

March 7, 1967

J. C. WIDMONT, JR
REEL STORAGE CONTAINER

3,307,688

Filed June 25, 1965

6 Sheets-Sheet 1

FIG. 1.

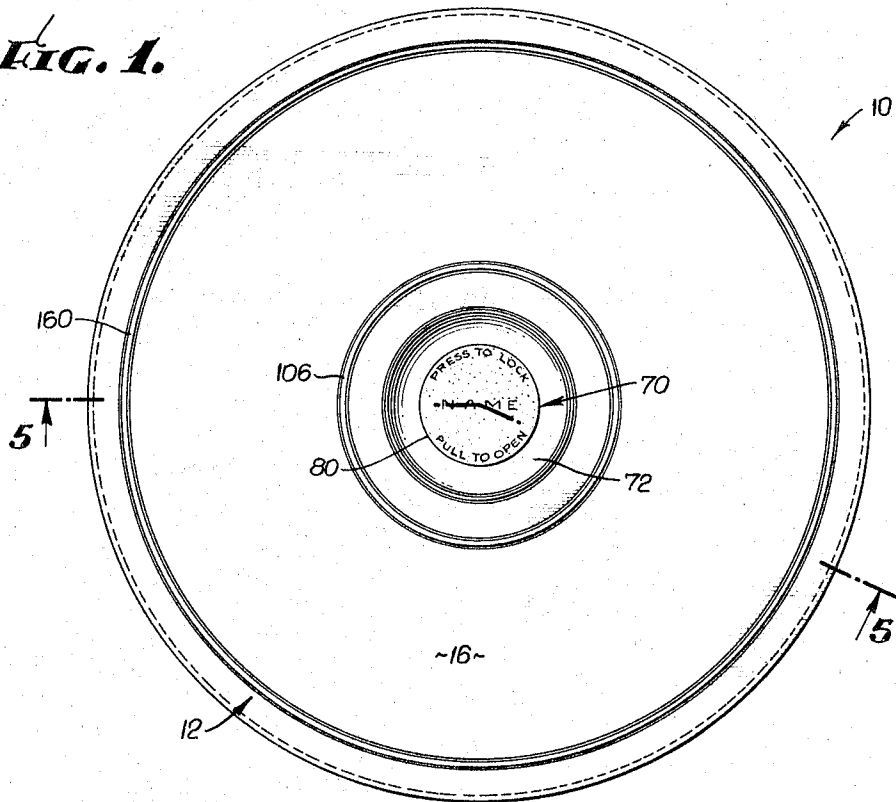


FIG. 2.

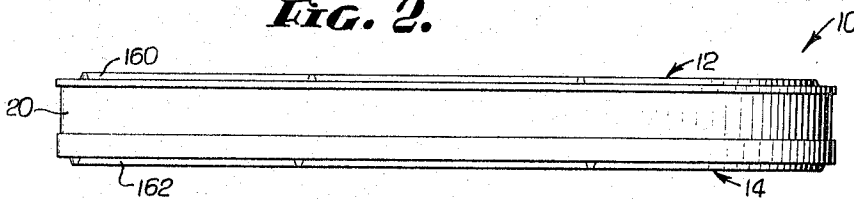


FIG. 18.

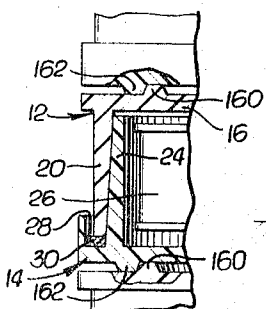


FIG. 19.

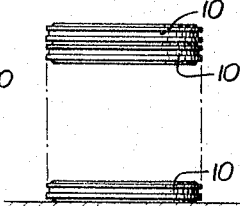
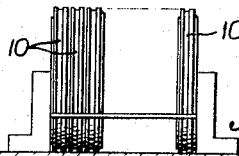


FIG. 20.



