United States Patent

[11] 3,587,991

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[21] Appl. No. **689,540**
[22] Filed **Dec. 11, 1967**
[45] Patented **June 28, 1971**
[32] Priority **Dec. 12, 1966**
[33] **Germany**
[31] **ST26237**

[54] **REELS AND REEL-AND-RIBBON ASSEMBLIES**
8 Claims, 6 Drawing Figs.

[52] **U.S. Cl.** **242/55.16,** 242 74, 226/118
[51] **Int. Cl.** B65h 75/02, G11b 23/06
[50] **Field of Search** 242/55.17, 55.16, 55.19, 74, 74.1, 86.1, 100.1, 96, 55.13, 55.11, 55, 107.13; 206/52; 226/118, 119

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ABSTRACT: A reel for a ribbon of flexible sound-recording magnetic tape, film, punched tape, or the like. The reel has a pair of spaced, parallel reel flanges and core means extends between and is operatively connected with the flanges to hold the latter apart from each other by a distance corresponding to the width of the ribbon which is to be stored between the flanges. This core means supports at least one of the flanges for free rotary movement about the axis of the core means with respect to the other of the flanges, and one of the flanges carries a means for facilitating the winding of a ribbon into the space between the flanges.

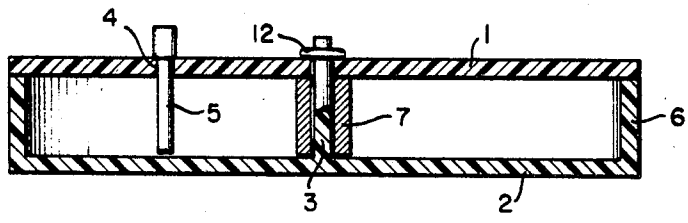


FIG. 1

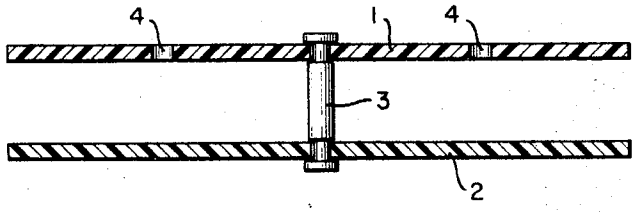


FIG. 2

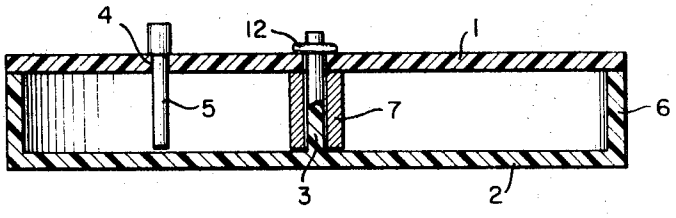


FIG. 3a

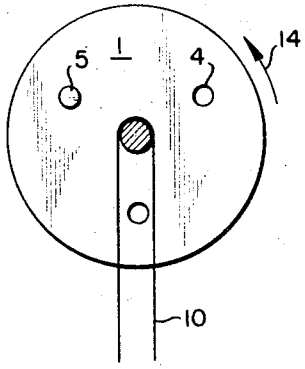


FIG. 3b

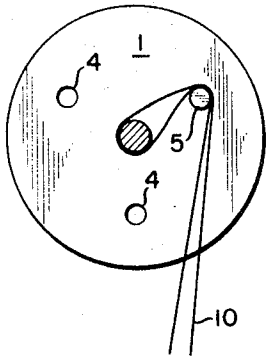
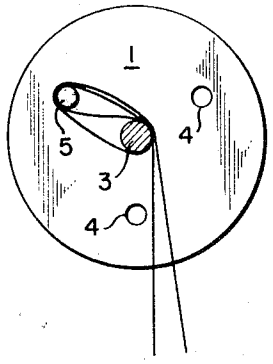


