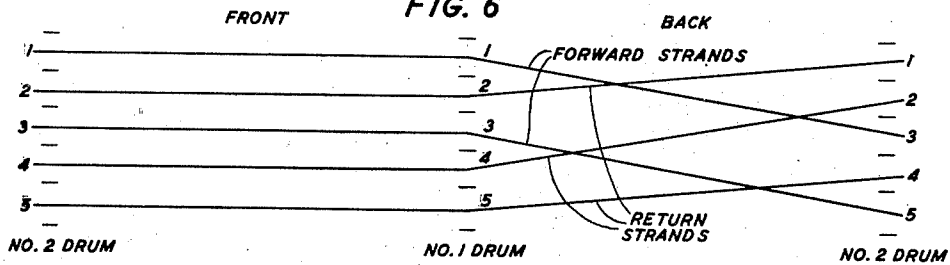


FIG. 7

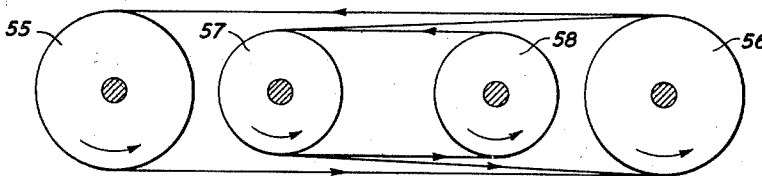
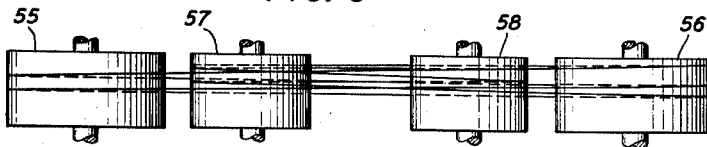


FIG. 8



INVENTOR
C.C. TOWNE
BY *Wm. Campbell*
ATTORNEY

March 18, 1941.

C. C. TOWNE

2,235,126

MAGNETIC TELEGRAPHONE

Filed July 13, 1939

4 Sheets-Sheet 4

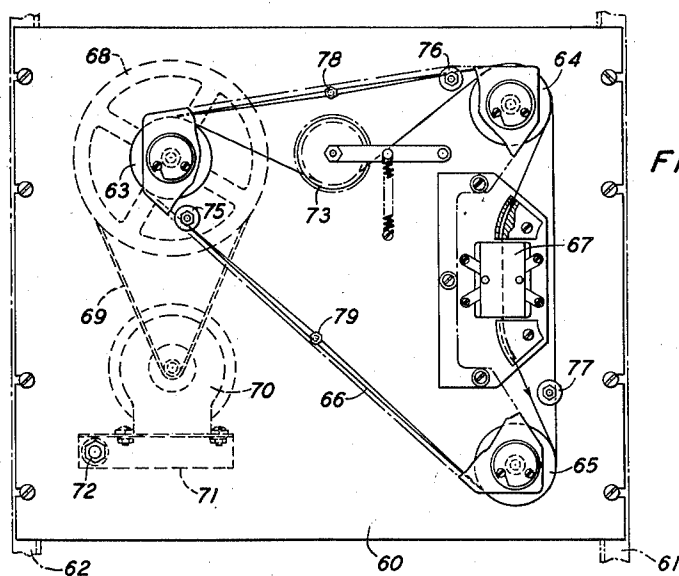


FIG. 9

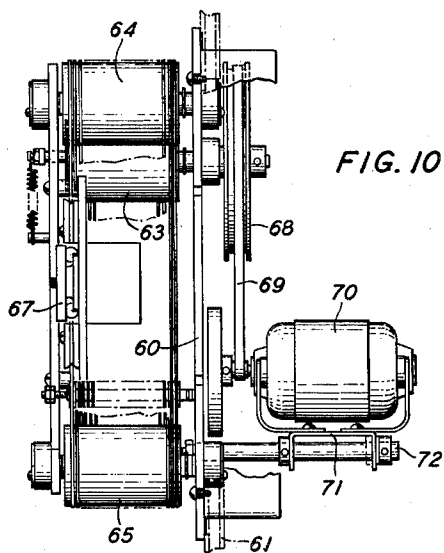


FIG. 10

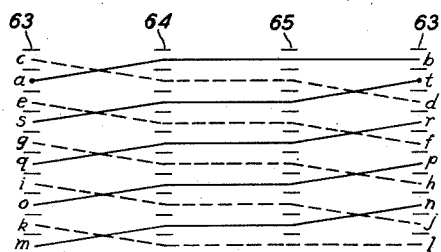


FIG. 11

INVENTOR
C. C. TOWNE

BY

E. H. Campbell
ATTORNEY

UNITED STATES PATENT OFFICE

2,235,126

MAGNETIC TELEGRAPHONE

Charles C. Towne, Summit, N. J., assignor to Bell Telephone Laboratories, Incorporated, New York, N. Y., a corporation of New York

Application July 13, 1939, Serial No. 284,155

8 Claims. (Cl. 179-100.2)

This invention relates to telegraphone systems and the object of the invention is a telegraphone which is particularly adapted for repeated reproductions of recordings of different lengths.

