

May 4, 1943.

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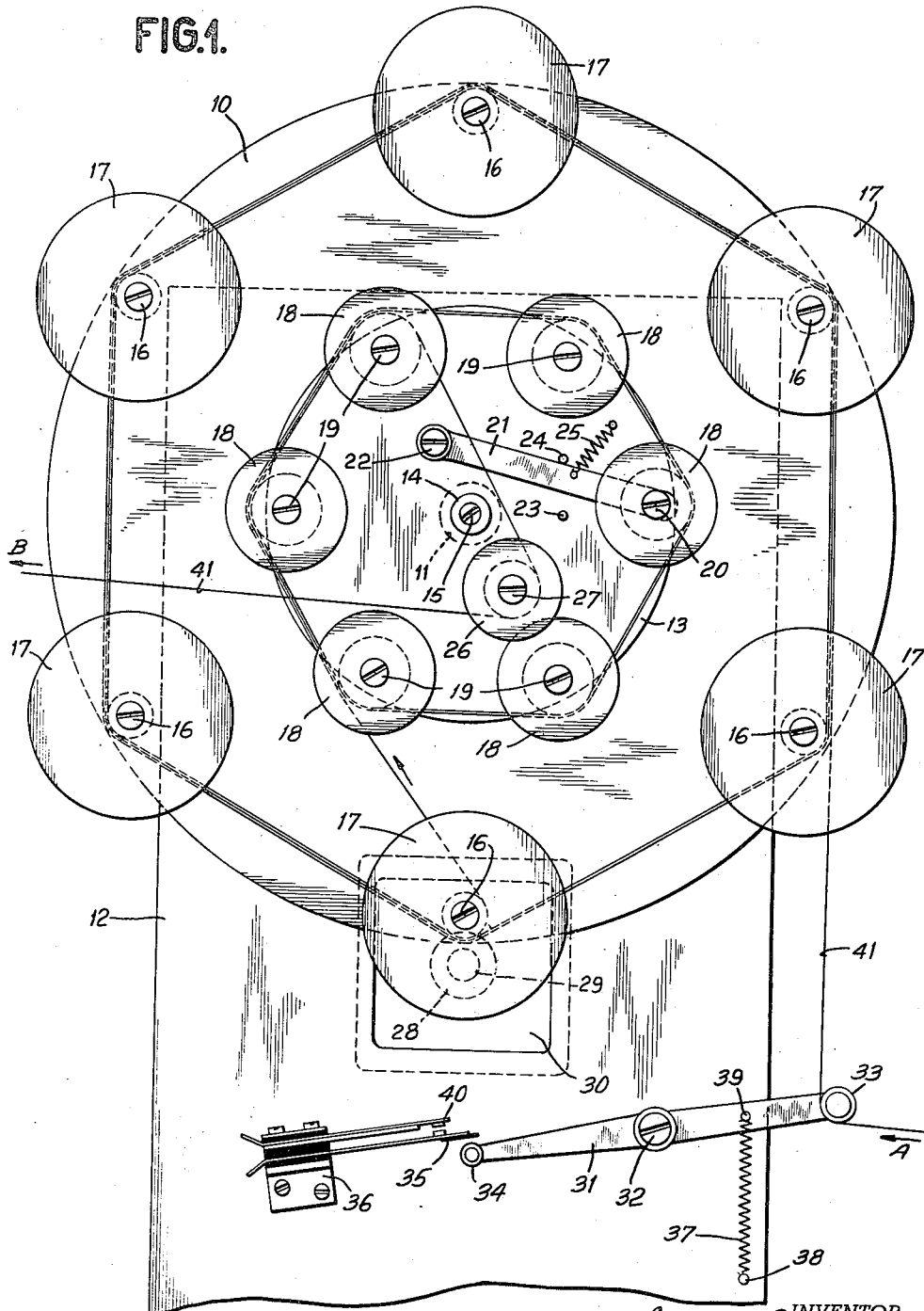
2,318,316

STORAGE MECHANISM

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2 Sheets--Sheet 1

FIG. 1.



