

[54] **REEL SPINDLE**

[75] Inventors: **George S. Hager, Anaheim; Eugene E. Keech, Costa Mesa; Lawrence S. Dossett, Orange, all of Calif.**

[73] Assignee: **Electronic Engineering Co. of Calif., Santa Ana, Calif.**

[22] Filed: **Nov. 11, 1971**

[21] Appl. No.: **197,779**

[52] U.S. Cl. **242/68.3, 242/71.8**

[51] Int. Cl. **B65h 19/02**

[58] Field of Search **242/68.3, 71.8, 71.9, 46.2; 287/53 R, 124, 20.3; 279/2; 85/70**

[56] **References Cited**

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Primary Examiner—George F. Mautz

Assistant Examiner—Edward J. McCarthy

Attorney—Harry R. Lubcke

[57] **ABSTRACT**

A spindle for rotatably supporting a reel having both positive and frictional engagement between the spindle and the reel. The positive engagement is made at one end of the spindle, as by means of plural pins which engage plural recesses in the reel. The frictional engagement is made at the other end of the spindle and is provided by a radially expansible elastomer which is expanded by a locking arm. This dual engagement advantageously holds two-piece reels together as well as to the spindle.

7 Claims, 3 Drawing Figures

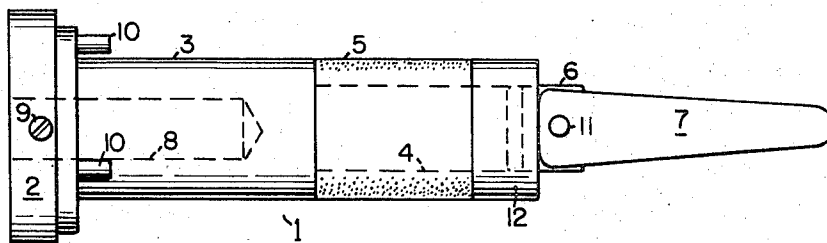


FIG. 1.

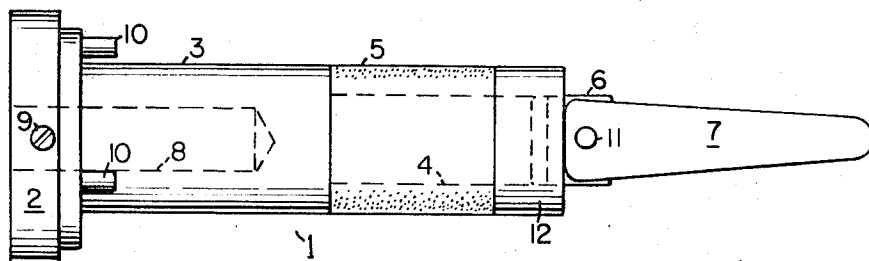


FIG. 2.

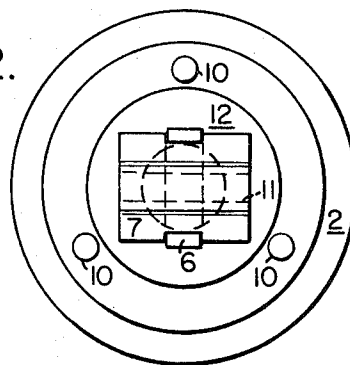
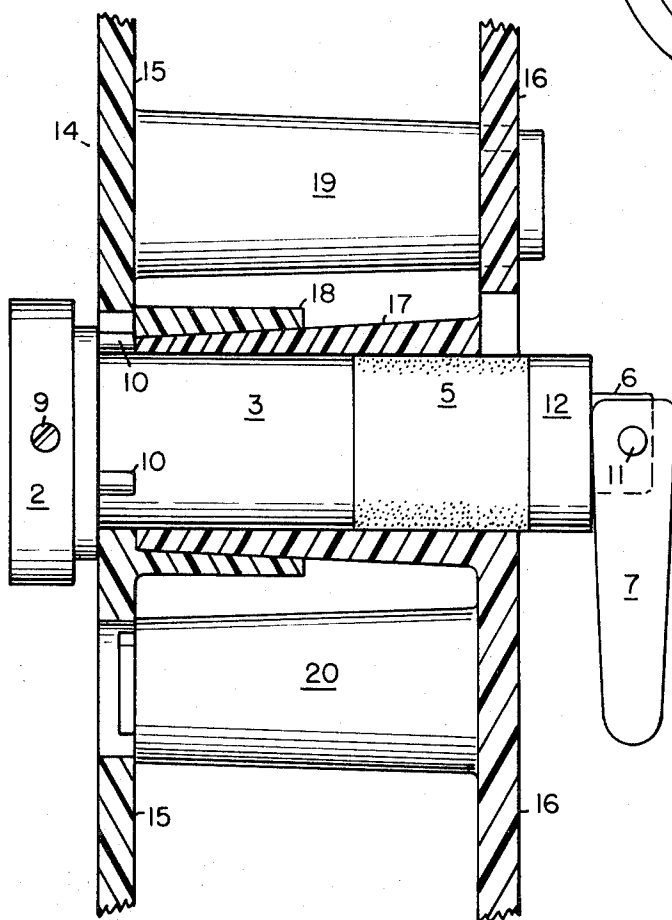


FIG. 3.