5 In accordance with the general features of the invention, the recording member comprises a continuous tape wound on a plurality of rollers or drums in such a manner that no cross-over idler pulleys are required to return the tape to its starting point. In general this is accomplished by winding the portion of the tape spirally around the drums and then winding the remainder of the tape spirally back to the starting point intermediate the spiral turns of the first portion.

15 The reeling apparatus is preferably designed as a replaceable unit so that in the event of a breakdown, or when a recording member of different recording time is required, a new unit may be quickly substituted with minimum disturbance to the remainder of the system. In its simplest form the tape storage unit comprises two spaced cylindrical drums wound in the manner described above but this winding method is also applicable to more complex units having three or more such drums to increase the tape storage capacity. Units with three or more drums have the additional advantage that any eccentricities in the drums are much less likely to be cumulative in their effect on the tension of the tape.

30 These and other features of the invention will be more clearly understood from the following detailed description and the accompanying drawings in which:

35 Fig. 1 is a perspective view of a telegraphone according to the invention which is readily portable and particularly suitable for instruction in elocution or languages.

40 Fig. 2 is a perspective view and Fig. 3 is a rear view of the chassis within the casing shown in Fig. 1.

Fig. 4 is a circuit diagram of the amplifying system of the telegraphone of Fig. 1.

45 Figs. 5 and 6 are diagrams showing alternate methods of winding the tape on the cylindrical drums of the telegraphone.

Figs. 7 and 8 show a modification of the tape storage unit using two pairs of drums.

50 Figs. 9 and 10 show a three-drum storage unit adapted for panel mounting; and

Fig. 11 shows a winding diagram for the unit of Figs. 9 and 10.

55 As shown in Fig. 1 the set in one form resembles a portable radio and comprises a cabinet 5 having an open grill 6 behind which may be lo-

cated a loud-speaking telephone shown at 7 in the circuit diagram Fig. 4. Located at the front of the cabinet 5 near one end is an opening 8 to provide access to a talk-listen switch 9 and a clear view of the recording time indicator 10. At its opposite end the front face of the cabinet is provided with an opening 11 adapted to expose a jack 12 and a volume control potentiometer 13. The jack 12 is provided to receive a plug 14 electrically connected with a pick-up microphone 4 to be used for recording purposes. Bracket 15 carrying the talk-listen switch 9 and the recording time indicator 10 and a bracket 16 carrying the jack 12 and volume control potentiometer 13 are supported near opposite ends of a base 17 constituting the chassis support for the equipment of the apparatus as shown in Figs. 2 and 3.

The base 17 is slidable into and out of the cabinet 5 for easy removal of the apparatus and in addition to the brackets 15 and 16, it supports rotating drums 18 and 19 carrying a magnetic tape 20, a driving motor 21 supported in a well 22 formed in said base 17 and the various circuit elements of the amplifier illustrated schematically in Fig. 4.

The rotating drums 18 and 19 with the associated tape and cooperating parts are removable as a unit from the chassis in order to provide for ready replacement of this part of the apparatus, and for this purpose there is provided a unitary frame structure comprising a pair of horizontal plates 25 and 26 formed integrally with a pair of U-shaped bracket members 27 and 28 between the legs of which the drums 18 and 19 are rotatably supported. At their lower ends the bracket members 27 and 28 are attached to horizontal members 29 and 30 adapted to rest upon and be bolted to supporting studs 31, 32, 33 and 34 secured to and extending upwardly from the base 40 17. The upper horizontal plate 26 is provided with a mounting plate 35 for supporting a recording-reproducing head 36, and a spring tensioned supporting arm 37 mounted upon the plate 26 supports a tape tensioning pulley 39. The 45 connections from the recording-reproducing head to the circuit of the amplifier loud-speaker and microphone pick-up are by means of a cable 40 that extends through a hole 41 in the horizontal plate 25 and terminates in a plug 42 that makes 50 connections with a socket in the base 17. The motor 21 is connected by a belt 43 with a set of pulleys mounted upon the lower face of the horizontal plate 25 and a second belt from this pulley combination runs around the drum 18 by 55

means of which the tape 20 is drawn through the recorder-reproducer head. To remove the tape unit requires only the unbolting of the drum supporting structure from the posts 31, 32, 33 and 34, disconnection of the belt 43 from the motor 21 and pulling out of the plug 42 from its socket and a corresponding new reeling unit can be inserted.