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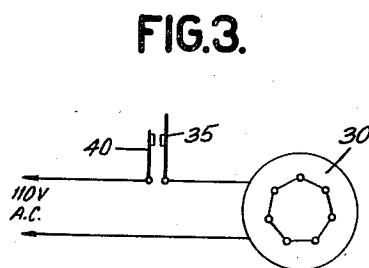
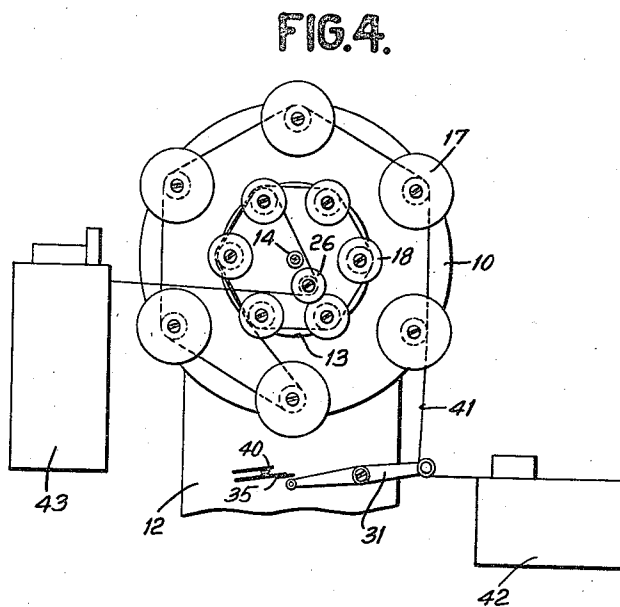
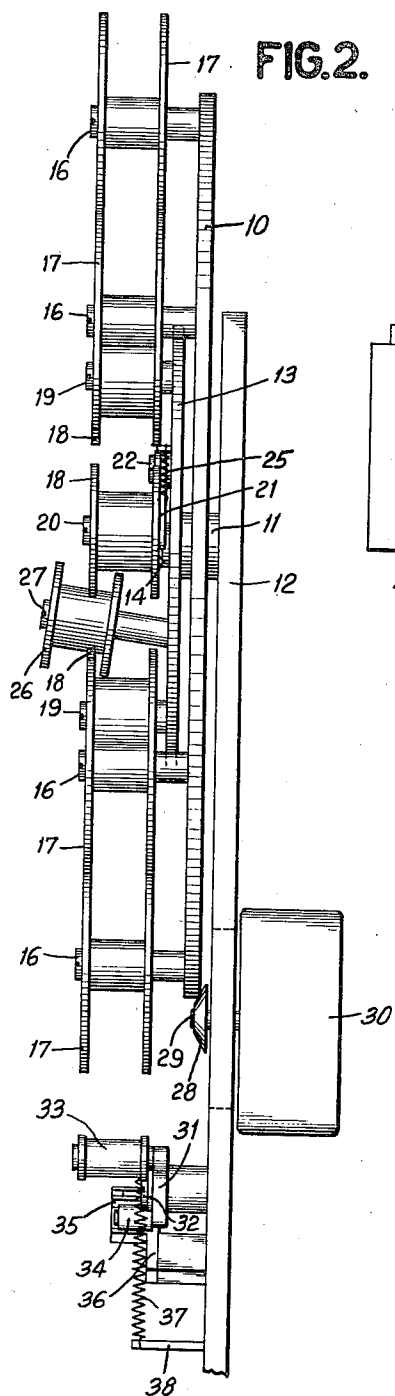
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STORAGE MECHANISM

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STORAGE MECHANISM

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This invention relates to storing devices of an intermediary nature where a length of material composing a small part of the whole is stored between operations on such material, the rate of storage and the rate of recovery from storage being unequal.

This invention relates in particular to a device for handling telegraphic tapes used in recording high speed transmission of news, etc., by punching such tapes with coded perforations where the tapes are perforated at one time and at a later time run through a sensing device for retransmission of such information as is contained in the tape's perforations.