REEL SPINDLE

BACKGROUND OF THE INVENTION

This invention relates to winding and reeling with a resilient head.

The prior art has employed keyed or splined spindles for driving reels, which have one or more corresponding recesses; particularly for applications where the reeling is performed at a relatively low speed, as for motion picture films.

For relatively high speeds, such as for winding yarn or other fibers in the textile industry, resilient heads have been used to maintain concentricity of the reel upon the spindle. The spindle has often included one or more rubber sections or disks over which the bore of the reel is frictionally engaged. Additional resilient sections which expand outwardly by centrifugal force have also been included to obtain a positive drive at high rotational speeds.

In these applications any acceleration has been moderate and the period of reeling has been relatively long, usually from the beginning to the end of whatever long fiber is reeled. Moreover, the configuration has been axially long and radially short, whereas the opposite configuration is found in the tape reeling art.

SUMMARY OF THE INVENTION

In the recently evolved tape arts reeling at moderate and high speeds with high and frequently repeated acceleration and deceleration is usual. Notwithstanding, relatively even reeling of the tape upon the reel is desired, to prevent damage to the tape and to alleviate reel-produced transients in the tape travel during the next run-through of the tape.

Two-piece tape reels, from which tape may be removed for storage and replaced upon the reel at will, are often used in the new art. Although such reels are structured to prevent coming apart during use, the faster pace of the tape-employing machines sometimes accomplishes this undesired effect.

This invention provides positive attachment of the reel at one side and frictional attachment at the other. This prevents separation of a two-part reel while on the spindle.

Additionally, the impact of acceleration or deceleration upon the positive pin attachment of the reel to spindle is damped by the frictional attachment. This largely eliminates noise and wear.

The structure provided is of relatively simple and rugged construction and allows rapid installation and removal of the reels.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows a side elevation view of the spindle alone with the locking arm positioned to accept a reel.

FIG. 2 shows an end elevation of the same.

FIG. 3 shows a side elevation view of the spindle with a reel attached and the locking arm positioned to lock the reel on the spindle.

DETAILED DESCRIPTION OF THE INVENTION

In FIG. 1, numeral 1 generally indicates the whole spindle according to this invention. The metal parts thereof are preferably made of stainless steel. The spindle is typically formed with a shoulder 2 at one end, a

cylindrical support surface 3 for partially holding a reel, a portion of reduced diameter 4 for supporting yieldable means 5 (elastomer), and a forwardly located tongue for holding locking arm 7.

Within the shoulder and cylindrical support surface hole 8 is concentrically provided. This is for mounting the spindle upon a supporting shaft for rotation. Such a shaft or equivalent support is known and therefore has not been shown. A threaded set screw 9 is radially disposed in the shoulder to fasten the spindle to the supporting shaft. Other attaching means may substitutionally or additionally employed.

Plural means extending from the shoulder are shown as the axially disposed pins 10 in FIGS. 1 and 2. Three are typically provided, equally spaced at 120° on a 0.625 inch centerline circle in order to fit the (keyway) slots of standard reels, of which the American National Institute of Standards specification No X3.20, two piece reel is an example. Pins 10 are typically a force fit into the shoulder and are silver-soldered at the rear (left side in FIG. 1), during manufacture of the spindle. It will be recognized that equivalent keys secured to the shoulder-spindle could be employed. For other standard reels, such as the NAB (National Association of Broadcasters) solid reels the slots are in the same position, and so these reels may be used interchangeably. For non-standard reels even other key-like means may be used, the object being to provide a positive fastening at the shoulder.

It will be understood that the spindle may be made in any size according to the use to which it is put, but for standard size reels the diameter of the cylindrical support surface is 0.500 inch. With the necessary tolerance and clearance between the spindle and the hole and the pin-receiving slots in the reel there exists enough space to cause a rattle noise, when the assembly is accelerated, decelerated, or during ordinary running due to the dynamics of the reeling tape. This tends to be disturbing and to cause definite wear in the slots of the reel, at least; the reels usually being molded of a plastic substance. This situation is corrected by the use of elastomer 5, which may occupy from approximately one-third to one-half of the length of the spindle proper.

The portion of reduced diameter 4 preferably has a diameter of the order of 0.31 inch for the standard reel spindle. The maximum dimension of tongue 6 is the same, so that elastomer 5 can be slipped in place. In the relaxed state the elastomer has an outer diameter of 0.500 inch and an inner diameter of 0.31 inch.

Any of a number of rubber-like materials may be used for the elastomer. The material should have a minimum "memory"; that is, it should not retain to an appreciable degree the radially expanded shape assumed when holding a reel in place. Also, it should be immune to damage from oil or other possible contaminants, and it should have stable elastic properties over as great a temperature range as may be encountered in use. The Shore hardness of approximately 50 is desired. Stability of characteristics with time, to provide a long life, is also desirable.