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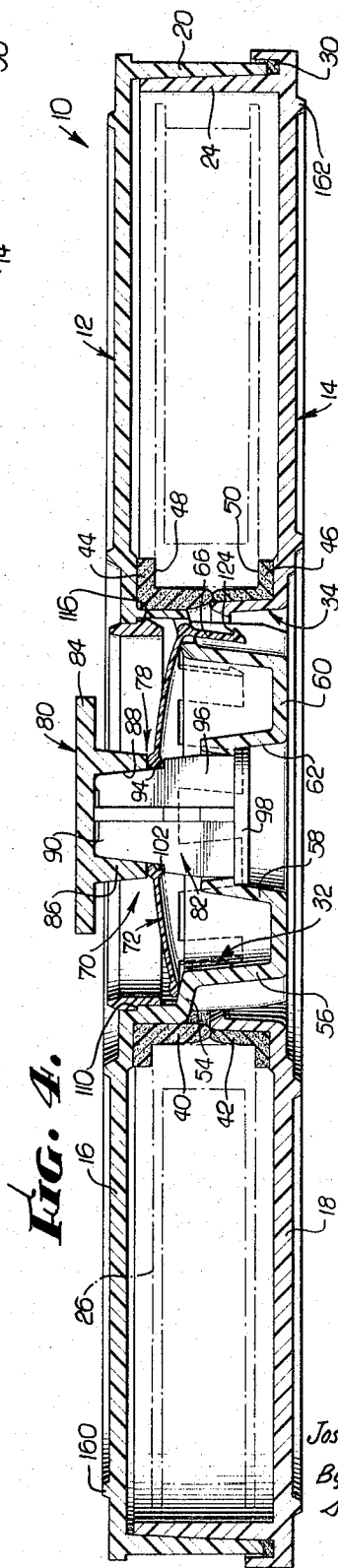
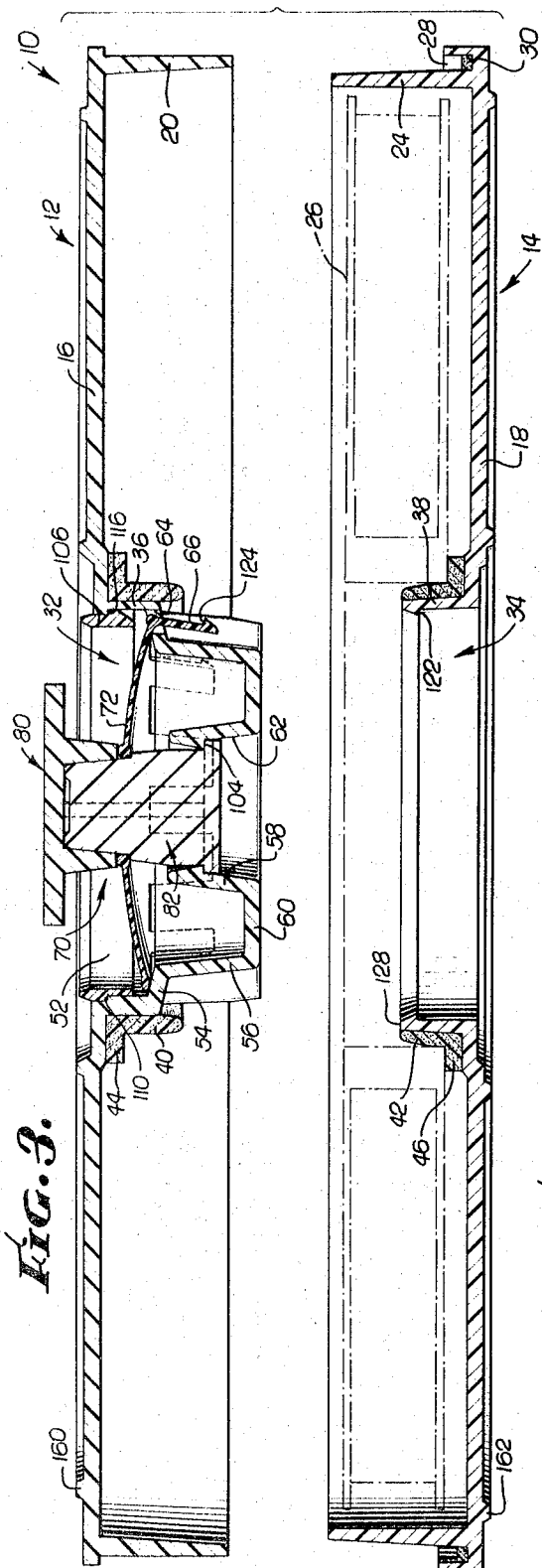
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