This invention relates to improved means for locking together the cover and bottom members of a reel case. Such cases are useful in storing reels of film, magnetic tape, or the like, and must completely seal the tape from external contamination.

It has been proposed heretofore to provide a real case of this type in which the locking means includes a plastic cam surface and a metal pin cam follower. When the lock handle is turned through an angle of 90°, the cam surface is moved with respect to the pin, causing the latter to effect a squeezing action of a rubber washer or ring disposed in an aperture in the base of the case. Under pressure, the ring distends laterally behind the aperture to lock the two halves of the case together. The force required to compress the ring is brought to bear on the pin which, in turn, bears against the cam surface. All of the force is concentrated on the thin bearing area (side) of the pin and is of such magnitude that the plastic cam surface wears away by abrasion as the lock is locked and unlocked. As the cam surface wears, the rubber ring can no longer be fully compressed and the strength of the lock consequently is impaired.

In accordance with the present invention, the cam and pin assembly has been completely done away with, thus obviating the problems resulting therefrom.

Another object of my invention is to provide an improved locking device of the type described which utilizes a high pitch threaded stud and cooperating nut, both molded from a waxy plastic material such as nylon or Delrin.

Another object is to provide a locking device of this kind which includes stop means to limit the rotation of the cover and prevent accidental rearward reversal thereof and separation of the case halves.

These and other objects and advantages of my invention will become apparent from the drawings in which,

FIGURE 1 is a plan view of a reel case which has an improved locking device constructed in accordance with the invention;

FIGURE 2 is a sectional view taken the line 2—2 of FIGURE 1;

FIGURE 3 is a sectional view taken along the line 3—3 of FIGURE 2;

FIGURE 4 is a sectional view taken along the line 4—4 of FIGURE 2;

FIGURE 5 is a sectional fragmentary view like that of FIGURE 2 showing the relationship of the parts when the case is locked;

FIGURE 6 is an exploded perspective view illustrating the several parts comprising my improved reel case; and

FIGURE 7 is a perspective view of cooperating bearing washers on which the lock actuating disk rotates.

Referring to the drawings, the case has a circular base or bottom member 10 and a similar cover or top member 12 having vertical side walls or rims 14 and 16, respectively, the bottom member having a rectangular trough 18 carrying a gasket 20 against which the lower edge of the rim 16 bears to seal completely the interior of the case. Top member 10 has a central well 22 molded therein, the well having a floor 24 and a circular side wall 26. An opening 28 of irregular configuration (FIGURE 4) is provided in the center of the floor through which the locking means extends. Surrounding opening 28 on the underside of the floor is an axial flange 30 against which the resilient gripping ring 32 is compressed, as explained below. An actuating disk 38 for the locking means takes the form of a dish with side walls 40 which dish nests in the well 22. An opening 28 is provided in the center of the actuating disk 38 aligned with the opening 28. Disposed between the actuating disk and the floor 24 are a pair of plastic bearing washers 42, 44 having detents which "click" when the lock is fully closed or fully opened. The detents comprise a pair of slightly raised flat projections 47 on one face of washer 42 and two pairs of cooperating depressions 49 on the opposed face of washer 44, as shown in FIGURES 6 and 7. The washers are locked to the adjacent parts by means of pins 43 which fit into depressions formed in the underside of disk 38 and topside of floor 24, and the pins together with the flat 51 on washer 42, orient the detents with respect to the position of the actuating disk 38.

A stud 34 having triple threads and an integral hollow head 36 extends through the openings 39, 28 to a point below the face of the axial flange 30. A nut 46 having a ring supporting flange 48 is adapted to screw onto the threaded end of the stud 34. Both the stud and the nut are molded from a plastic material such as nylon or Delrin, so that there is a minimum amount of friction between the mating threads of the nut and stud. The triple, high pitch threads have a relatively large bearing area so the pressure on the bearing area is minimized. By reason of the triple threads the nut moves a relatively long distance up the stud 34 for a relatively small angle of rotation. The peripheral configuration of the nut 46 matches the irregular configuration of the opening 28 so that the nut does not rotate with respect to the well floor 24 but moves only axially (FIGURE 4).

A gripping ring 50 surrounds the nut 46, the underside thereof bearing against the flange 48 and the upper side bearing against axial flange 30. The ring is made from compressible, rubbery material so that it can be compressed between the nut flange 48 and the floor 24 to cause axial detension thereof.

The actuating disk 38 carries a pair of spaced ribs 41, 45 to facilitate manual rotation of the disk and to provide a receptacle for the integral head 36 of the stud 34. One corner 37 of the head 36 is cut off to accommodate a key 35 projecting from the disk, so that the disk can be properly oriented to fit into the receptacle between the ribs. By keying the stud to the disk in this manner and by keying the nut 46 to the floor 24, the threads are oriented for immediate engagement when the actuating disk is properly oriented with respect to the floor 24 of the well 22. This is more fully explained hereinafter. Furthermore, the keying arrangement causes the stud to rotate with the actuating disk.