Silicon rubber is preferred as best meeting the above requirements. Its temperature range of useful performance is from -50° to +150° C. Other suitable materials are buna N nitrile or polyurethane; also neoprene, synthetic rubber, or natural rubber.

The lengths of portions 3 and 5 depend upon the width of the tape to be handled, and so upon the width of the reel. For one-inch wide tape (used for both paper and magnetic tapes), the total length is slightly over 1½ inches. Of this, portion 3 is typically seven-eighths inch.

The end of tongue 6 is provided with a hole, through which pin 11 fastens locking arm 7 to the tongue. The locking arm has a U shaped cut-out at the left end as shown in FIG. 1, both sides of which U fit over the tongue and also accept pin 11.

Washer 12 may be made in two pieces, but in manufacturing it is superior to fabricate it in one piece of metal, which has an oblong hole at the right side of the washer in FIG. 1 and a cylindrical hole at the left. The first-mentioned hole slides along the base part of the tongue and the latter hole slides along the portion of reduced diameter 4.

Locking arm 7 preferably has the tapered shape indicated and for the example given herein may be about one inch long. The significant shape thereof is at the left end of the locking arm in FIG. 1, where it bears against washer 12. This does not have a radius, the center of which is pin 11, but has two smaller radii near the edges of the arm. This construction gives an "over-center" action, which causes the arm to remain in either the longitudinal position shown in FIG. 1 or the transverse position shown in FIG. 3.

This action takes place because of the resistance to deformation of the elastomer. In the longitudinal position of the arm an increment of such deformation occurs, when the arm is in the transverse position the deformation is maximum. There is therefore stress to retain the arm in either position, and this is desirable in the use of the spindle in engaging or disengaging a reel.

The elastomer is fabricated to have the same outer diameter as portion 3 of the spindle; i.e., one-half inch for the example given. With arm 7 in the transverse position the elastomer is axially compressed approximately 0.070 inch. This makes the diameter increase by approximately 0.035 inch, which is sufficient to hold the reel firmly and concentrically.

Spindle 1 with a reel 14 attached is shown in FIG. 3. The spindle is the same as that shown in FIG. 1. The locking arm 7 is in the transverse position to expand elastomer 5.

The reel has two halves, 15 and 16. The latter half has an extended hub portion 17, which surrounds the spindle. The former half has a short hub portion 18, which surrounds hub portion 17. Slightly tapered finger 19 is cast as a part of half 15 and slightly tapered finger 20 is cast as a part of half 16. There are four of these fingers in all and the tape is wound externally upon them. In FIG. 3, with its relatively large scale, only the central parts of the sides of the reel have been shown. These sides and a relatively full reel of tape extend far radially outward from the fingers shown.

Pins 10 positively retain reel half 15, while the ex-

panded elastomer 5 retains reel half 16. If reel 14 were to be in one piece, as the NAB reel, it is seen that it would be rigidly held, with expanded elastomer 5 preventing rattle of projections 10 in the slots of the reel.

Locking arm 7 may be moved to the transverse position shown in FIG. 3, or in an 180° opposite position. In other words, it can be folded down in either direction. This gives desirable speed to the process of attaching a reel to the spindle for use, particularly since the lever is not required to enter any additional keyway in the reel to retain the second half of the reel, as has been required in some prior art.

We claim:

1. A spindle in combination with a reel having two sides with at least one hub (17) therebetween, comprising;

- a. a rigid spindle (1) having a shoulder (2) at one end,
- b. plural means (10) extending from said shoulder to positively engage one side (15) of said reel (14),
- c. yieldable means (5) surrounding a portion of said spindle and spaced from said shoulder, and
- d. a locking arm (7) attached to said spindle at the end opposite to said shoulder, having two locked and one unlocked positions, and having means (12) to radially expand said yieldable means substantially uniformly along the length of said yieldable means when said locking arm is in a locked position,

whereby said hub (17) of said reel is frictionally engaged to said spindle along substantially the whole length of said yieldable means.

2. The spindle of claim 1, in which;

- a. said reel is two-piece, having separable sides (15 & 16).

3. The spindle of claim 1, in which;

- a. said yieldable means (5) is a sleeve surrounding approximately half of the length of said spindle.

4. The spindle of claim 1, in which;

- a. said yieldable means is formed of a material selected from the group consisting of; silicon rubber, buna N rubber, polyurethane, Neoprene, synthetic rubber, and natural rubber.

5. The spindle of claim 1, in which;

- a. said yieldable means has a Shore hardness of approximately 50.

6. The spindle of claim 1, which additionally includes;

- a. a washer (12), slidable upon said spindle, and positioned between said yieldable means and said locking arm.

7. The spindle of claim 6, in which;

- a. said washer (12) is formed of a single piece of rigid material, having an oblong hole in part of the axial length thereof, and a cylindrical hole in the remainder of said axial length.

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