The tape 20 as illustrated in Figs. 2 and 3 is in the form of a continuous loop, and the recorder-reproducer head 36 is stationary and in order to bring the tape back to its starting position with respect to the sound-head without using special cross-over pulleys or putting undue transverse pressure upon the tape either of the two interleaving schemes shown in Figs. 5 and 6 may be used. In the scheme shown in Fig. 5 the cross-over of adjacent loops of the tape occurs both at the front and back of the drums while in Fig. 6 the cross-over occurs only at the back.

For example, starting with the top loop of the tape which is the one that will be passing through the sound-head, it will be noted that from position 1 of the No. 1 drum the tape will reach to position 2 on the No. 2 drum and from position 2 on the No. 2 drum it will pass over position 3 on the No. 1 drum to position 4 on the No. 2 drum and from position 4 on the No. 2 drum through position 5 on the No. 1 drum to position 5 on the No. 2 drum. From position 5 on the No. 2 drum the tape will pass back through position 4 on the No. 1 drum to position 3 on the No. 2 drum, back through position 2 on the No. 1 drum to position 1 on the No. 2 drum, and back to the starting point on the No. 1 drum.

In the scheme shown in Fig. 3 in which the cross-over occurs only at the back side of the drums the tape passes from the 1 position on the No. 1 drum to the 3 position on the No. 2 drum through the 3 position on the No. 1 drum to the 5 position on the No. 2 drum, back through 5 of No. 1 to 4 of No. 2, over 4 on No. 1 to 2 on No. 2, over 2 on No. 1 to 1 on No. 2 and back to the starting point on No. 1.

The relative position of adjacent spirals of tape are maintained on the drums 18 and 19 by means of multiple sheaves 45 and 46 mounted on the horizontal plate 25 and extending in parallel relation to their respective drums adjacent the advance surface thereof. Separators 47 and 48 secured to the frame supporting the drums 18 and 19, midway between the drums maintain the adjacent spirals of the tape 20 separated adjacent their cross-over positions. Vertical rods 49 and 50 extending upwardly from the plate 25 adjacent the multiple sheaves and parallel thereto maintain the parallelism of the spirals adjacent the sheaves 45 and 46.

The tape storage capacity may be very materially increased without increasing the total overall space occupied by the drums by means of the arrangement shown in Figs. 7 and 8. In this modification, there are two main drums 55 and 56 and two intermediate drums 57 and 58 positioned between the drums 55 and 56 and the tape loop is coiled around the main drums 55 and 56 in a spiral running from the top of these drums to the bottom and the bottom spiral from these drums 55 and 56 is fed onto the lower ends of the drums 57 and 58 and coiled around them in a spiral running from bottom to top, the top loop from these drums being fed back onto the drums 55 and 56 at the tops of these drums. The length of tape effective for recording is by this means increased by the length that can be stored upon the drums 57 and 58.

The foregoing description of apparatus applies especially to a horizontal portable type of machine particularly adapted for use in educational work.

Where it is desired to extend the usefulness to other fields where greater storage space for tape and permanency is desirable and where space may be somewhat limited a vertically mounted type such as illustrated in Figs. 9 and 10 may prove very convenient.

In this type a mounting panel 60 for the apparatus is removably mounted upon a supporting frame of channel pieces 61 and 62 which may be conveniently supported. Rotatably supported upon the face of the panel 60 at the points of a triangle are three tape drums 63, 64 and 65 carrying a tape 66 which is adapted to be guided through a recording-reproducing head 67 mounted upon the panel 60 midway between the tape rolls 64 and 65. The drive for the rolls is through roll 63 connected to a pulley 68 mounted on the back of the panel 60 and connected by belt 69 with a synchronous motor 70. The motor 70 is mounted upon a bracket 71 pivotally supported upon a stub shaft 72 secured to the back of the mounting plate 60 so that the weight of the motor maintains the driving tension on belt 69. Located between the drums 63 and 64 is a spring mounted tensioning pulley 73 under which the first spiral of the tape 66 passes before passing over drum 64 into the recorder-reproducer head 67.

The same general scheme for interleaving the tape spirals is followed in this three-drum modification as was followed in that disclosed in Figs. 5 and 6 and the present arrangement is illustrated in Fig. 11. In this arrangement the cross-over between the spirals occurs between drums 63 and 64 and between drums 65 and 63 there being no cross-over between drums 64 and 65. The travel of any given point on the tape 66 from any given point, for example, *a* on the drum 63 back to that same point is indicated by the lower case letters *a* to *t* in alphabetical order on the developed views in Fig. 11.

Guide sheaves 75, 76 and 77 secured to the plate 60 in advance of the drums 63, 64 and 65, respectively, serve to maintain the adjacent spirals of tape in properly spaced positions upon the drums. Spreader rods 78 and 79 located between drums 63 and 64 and drums 65 and 63, respectively, serve to separate the tape spirals adjacent their cross-over positions to prevent clashing or rubbing of adjacent layers of the tape.