FIG. 3c



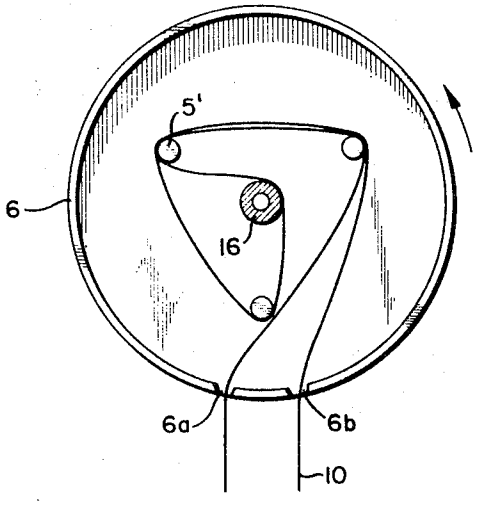


FIG. 4

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REELS AND REEL-AND-RIBBON ASSEMBLIES

My invention relates to reels for storing flexible ribbons which may take the form of punched tapes, magnetic sound-recording tapes, elongated strips of photographic film, or the like.

In particular, my invention relates to reels which are especially adapted for endless ribbons which form a closed loop so that information stored on the ribbon may be repeatedly derived therefrom during continuous running of the ribbon through a device capable of abstracting the information therefrom.

Reels for sound-recording tape take many different forms. For example, there are known enclosures for holding in their interior a pair of reels which for the purpose of playing back sound recorded on a tape carried by the reels can be placed upon a specially constructed recording and playback device. The tape which is stored in a construction of this type is generally of a relatively short length and when it has completely run through the recording and playback device the enclosure with the pair of reels and tape therein is removed from the device and replaced thereon in a reversed position for repeating purposes. In order to provide for playback with constructions of this type it is necessary to add to the sound recorder relatively expensive structures, and the tape-holding structure itself requires very careful working and a special tape which is coated with an antifriction medium. Because of the relatively high cost of such structures they generally are not used for interchangeable storing of tapes.

It is a primary object of my invention to provide a reel structure which on the one hand permits storing and playback of endless sound tapes in connection with conventional sound-recording devices which need not be modified or have any special additions attached thereto, and which on the other hand is suited in general for the convenient storing and cataloging of film or magnetic tapes or strips produced, for example, in studios.

Thus, it is a particular object of my invention to provide a simple inexpensive reel structure capable of storing endless magnetic tape while at the same time coacting therewith to participate in the playback of sounds recorded thereon without requiring any modification of conventional recorders for this purpose.

The reel of my invention has a pair of reel flanges which are parallel to each other and spaced from each other by a distance corresponding to the width of a ribbon which forms the tape, film, or the like which is to be stored between the flanges, and a core means extends between and is operatively connected to the reel flanges to maintain them at this predetermined distance from each other, the core means extending axially between the flanges at central portions thereof. This core means of my invention supports at least one of the flanges for rotary movement with respect to the other, and at least one of the flanges is provided with a means for facilitating the winding of the ribbon into the space between the flanges coiled about the core means extending therebetween. This means which facilitates the winding of the ribbon into the space between the flanges can take the form of a flange portion which is formed with an opening passing through so that an elongated member such as pencil point, for example, can extend through this opening into the space between the flanges to engage a ribbon and facilitate the winding thereof about the core means into the space between the flanges, or this means can take the form of an axially extending pin carried by a flange and extending into the space between the flanges to be turned about the core means during winding of a tape into the space between the flanges.

My invention is illustrated by way of example in the accompanying drawings which form part of this application and in which:

FIG. 1 is a sectional elevation of a reel means of my invention taken in a plane which contains the axis of the core means;

FIG. 2 is a sectional elevation of another embodiment of a reel of my invention also taken in a plane which contains the axis of the core means;

FIGS. 3*a*—3*c* schematically illustrate the operation of the reel of my invention during winding of a ribbon into the space between the reel flanges; and

FIG. 4 is a schematic illustration of another embodiment of a reel of my invention during winding of a tape into the space between the flanges.