For example, in transatlantic radio or cable news service, a high speed of transmission is used to speed up the service and reduce rental costs of the transatlantic connection. Reception is made upon tapes, and later these tapes may be retransmitted at a slower speed to other members of the news service or to printing machines. It is quite often necessary to have both the reception and retransmission operations going on simultaneously and at different rates of speed. For example, retransmission may be made at approximately 30 words per minute from the same tape which may be recorded upon by the receiving device at 100 words per minute. Consequently more tape is delivered from the receiving-recording device than can be used up by the retransmitting device, and an accumulation of tape occurs between the two. Should the retransmission be temporarily halted, as is often the case, the accumulation of tape is further heightened. The customary practice in such instances is to allow the accumulated tape to pile up upon the floor of the operating room. The resulting tangle, aside from the unsightliness and danger of damage to the tape from twisting and pulling, rivals the traditional fishing line.

Similar difficulties arise in the transmission of transoceanic messages at high speed by robot and perforated tapes. Here the tapes are perforated by hand prior to their transmission by the robots. Quite often the tape may be perforated while the transmission by robot is progressing. During this process, it is not uncommon for the robot to be temporarily halted, and the tape again accumulates.

Cutting and winding such tape accumulations has been suggested as a solution to such difficulties, but, unless the tape is reversely rewound, the message sequence and word sequence are destroyed. Furthermore, additional handling of the tape is required, and, unless special care is

taken for identifying lengths of tape so withdrawn, the advantages of rapid transmission may be sacrificed by inefficient tape handling.

It is, accordingly, an object of this invention to provide a device for intermediate storage of tapes or similar media where the tape can be stored at one rate of speed and removed at another rate of speed, each operation being independent of the other and, when required, both operations being simultaneous.

It is a further object of this invention to provide a storage device for tapes or similar media in which storage is automatically made by winding any slack material into the storage device while at the same time allowing previously stored material to be removed at a rate of speed either higher or lower than that of storing.

Other objects of the invention will be pointed out in the following description and claims and illustrated in the accompanying drawings, which disclose by way of example, the principle of the invention and the best mode which has been contemplated, of applying that principle.

In the drawings:

Fig. 1 is a front elevation view of the storage mechanism showing the disposition of the tape upon the device.

Fig. 2 is a side elevation view of Fig. 1 with the tape removed to show the alignment of the storing spools and the manner in which the rotatable disk is actuated by the friction drive wheel.

Fig. 3 is a circuit diagram of the motor and controlling contacts.

Fig. 4 is a line diagram of a way in which the device might be applied to store tape between a perforating mechanism and a sensing mechanism.

Referring to Figs. 1 and 2, a circular disk 10 is mounted to rotate upon the bearing 11 which is fixed to the plate 12. Coaxially mounted with respect to disk 10 is a second circular disk 13 which is held forward to clear the bearing 11 by the bearing spindle washer 14 and the mounting screw 15 which also clamps disk 13 stationary. Located near the periphery of disk 10 are six equally spaced bearing screws 16 which perform both mounting and bearing functions for six identical spools 17 mounted thereon. The spools 17 are free to rotate in either direction.

On the inner or second disk 13, six other identical spools 18 are equally spaced and five of them are mounted upon the bearing screws 19 while the sixth is mounted upon a bearing screw 20, in an arm 21. This arm 21 is pivoted about

its bearing 22 and limited in its travel by the pins 23 and 24 normally being held against pin 24 by a spring 25. A take-off spool 26 is also mounted on the disk 13 by a bearing screw 27. The take-off spool 26 is offset in both lineal and axial alignment with respect to the other spools 18 which have their axes parallel to each other as well as parallel to the axis of the disk 10 and the axes of the outer spools 17. The spools 17 and 18 have also a common depth and the flanges at their respective ends are substantially in the same planes, such that a tape or other medium wound about all of the spools 17 and 18 would have its one edge always in one plane and its other edge always in another plane, the planes being parallel and separated by a distance equal to the width of the said tape.

The circular disk 10 is contacted along its circumference by a friction drive wheel 28 attached to the end of a motor shaft 29 which constitutes the armature shaft of a motor 30 mounted upon the plate 12. Upon energization of the motor 30 with a source of electromotive force, the wheel 28 is rotated in a clockwise direction to rotate the disk in a counterclockwise direction. Upon the lower part of the plate 12 is attached a lever 31 mounted by means of a bearing screw 32 in such a way that a roller 33 on one end of the lever 31 is extended from the plate 12 as shown in the figure. The opposite end of the lever 31 has attached a second roller 34 which normally bears against a lower blade 35 of a simple normally open contact assembly 36 under influence of spring 37 which is attached to the plate 12 by a stud 38 and to lever 31 by another stud 39.