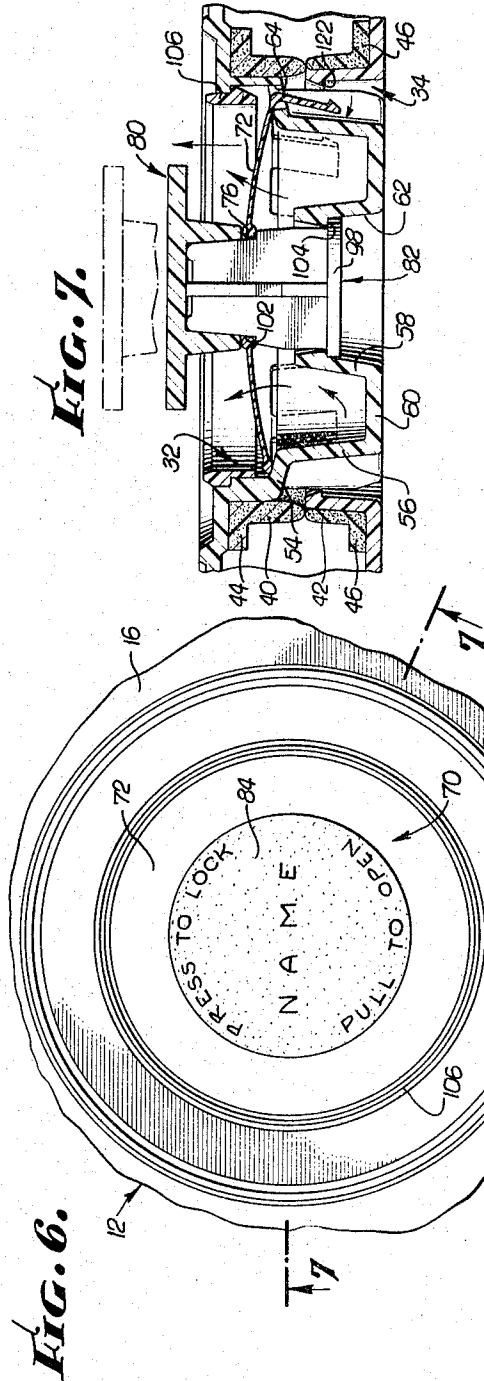
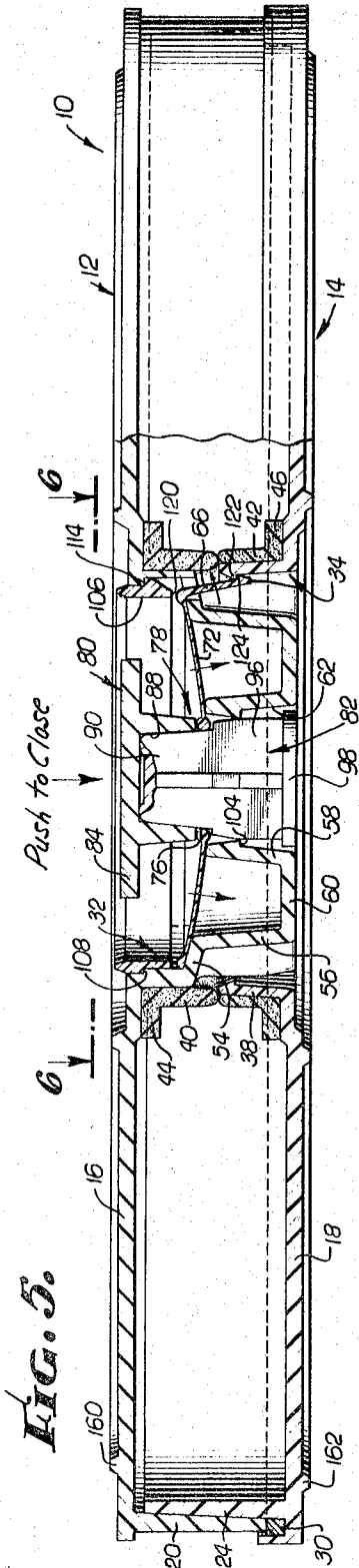
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FIG. 8.