Referring now to FIG. 1, the reel of my invention which is illustrated therein includes a pair of circular reel flanges 1 and 2 which are preferably circular and of equal diameters and which should be made of a material such as Plexiglass, for example. These reel flanges 1 and 2 are spaced from and parallel to each other and they are interconnected by a core or hub means 3 which extends between the flanges and is operatively connected thereto for holding them spaced from each other at a predetermined distance corresponding to the width of the ribbon which is to be situated between the flanges. The axis of the core means 3 extends through the centers of the flanges 1 and 2, perpendicularly to the latter, and the core means 3 may take the form of a simple pin having portions of reduced diameter extending through central openings of the flanges 1 and 2, while at the exterior of the latter the core means 3 has enlarged end portions overlapping the exterior surfaces of the flanges and surrounding the openings thereof so as to maintain the flanges assembled with the core means. A winding means is provided for facilitating the winding of a ribbon into the space between the flanges, and in the example of FIG. 1 this means takes the form of portions of the flange 1 which are formed with openings 4 situated between the core means 3 and the outer periphery of the flange 1. Although one opening 4 will suffice, several openings may be provided.

The distance of the openings 4 from the core means 3 or from the periphery of the flange 1 will be determined primarily according to the length of the ribbon which is to be stored between the flanges. The greater the distance of these openings from the periphery of the flange, the greater the length of tape which can be stored between the flanges with flanges of a predetermined size. However, if the openings 4 are situated in the immediate vicinity of the core means 3, then the flange 1 cannot be turned easily and the speed with which a tape can be wound between the flanges is reduced. The core means 3 supports at least the flange 1 for rotary movement with respect to the flange 2, and this latter flange 2 may, if desired, be fixed to the core means 3. As will be apparent from the description which follows, a tape in the form of an endless loop can extend around the core means 3 and outwardly beyond the space between the flanges, and any elongated instrument such as the point of a pencil, for example, may be introduced through an opening 4 to engage the tape to facilitate the winding thereof around the core between the flanges during rotary movement of the flange 1 with respect to the flange 2, for example. However, it is also possible to introduce through one of the openings 4 an elongated pin, such as the pin 5 shown in FIG. 2, which extends into the space between the flanges to engage a ribbon and facilitate in the winding thereof around the core means 3 into the space between the flanges.

With a preferred embodiment of my invention which is illustrated in FIG. 2, the flange 2 which is not provided with the openings 4 is integrally connected at its outer periphery to an endless cylindrical sidewall 6 extending perpendicularly from the flange 2 up to the rotary flange 1. In this way the endless sidewall 6 coacts with the flanges 1 and 2 to enclose a predetermined space therewith, and in this case the flange 6 is provided either with ribbon entrance means comprising a pair of slits extending perpendicularly to the flanges and through which portions of a ribbon can freely pass or alternatively comprising a single elongated opening extending circumferentially about the core means and having a length great enough to provide for free passage of a tape through this opening in the sidewall, this latter opening or the slits having axially of the core means a length at least as great as the width of the ribbon. For example, FIG. 4 schematically illustrates the sidewall 6 provided with a pair of slits 6*a* and 6*b* through which side portions of the schematically indicated ribbon 10

pass, this ribbon **10** in the illustrated example being an endless magnetic tape on which sounds are capable of being recorded and from which these sounds can be played back. Instead of a pair of slits **6***a* and **6***b* it is also possible to provide a single opening which will have a circumferential length equal to the distance between the slits **6***a* and **6***b*.