The contact blades 35 and 40 are connected in series with the terminals of the motor 30 and the source of electromotive force so that when their contacts close the motor is energized to rotate in a clockwise direction, as previously stated. Normally, the spring 37 exerts enough tension upon lever 31 to cause roller 34 to bear on contact strap 35 to cause the contacts on the latter and on strap 40 to remain closed. However, when a slight reverse tension is applied at roller 33 to counteract the effect of spring 37, the roller 34 is withdrawn from blade 35 and the contacts on the latter and on strap 40 open.

Let it be assumed that tape 41 has been wound about the device as shown in Fig. 1, the tape coming from "A" and being delivered to "B" from the device. A machine at some point ahead of "A" prepares the tape, say by perforating it, and a machine at some point beyond "B" receives the tape for further operations upon it, say by sensing the perforations and printing therefrom. Let us further designate these two machines cooperating with the instant device as preparing device 42 and receiving device 43, respectively, as shown in Fig. 4.

When the receiving device 43 withdraws tape from the device and the preparing device 42 is idle, the tape 41 is removed in the direction of "B," spool 26 rotates in a clockwise direction, spools 18 rotate in a clockwise direction, spools 17 rotate in a counterclockwise direction, disk 10 rotates in a clockwise direction unwinding tape from the spools 18 on disk 13 in a clockwise direction, and the tension of tape 41 at roller 33 is sufficient to cause roller 34 to clear the contact blade 35 so that the contacts on blades 35 and 40 remain open and motor 30 is not energized.

Suppose, however, that the preparing device 42 now begins to operate, delivering tape to the

mechanism at the same rate at which the receiving device 43 removes it. Since the tape is now used as fast as it is supplied, none is removed from storage so that disk 10 stops rotating in a clockwise direction thereby no longer unwinding tape in a clockwise direction from the spools 18 on disk 13. The tape tension at roller 33 is maintained thereby maintaining contacts on blades 35 and 40 open and motor 30 de-energized.

Suppose now, however, that the receiving device 43 stops, or that the preparing device 42 delivers tape to the mechanism faster than it is removed from the device by the receiving device 43. Immediately the tape 41 at roller 33 becomes slack, the tension no longer overcomes the tension of spring 37, the roller 34 moves up to close the contacts on blades 35 and 40, the motor 30 is energized and rotates the friction drive wheel 28 in a clockwise direction to cause disk 10 to rotate in a counterclockwise direction. As the disk 10 rotates counterclockwise, tape is stored upon the spools 17 which rotate in a counterclockwise direction to wind and further store tape on the spools 18 of disk 13 in a counterclockwise direction until such time when the slack in tape 41 at roller 33 is taken up and the tension sufficient at that point to cause lever 31 to remove roller 34 from contact with contact strap 35. The contacts on blades 35 and 40 now open and the motor 30 ceases rotating and the disk 10 likewise stops rotating in a counterclockwise direction.

The actions just described take effect so as to store tape upon the mechanism and remove such tape from storage with a differential action. It is to be noted that no tape is stored unless the disk 10 rotates counterclockwise, and conversely, that no tape is removed from storage unless the disk 10 rotates clockwise.

Under a condition where the receiving device 43 is idle and the preparing device 42 is delivering tape to the mechanism, the disk 10 would be rotated counterclockwise, the spools 17 would also rotate counterclockwise, tape would be wound about the spools 18 on disk 13 in a counterclockwise direction, but the spools 18 and the spool 26 would not rotate in either direction.

It was found by experiment that when the tape was first started to be withdrawn from the device by the receiving machine, binding sometimes occurred on the spools 18. This difficulty was overcome by providing at least one of the spools 18 with a resilient mounting such as is shown by the pivoted lever 21, the spring 25, and the stops 23 and 24. This resilient mounting has the effect of momentarily reducing the normal frictional force upon the turns of tape wound about the spools 18 when the tape at "B" is first pulled by the receiving device.