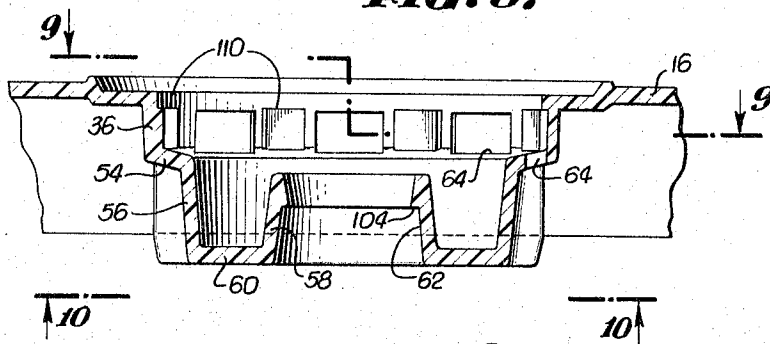


FIG. 9.

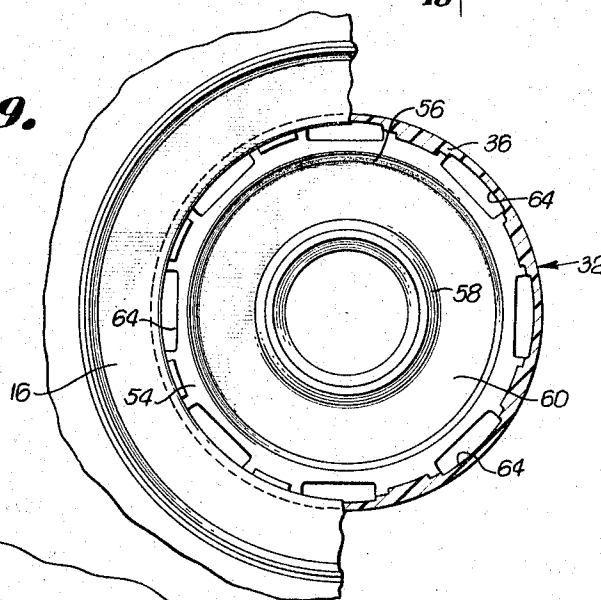
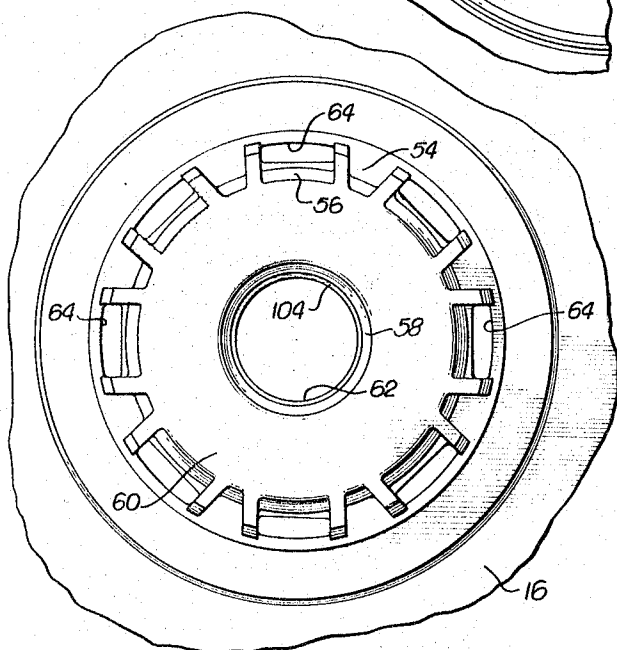


FIG. 10.



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FIG. 11.

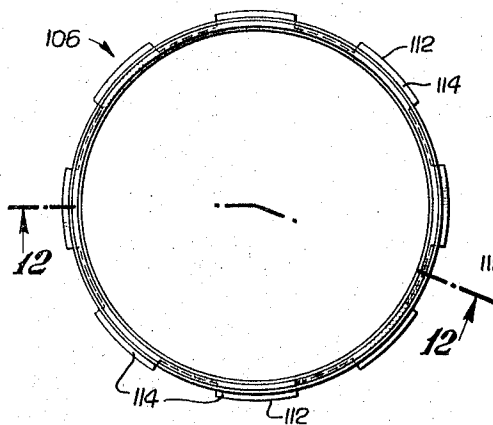


FIG. 12.