Furthermore, as is indicated in FIG. **2**, it is preferred to provide a core means **3** which includes a roller **7** surrounding and freely turnable on an elongated inner member fixed to the flange **2** and extending through a central opening of the flange **1**. At its portion which extends beyond the flange **1** the inner member of the core means carries, for example, a snapring **12** which serves to releasably hold the flange **1** on the core means. If desired, however, a plastic cap may be frictionally mounted on the top free end of the inner member exteriorly of the flange **1**, as viewed in FIG. **2**, so as to retain the latter releasably on the core means. The freely rotatable roller **7** has an axial length corresponding to the width of the ribbon.

In general the distance between the slits **6***a* and **6***b* or the circumferential length of the opening through which the ribbon passes are selected in such a way that the endless ribbon loop has an elongated portion extending into the space between the flanges around the core means and an elongated portion extending from the core means out of the space between the flanges and making with the portion which extends into the space between the flanges an angle of between approximately 15° and 150°. In this way the inwardly running and outwardly running tape portions will not have between themselves an angle which is too sharp to provide for free, unrestrained running of the tape.

Of course, in a case such as that shown in FIG. **4**, where the sidewall **6** has a pair of slits **6***a* and **6***b*, when the tape is stored between the flanges there will be an exposed portion of the tape extending along the exterior surface of the sidewall **6** between the slits thereof. However, particularly in the case of endless magnetic tapes in the form of a Moebius band, it will in general be preferred to wind the tape completely into the space between the flanges so that in this case use will be made of a structure where the sidewall **6** is provided with a single elongated opening through which the tape can pass completely into the space between the flanges. Thus in this latter case at the end of the winding of the tape into the space between the flanges the entire tape loop is housed between the flanges. With a structure of this latter type it is sufficient, for winding purposes, simply to introduce the point of a pencil through an opening **4** so as to engage a side edge of the tape and wind the latter about the core means completely into the space between the flanges. After the winding operations are completed the pencil point or the like is simply removed from the opening **4**, and the tape will not of itself unwind from the space between the flanges and will instead reliably remain therein. In the case where there is no sidewall, as shown in FIG. **1**, or where a pair of slits are provided in the sidewall, as shown in FIG. **4**, so that part of the ribbon will be exposed when it is wound into the space between the flanges, it is preferred to use a plastic pin of suitable dimensions which can be introduced through one of the openings **4** into the space between the flanges, such as the pin **5** shown in FIG. **2**, and this pin can be used to facilitate the winding of a tape about the core means and can simply remain attached to the assembly during storage.

Referring now to FIGS. **3***a*—**3***c*, there is therein a schematic illustration of the manner in which a simple reel, such as that shown in FIG. **1**, is manipulated during winding of a ribbon **10** into the space between the flanges. The endless ribbon loop **10** extends around the core means **3** as indicated in FIG. **3***a*. In this way equal lengths of the endless loop **10** will hang from the core means **3**. Thus, the endless loop simply hangs down from the core means **3** when the parts have the position shown in FIG. **3***a*. In order to wind the ribbon into the space between the flanges a pin such as the pin **5** is passed through one of the openings **4** so as to extend across the space between the flanges, and now the rotary flange **1** is turned in the direction of arrow **14**, for example. The other flange **2**, which is not illustrated in FIGS. **3***a*—**3***c*, can simply be held stationary at this time. Thus, the pin **5** together with flange **1** will turn around the core means **3** to engage the loop **10** and wind it around the core means **3** and the pin **5** into the space between the flanges, in the manner indicated in FIG. **3***c*. It is preferred to provide the flange **1** with more than one opening **4**, such as the three openings of FIGS. **3***a*—**3***c*, so that it will always be possible to pass the pin **5** through an opening **4** which is situated outwardly beyond the closed tape loop **10** to one side or the other side thereof, so as to make it possible to wind the tape very conveniently in the manner shown in FIGS. **3***b* and **3***c*. If a single opening **4** happened to be situated between the side loop portions, as shown for the lower opening **4** of FIG. **3***a*, then it would be necessary to turn the flange until the single opening was located to one side or the other of the loop **10**.