While there have been shown and described and pointed out the fundamental novel features of the invention as applied to a single modification it will be understood that various omissions and substitutions and changes in the form and details of the device illustrated and in its operation may be made by those skilled in the art, without departing from the spirit of the invention. It is the intention, therefore, to be limited only as indicated by the scope of the following claims.

What is claimed is:

1. A mechanism, intermediate of a feeding device and a receiving device in asynchronism, for

storing a length of a continuous tape passing from one to the other of the said devices, comprising a support, a first disk journaled upon said support, a second disk attached to the said support, coaxial and parallel with and spaced from the said first disk, the said second disk being non-rotatable and of smaller diameter than the first, a plurality of spaced rotatable spools mounted adjacent the peripheries on the respective faces of each of the said disks, the said spools having their corresponding flanges substantially in the same planes, means for rotating the said first disk, the said tape from the said feeding device being wound about the cores of the said spools passing from the first to the second of said disks to the receiving device in such a manner that upon rotation of the said first disk in one direction the said tape becomes stored, and means in contact with and governed by a reduction of the tension in the said tape at a point where it enters the said mechanism from the said feeding device for controlling the said rotating means to cause said first disk to rotate in the said direction.

2. In combination with feeding means and an asynchronous receiving means, an intermediate device for storing a length of a continuous filament passing from the former to the latter means, comprising a first fixed member, a first rotatable member attached to the said first fixed member, spaced from and parallel to the said fixed member, a second fixed member attached to the said first fixed member, spaced from and parallel with the said first rotatable member, a plurality of other spaced rotatable members upon the said first rotatable member, their axes perpendicular to a common plane and distributed along a circle inscribed upon the first rotatable member, a plurality of spaced smaller rotatable members upon the said second fixed member, their axes perpendicular to a common plane and distributed along a smaller circle inscribed upon the said second fixed member, means to rotate the first said rotatable member, the said filament being so disposed upon the said other rotatable members on both said circumferences as to be stored upon rotation of the said first rotatable member in one direction, and means governed by the tension in the said filament coming from the said feeding means for controlling the said rotating means.

3. At a receiving station in a communications system where the received message is recorded into a tape at one speed by a perforating device and subsequently decoded at another speed by a sensing device, an intermediate differential tape storing mechanism comprising a fixed plate, a rotatable first disk attached to the said plate, parallel with and spaced from the said plate, a smaller non-rotatable second disk attached to the said plate, parallel with and spaced from the said first disk, a plurality of equally spaced spools mounted upon a circumference adjacent the periphery of the said first disk, a plurality of equally spaced spools mounted upon the said second disk in a like manner but upon a smaller circumference, all of said spools being free to rotate about their axes which are parallel with the axis of the said first disk, the corresponding end faces of all of the said spools lying substantially in the same planes, a motor mounted upon the said plate, a friction wheel fastened to the armature shaft of the said motor contacting the said first disk and capable of rotating the latter, a pair of operating contacts, circuit connections

through the said contacts to the said motor, a length of tape from the said perforating device entering the outside path formed by the said spools of the said first disk, said tape being wound about the said circumference of the said first disk, passing between two of the said spools to be wound about the path formed by the said spools of the said second disk, and being withdrawn between two of the said spools of the latter to the said sensing device, and an arm upon the said plate engaging the said tape as it leaves the said perforating device for operating the said contacts to energize the said motor to rotate the said first disk for storing excess tape, upon the tension of the said tape from the said perforating device falling below a predetermined value.

4. A mechanism, intermediate of a feeding device and a receiving device in asynchronism, for storing a length of a continuous tape passing from the former to the latter of the said devices, comprising a support, a first disk journaled upon said support, a second disk attached to the said support, coaxial and parallel with and spaced from the said first disk, the second disk being non-rotatable and of less diameter than the first, a plurality of spaced rotatable spools mounted upon an inscribed circumference upon the said first disk, a plurality of spaced smaller spools mounted upon an inscribed circumference upon the said second disk, the latter circumference being smaller than the former, all of the said spools having their corresponding flanges substantially in planes parallel with the planes of the said disks, a single spool mounted upon the said second disk at an angle with the other of said spools, means for rotating the said first disk, the said tape from the said feeding device being wound about the cores of said spools on the said circumferences and finally being fed over the said single spool to the said receiving device, the path of the said tape being such that upon rotation of the said first disk in one direction the said tape will be further wound about the said path to effectively store it, and means engaging the said tape from the said feeding device for controlling the said rotating means, when the tension of the said tape upon the said engaging means falls below a predetermined value, to rotate the said first disk in the said direction.