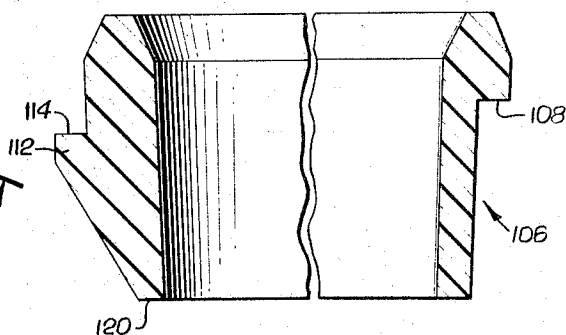


FIG. 13.

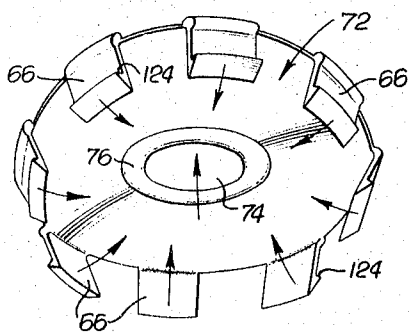


FIG. 14.

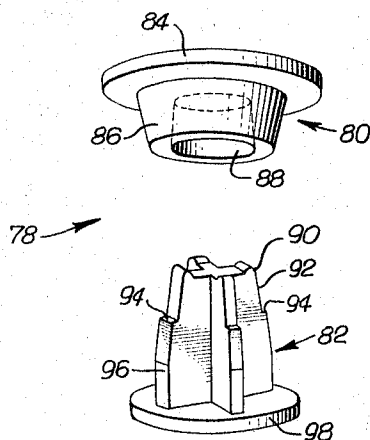
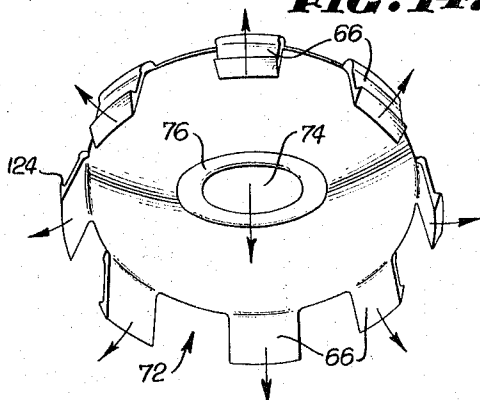


FIG. 15.

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FIG. 16.

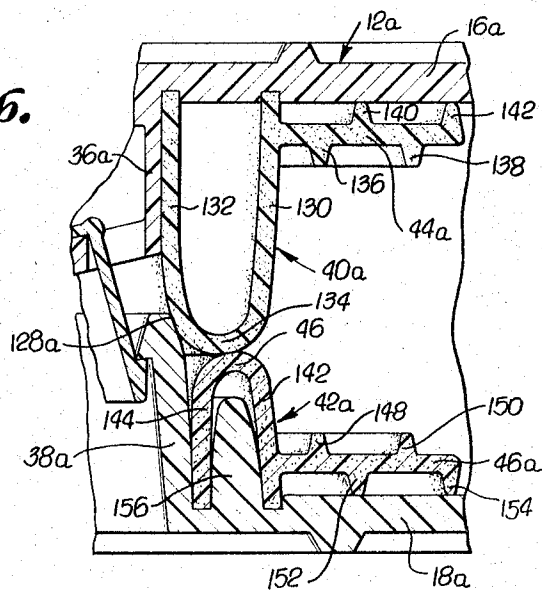
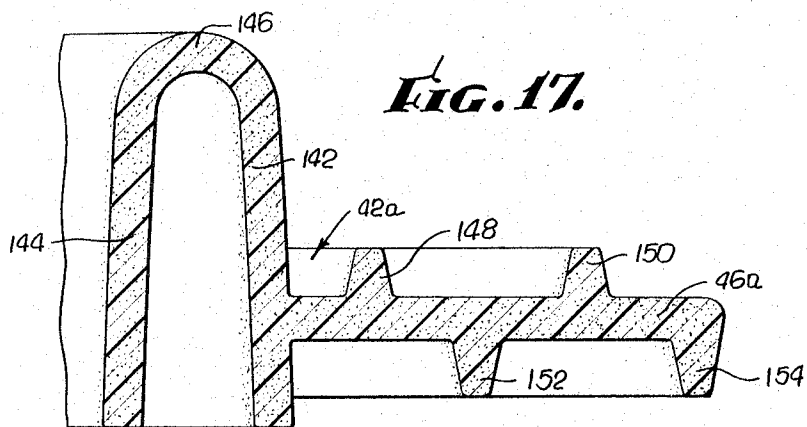