The reels of my invention which are provided with an endless sidewall **6** are generally constructed in such a way that they can be opened for the purpose of introducing an endless tape loop. With a preferred construction of this type, as shown in FIG. **2**, the core means **3** is fixed with that flange which does not have any openings and extends outwardly beyond the other flange through a central opening thereof, as described above in connection with FIG. **2**, so as to receive a device such as the snapring **12** or a removable plastic cap for the purpose of maintaining the flange **1** releasably assembled with the other structure of the reel of my invention. On the other hand, it is possible to provide a construction where both flanges are permanently connected with the core means, in the case where the endless sound tape or magnetic tape provided with any impulses is initially introduced into the space between the flanges during manufacture of the reel, and in this latter case the outwardly extending free end of the core means which extends beyond the flange **1** can be upset or can have a plastic cap welded thereto for the purpose of permanently connecting the flange **1** to the core means so as to be rotatably supported thereby.

Of course, it is also possible to permanently connect a pin to the rotary flange in such a way that during tape-winding operations it is introduced into the space between the flanges while during unwinding of tape from the space between the flanges the pin is withdrawn from the space between the flanges while remaining connected to the rotary flange.

Also, it is possible to provide a fixed connection between a pin and a rotary flange, so that in this case the means for facilitating the winding of a tape between the flanges does not require a flange opening but simply calls for a pin permanently fixed to the rotary flange and extending across the space between the flanges. The unwinding of the tape in this case will of course require greater effort, since the tape will not of itself unwind from the space between the flanges and the tape will not always unwind simply by pulling. In this case when the tape is pulled it will act on the pin **5** to turn the latter together with the flange **1** around the core means **3**.

It is also possible to provide, as shown in FIG. **4**, a plurality of pins **5'** which are permanently welded or otherwise joined to the rotary flange extending between the latter and the flange which is fixed to the core means, this construction including a snapring **12** or the like so that the rotary flange with the pins **5'** fixed thereto can easily be separated from the remainder of the assembly so that the tape can then easily be removed or unrolled. In the case where a plurality of such pins are used during winding of a tape into the space between the flanges there is the advantage that with the same size of reel it is possible to store more tape in the space between the flanges. This is apparent from the example illustrated in FIG. **4** which shows an example where the sidewall **6** is provided with the pair of slits **6***a* and **6***b*. The flange **1** which is not connected to the sidewall **6** has the three pins **5'** permanently fixed thereto, these pins **5'** having a length corresponding approximately to the width of the tape. The band is wound around these pins **5'** during storing of the band in the space between the flanges, as is apparent from FIG. **4**. When the tape is fully unwound from the space between the flanges in the example of FIG. **4**, the pin

5' which is shown in the lowermost position in FIG. 4 remains within the endless loop 10 at a location beneath the core 3. Thus, in this case, the tape will be wound around the pins 5' along an endless path greater than that which is afforded with a construction as shown in FIGS. 3*a*—3*c*.

A particular advantage of the reel-and-tape assembly of my invention resides in the fact that the stored tape loop can be played back in the simplest possible manner on many types of sound recorders. For example, the withdrawn tape loop can simply be passed through the guiding slot of a vertical recorder resting, for example, on a shelf, and the tape together with the reel can simply hang down. In this case, the power of the tape-advancing rollers in the sound head are sufficient to reliably provide for playback of the tape. The tape runs during playback around the core means of the freely hanging reel. Of course, care should be taken to see to it that the tape does not run over locations where there is a relatively high friction. The weight of the reel is selected so that the moving tape remains under a light tension. Proper operation has been achieved, for example, with a reel weight of approximately 20 grams, this weight sufficing to maintain the tape in a taut condition without excessively tensioning the tape. When an operation of this latter type is provided it is preferred to provide a core means which is freely rotatable with respect to both of the flanges or which is provided with a freely rotatable roller such as the roller 7 of FIG. 2, this roller having an exterior diameter of at least 4 mm., preferably from 6 mm. to 15 mm., so that an undesirably sharp curvature of the tape along a small radius will be avoided. The length of the roller 7 of course equals at least the width of the tape or the distance between the flanges.