The mounting plate with its associated apparatus may be used as a unit for ready replacement should the tape of the one in use break or the apparatus be otherwise disabled.

By using the three drums a greater storage space is provided and the combination has the additional advantage that eccentricities in the drums are less likely to be accumulative in their effect upon the tension of the tape.

A circuit combination suitable for use with the apparatus illustrated in Figs. 1, 2 and 3 is illustrated schematically in Fig. 4. This circuit comprises in general a conventional amplifier of voice currents supplied with filament and plate current through transformer and rectifier from a commercial sixty-cycle source. The double throw switch 9 already mentioned in the description of the cabinet of Fig. 1 is wired in circuit with the sound-head 36, loud-speaker 7 and microphone 4 and is adapted when moved to the right of its normal position to connect the microphone with the input side of the amplifier and to connect the

output side of the amplifier with the voice coil 80 of the recorder-reproducer 30. When moved to the left, as shown, switch 9 connects the coil 80 of the recorder-reproducer with the input side of the amplifier and the output side of the amplifier to the energizing winding of the loud-speaker 7.

A socket 82 in base 17 is adapted to receive a plug wired to the ordinary house or commercial source of current.

The amplifier and switching equipment for the recorder-reproducer apparatus illustrated in Figs. 9, 10 and 11 may be mounted upon a panel (not shown) which will be mounted upon the same frame as the mounting plate 60 or one similar to it.

The tape in strip form may be threaded onto the reels in the spiraled relation in which it is to be operated and the loose ends secured to form the loop by welding.

What is claimed is:

1. A tape storage and carrying unit for telegraphones comprising a plurality of rotatable drums mounted in spaced relation, and a continuous magnetic tape spiraled around the drums with adjacent spirals so related that any given point on the tape will move axially of the drums from end to end and back to its starting position in one complete cycle of travel of the tape loop.

2. A tape storage and carrying unit for telegraphones comprising a plurality of rotatable drums mounted in spaced relation and a loop of magnetic tape continuously spiraled around the drums with substantially one-half of its length forming a first spiral in one direction axially of the drums and the remainder of the tape forming a return spiral intermediate the turns of the first spiral.

3. In a telegraphone apparatus in combination, a plurality of tape carrying drums rotatably mounted in spaced relation, and a continuous magnetic tape spiraled around the drums with adjacent spirals so interleaved that any given point on the tape will move axially of the drums from end to end and back to its starting point in one complete cycle of travel of the tape loop.

4. In a telegraphone apparatus in combination, a plurality of tape carrying drums rotatably mounted in spaced relation, a continuous magnetic tape spiraled around the drums with adjacent spirals so interleaved that a given point on the tape will move axially of the drums from end to end and back to its starting position in one complete cycle of travel of the tape loop, and guide sheaves located adjacent the advance edges

of the drums for maintaining the relative positions of adjacent loops of the spiral over the faces of the drums.

5. In a telegraphone apparatus in combination, a plurality of tape carrying drums rotatably mounted in spaced relation, a continuous magnetic tape spiraled around the drums in interleaved relation with alternate loops crossed over each other between the drums and separators located midway between the drums for maintaining a spaced relation between the adjacent coils at the cross-over position.

6. In a telegraphone apparatus in combination, a plurality of tape carrying drums rotatably mounted in spaced relation, a continuous magnetic tape spiraled around the drums in interleaved relation with alternate loops of the spiral crossed over between the drums, separators located between the drums for maintaining a spaced relation between the adjacent layers at the cross-over position and guide sheaves located in advance of each drum for leading the coils of the spiral onto the faces of the drums in fixed spaced relation.

7. In a portable telegraphone in combination, a continuous magnetic tape, a recorder-reproducer head cooperating with the tape, a plurality of rotatable drums for carrying the tape in cooperative relation to the recorder-reproducer head, a driving motor for the drums, an amplifier, switching means for connecting the recorder-reproducer alternately in input and output relation to the amplifier, a casing, a removable chassis in the casing supporting the motor, amplifier and telegraphone equipment, and supporting means for the drums and recorder-reproducer head removably mounted upon the chassis.

8. In a portable telegraphone in combination, a continuous magnetic tape, a recorder-reproducer apparatus cooperating with the tape, a pair of rotatable drums for moving the tape in cooperative relation to the recorder-reproducer head, a support for the drums and recorder-reproducer head, a chassis upon which the support for the drums is removably supported, a driving motor for the drums supported upon the chassis, amplifier equipment mounted on the chassis, switching means carried by said chassis for selectively connecting the recorder-reproducer apparatus in input or output relation to the recorder-reproducer apparatus, and a casing in which the chassis is removably supported.

CHARLES C. TOWNE.