FIG. 17.



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REEL STORAGE CONTAINER

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Filed June 25, 1965, Ser. No. 467,034

13 Claims. (Cl. 206—52)

This invention relates to an improvement in containers for storing reels of magnetic tape, such as instrumentation tape, computer tape and audio tape, and is directed in particular to a new and improved locking mechanism in containers for reels of magnetic tape.

Containers which are used to store reels of magnetic tape conventionally comprise a pair of cover members—a top member and a base member—each of which has a circular flat side wall and a peripheral flange or end wall. When the top member is placed on the base member, the peripheral end walls overlap or telescope to form a hollow, relatively flat, drum-like container to receive and store the reel therein. Each member of the container is also provided with a locating ring disposed centrally of the circular side wall and directed inwardly toward the center of the container to position the reel in the container. These locating rings approximate the diameter of the capstan opening of the reel and have peripheral gripping rings of elastomeric material which grip the reel about the capstan opening and hold it tightly within the container when the cover member is locked onto the base member.

One known locking mechanism for locking the cover member to the base member and for causing the elastomeric rings to engage and hold the reel in place within the container comprises a rotatable handle located within a well formed by the locating ring of the cover member and which is connected to an expandable washer-shaped grommet. This grommet is located so as to frictionally engage the side wall of a complementary locking opening in the locating ring of the base member when the cover is placed on the base member. The expanding mechanism for expanding the grommet in the known locking mechanism may comprise either a quick-acting screw thread or a camming mechanism which is operable by said handle to cause a disc to compress the grommet in one direction so that the peripheral walls of the grommet expand. Thus, when the top member is placed on the base member so that the grommet is within the locking opening in the base member, and the handle is rotated about 90° clockwise in one direction, the grommet expands and engages the side wall of the locking opening to frictionally lock the top member to the base member. To open the container, the handle is rotated back or counterclockwise, allowing the expanding mechanism to release its squeeze on the grommet so that the grommet can return to its original and smaller diameter where it no longer frictionally engages the side wall of the locking opening. In this latter position of the grommet, the cover member of the container can then be easily removed and the reel withdrawn from the base member.

In this prior art container, the ability of the container to remain tightly locked and to hold the reel immovably within the container is dependent upon the action of this expandable grommet. When new, the grommet will reasonably perform its function, but through age and use the elastomeric property of this expandable grommet may deteriorate so that it eventually loses its ability to properly frictionally engage the side wall of the locking opening in the base member. When this happens, the container cannot be depended upon to remain locked or to hold the reel tightly. Too, even when new, the expanded grommet may slip as it engages the side wall

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of the locking opening, or it may engage in position such that the required pre-stress to hold the reel securely is not applied, thus allowing the reel to become loose within the container. When the reel is not held securely, the reel may rotate with respect to the container, allowing the tape stored therein to un-spool. Also, there have been instances, when the grommet can no longer grip the side wall of the locking opening sufficiently tight, where the weight of the reel and tape will cause the container to accidentally open, especially if the container is picked up by its cover member with the result that the tape may un-spool or be otherwise damaged.