5. A mechanism, intermediate of a feeding device and a receiving device in asynchronism, for storing a length of a continuous tape passing from the former to the latter of the said means, comprising a support, a first disk journaled upon said support, a second disk attached to the said support, coaxial and parallel with and spaced from the first said disk, the second disk being non-rotatable and of less diameter than the first, a plurality of spaced rotatable spools mounted upon an inscribed circumference upon the first disk, a plurality of spaced smaller spools mounted upon an inscribed circumference upon the said second disk, the latter circumference being smaller than the former, all of the spools having their corresponding flanges substantially in planes parallel with the planes of the said disks, at least one of the said spools upon the said second disk being provided with a resilient mounting limited by stops on either side of the said circumference upon the said second disk, a single spool mounted upon the said second disk at an angle with the other spools, means for rotating the said first disk, the said tape from the said feeding device being wound about the cores

of said spools on the said circumferences and finally being fed over said single spool to the said receiving device in such manner that upon rotation of the said first disk in one direction the said tape will be further wound upon the said envelopes to effectively store it, and means engaging the said tape from the said feeding device for controlling the said rotating means, when the tension of the said tape upon the same engaging means falls below a predetermined value, to rotate the said first disk in the said direction.

6. A tape storage device comprising two coplanar reels concentrically mounted upon a support, the outer reel being journaled so as to rotate about the inner reel, a source of tape supply, means for rotating the outer reel to withdraw tape from the said source of supply and to wind it upon the said outer reel and upon the said inner reel, the leading end of said tape passing from said outer reel to said inner reel, means for withdrawing the said tape from said inner reel, and means responsive to the tension of the tape for disabling said rotating means when the rate of tape withdrawal equals or exceeds the rate of tape supply.

7. A tape storage mechanism comprising two coplanar reels concentrically mounted upon a support, the outer reel being journaled so as to rotate about the inner reel, a source of tape supply, means for rotating the outer reel to withdraw tape from the said supply source and store it by winding in a predetermined fashion upon the said reels, the leading end of said tape passing from a storage path formed by the outer reel to a storage path formed by the inner reel, and means for withdrawing the said tape from the said inner reel.

8. A differential tape storage device, intermediate of a source of tape supply and a point of tape consumption, comprising an inner reel and an outer reel concentrically mounted and coplanar, the said outer reel revolving about the said inner reel, the latter of said reels being in-

dependently and fixedly mounted, a plurality of spaced rotatable elements upon each reel, a length of tape from the said source of supply wound about the said elements, the leading edge of said tape passing from the outer reel to the inner reel and from the inner reel to the said point of consumption, and the said tape being wound in such manner upon the said elements as to provide means for storing a length of said tape upon the said elements upon rotation of the said outer reel in one direction, to provide means for withdrawing a length of said tape from storage upon the said elements upon rotation of the said outer reel in the reverse direction, and to provide means for allowing a length of said tape to be drawn through said device without being stored when the said outer reel is not rotated in either direction.

9. A tape storage device comprising two concentrically mounted and coplanar storage reels, each comprising a circular series of tape supports, the outer reel being mounted to revolve about the inner reel, the tape being supplied to said outer reel, led inward from said outer reel to said inner reel and withdrawn inward from said inner reel, and means to revolve said outer reel to wind the tape simultaneously on said outer and inner reels.

10. A tape storage device comprising two concentrically mounted and coplanar storage reels, each comprising a circular series of individually rotatable spools, the outer reel being mounted to revolve about the inner reel, the tape being supplied to said outer reel, led inward from said outer reel to said inner reel and withdrawn inward from said inner reel, and means to revolve said outer reel to wind the tape simultaneously on said outer and inner reels.

11. A tape storage device as described in claim 9, wherein one of the tape supports of said inner reel is yieldably mounted to move inward toward the center of the reel.

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