It is also possible to support the recording and playback device on a table top in a horizontal position and to mount in this case the reel at a corresponding distance from the recording device in the same plane as the sound head thereof. With such an arrangement the weight of the reel will have no function in the operation, but it is desirable in this case to provide the core means with an axially extending bore, such as the bore 16 shown in FIG. 4, so that the entire reel can be supported on an upstanding pin which extends freely through the bore 16. Such a pin may carry at its bottom end a device such as a suction cup enabling it to be mounted on a flat surface, such as a table top, and in this way the reel can be maintained in a horizontal plane at a suitable distance from the recording and playback device enabling the endless tape to run continuously through the device along a horizontal endless path.

The structure of my invention is particularly suited for repeated playback as often as desired of a given text, song, or the like recorded on the endless tape loop for the purpose of instruction or self-teaching, without requiring any additions to a conventional tape recorder.

This latter advantage is particularly in contrast to specially constructed reels for the purpose of playing back endless sound tapes where among other requirements special pressure devices are required and use must be made of a special strong sound tape provided with an antifriction medium. Since structures of this latter type require very careful working, they are unsuited for the amateur, as contrasted with the very simply manipulated structure of my invention.

Of course, my invention is not limited to reels for storing and playback of magnetic tapes. It can also be used with ribbons of any type which are to be wound and stored.

I claim:

1. A capsule reel assembly holding an endless loop of recording tape comprising:
   a. first and second flanges spaced by at least the width of said tape;
   b. hub means being free to rotate and extending between said flanges supporting said tape trained therearound;
   c. means for supporting said flanges for rotary movement with respect to each other;
   d. winding means carried by one of said flanges for winding said ribbon into the space between said flanges, said winding means including a member extending between said flanges at a location spaced from said hub means and in the path of winding of said ribbon about said hub;

whereby when said tape unreels the endless loop may revolve freely about said hub means as said hub means rotates.

2. The combination according to claim 1, wherein a sidewall connected to the periphery of one of said flanges and coacting with said flanges to enclose a predetermined space, said sidewall having an opening through which said loop of recording tape can be extended whereby when a loop of said tape is held extended through said opening said reel assembly is suspended.

3. The combination according to claim 1 wherein said winding means includes:
   a. an opening in one of said flanges spaced radially from said hub means; and
   b. pin means removably positioned within said opening and extending into the path of winding of said ribbon about said hub.

4. The combination according to claim 1 wherein:
   a. said winding means comprises at least one winding pin fixed to one of said flanges.

5. The combination according to claim 4 wherein: a peripheral sidewall fixed to one of said flanges and extending toward the other flange for defining an enclosed storage space outwardly of said winding means within which said ribbon can be stored, said sidewall is formed with a pair of slits extending transversely of said sidewall between said flanges and defining an entrance means.

6. The combination according to claim 4 wherein:
   a. a peripheral sidewall fixed to one of said flanges and extending toward the other flange for defining an enclosed storage space outwardly of said winding means within which said ribbon can be stored, said sidewall being formed with at least one opening defining an entrance means through which said ribbon can extend from said storage space.

7. The combination according to claim 6 wherein:
   a. said means for supporting said flanges for rotary movement includes an elongated member fixed at one end to one of said flanges and with the other end extending through an opening in the other flange for rotatably supporting said other flange for rotation about the axis of said hub means.

8. The combination according to claim 7 wherein:
   a. said hub means further includes a hollow roller rotatably mounted on said elongated member and extending between said flanges, said roller having an axial length at least equal to the width of said ribbon.