A receptacle (not shown) may be secured to the actuating disk to cover the receptacle between the ribs.

The bottom member 14 of the case has a central well 15 molded therein having an inclined floor 17 and an aperture 19 aligned with the openings 39 and 28 when the case halves are assembled. In the assembled state, the well 22 in the top member and the well 15 in the bottom member face each other and provide a hub about which the reel is encased. A pair of rubber ring cushions 68 surround the wells and the central portion of the reel rests upon these cushions. A supporting flange 48 and the gripping ring 50 are dimensioned to fit into the aperture 19 when the case is closed, as illustrated in FIGURE 2.

To limit the angular rotation of the actuating disk, a pair of button-like projections 60, 62 extend upwardly from the floor 24 (FIGURE 3). These stationary projections cooperate with complementary arcuate grooves 61, 63 molded in the underside of the actuating disk 38.
The grooves extend radially for about 145°. The ends of the grooves, which are engaged by the projections when the actuating disk is in locked position, are reinforced by collars 64, 66 to resist the torque applied to the actuating disk 38 during locking. Locking occurs when the disk 38 is rotated in the direction indicated by the arrow in FIGURE 3. A well cover 70 fits into the top of the well 15 with its plane surface resting slightly below the plane of the surface of the bottom member 10.

In assembly the locking means with the top member 12, the parts are disposed as shown in FIGURE 2 and the gripping ring 50 is manually compressed by pushing the nut 46 in its keyed opening 28 toward the floor 24. This causes the threads of the stud 34 and nut 46 to engage. The actuating disk 38 is then rotated until the grooves 61, 63 meet with the button projections 60, 62. At this point the actuating disk is oriented at the point opposite that shown in FIGURE 3 so that the projections 60 and 62 are abutting the opposite ends of the grooves 61, 63. By keying the stud head to the disk and the nut to the floor so that they fit in only one position, these parts are located in a predetermined orientation which compresses slightly the gripping ring when the projections are in the grooves.

To lock the case halves the top and bottom members are brought together (FIGURE 2) with the nut and gripping ring disposed in the aperture 19. The actuating disk 38 is then turned in the direction of the arrow (FIGURE 3). This causes the stud 34 to turn and the nut 46 to climb the high pitch threads on the stud, thereby compressing the gripping ring further and causing it to distort laterally beneath the aperture 19 as shown in FIGURE 5. The rotation is arrested by projections 60, 62 striking the ends 64, 66 of the grooves 61, 63. By reversing rotation, the stud is lengthened and the gripping ring is decompressed and shrinks laterally so that the ring can be removed from the aperture 19 to open the case.

Modifications in the construction of the novel locking means will be apparent to those skilled in the art and it is not my intention to limit the device to the specific form shown and described other than as necessitated by the scope of the appended claim.

1 claim:

A molded plastic case for holding a tape reel comprising a bottom member and a top member having rims that mate when the case is closed to sealingly enclose said tape reel, top and bottom wells having floors and being formed in the centers of said top and bottom members which wells face each other and provide a hub for the reel when the case is closed, an actuating disk mounted for rotation within said top well, aligned central openings extending through said disk and the floor of said top well, a molded plastic stud extending through said central openings and having an integral head coupled to said actuating disk so that the disk and stud rotate together, said stud having multiple threads, key means on said actuating disk cooperating with said head so as to couple said stud and said disk at a predetermined orientation only, a unitary molded plastic nut threadably received on the threaded end of said stud and having a ring supporting flange extending radially outwardly on the outer face thereof, said flange being substantially parallel to the floor of said top well, the multiple threads provided on said nut and on said stud permitting said nut to move a relatively long distance axially of said stud for a relatively small angle of rotation of said actuating disk, a pair of arcuate grooves in the underside of said actuating disk, a pair of button-like projections on the opposing face of the floor of said top well for cooperating with said grooves to arrest rotation of said disk upon turning through the arcuate length of said grooves, a gripping ring of compressible rubbery material encircling said nut and axially sandwiched between said ring supporting flange and the floor surrounding said central opening in said top well, said nut being keyed to the floor of said top well at a predetermined orientation so that the threads engage to slightly compress said gripping ring when said projections are disposed in said grooves in the unlocked position, an aperture through the floor of said bottom well dimensioned to permit said ring supporting flange and said ring to pass thereinto when the case is closed, whereby upon rotation of said actuating disk in one direction, said nut rises axially to axially compress the gripping ring and cause it to distend radially into locking engagement with the wall surrounding said aperture, and upon rotation of said actuating disk in the other direction, said ring is axially decompressed to permit removal through said aperture and permit separation of said top and bottom members.

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