This invention teaches how to solve the problem of satisfactorily locking the cover member on the base member so that it will not accidentally become separated and how the reel may be reliably and immovably held within the container. This is accomplished in the present invention by the concept of a locking mechanism which mechanically latches the cover member to the base member to prevent the cover and the base from moving apart and thus hold the reel securely and tightly within. In this arrangement, too, because of the mechanical latching action of the locking mechanism, the distance between the cover and base member is always the same so that the reel is always held by the elastomeric rings with the same amount of gripping force imposed on the reel regardless of the age or amount of use of the locking mechanism.

In the preferred practice of this invention, the locking mechanism comprises a plurality of latching fingers which are actuated by a push-pull type button to engage and disengage a corresponding complementary shoulder on the base member to lock and unlock the container. This push-pull type button is operatively connected to the latching fingers by means of a concavo-convex snap ring which functions as a belleville washer to cause the latching fingers to snap into engagement with the shoulder of the base member when the snap ring is actuated by the push-pull button in one direction and to snap out of disengagement with this shoulder when the snap ring is actuated or snapped in the opposite direction by the push-pull button to permit removal of the top member from the base member. The use of these latching fingers as operated by this snap ring permits the cover member to be attached and removed without interference between the latching fingers and the corresponding shoulder. Too, the latching fingers not only prevent any slippage between the cover member and the base member by the mechanical engagement of the fingers with the corresponding shoulder, but the fingers, being of uniform length, space the cover member from the base member so that the elastomeric rings grip the reel with a uniform and consistent force so that the reel is always held securely within the container.

Also in the practice of this invention, the conventional elastomeric rings of natural or synthetic rubber are used to grip the reel, as explained, supra, may be replaced with rings of polyethylene which give the invention the additional advantage of longer life since the polyethylene is less apt to deteriorate in use, as contrasted to the elastomeric rings, and thus render the container more reliable for use over longer periods of time.

Another feature of this invention is that the push-pull bottom has an additional advantage over the conventional rotatable handle in that it acts as an obstruction to the storing of the containers together when the container is unlocked to warn the user that the cover is not locked on the base member.

Other and additional features and advantages of the present invention will become apparent from a more detailed description of the drawings, wherein:

FIGURE 1 is a top plan view of the container con-

structed in accordance with the teachings of the invention;

FIGURE 2 is a side elevational view of the container of FIGURE 1;

FIGURE 3 is a sectional view similar to FIG. 5 illustrating the top cover and the bottom cover separate from one another with the locking mechanism of the cover member in position to be received by the bottom member to enclose a reel of tape therein;

FIGURE 4 is a sectional view similar to FIG. 5 illustrating the top cover in position on the bottom member before the top member is locked to the bottom;

FIGURE 5 is a sectional view showing the container with the locking mechanism in locked position and taken along line 5—5 of FIGURE 1;

FIGURE 6 is an enlarged plan view of the locking mechanism taken along line 6—6 of FIGURE 5;

FIGURE 7 is a cross-sectional view illustrating the locking mechanism in unlocked position and taken along line 7—7 of FIGURE 6;

FIGURE 8 is a cross-sectional view of the locating ring of the cover member and the well formed thereby for receiving the locking mechanism but with the locking mechanism and the gripping rings omitted;

FIGURE 9 is a top plan view taken along line 9—9 of FIGURE 8 showing the locating ring of FIGURE 8 in more detail;

FIGURE 10 is a bottom view of the locating ring taken along line 10—10 of FIGURE 8;

FIGURE 11 is a top view of a retaining ring used in the well of the locating ring to hold parts of the locking mechanism in place;

FIGURE 12 is a cross-sectional view of the locking ring of FIGURE 10 taken along line 12—12 of FIGURE 10 and enlarged to show the details thereof;

FIGURES 13 and 14 are perspective views of the snap ring with its integral latching fingers to show the position of the latching fingers as positioned by the snap ring;

FIGURE 15 is a view of the push-pull button used to actuate the snap ring;

FIGURE 16 is a cross-sectional view of the container locking mechanism in closed position to illustrate the gripping ring of polyethylene;

FIGURE 17 is an enlarged detail, cross-sectional view of one of the polyethylene gripping rings;

FIGURE 18 is a cross-sectional view of a portion of the containers to illustrate how the containers can nest when stored;

FIGURE 19 is a partially schematic elevational view illustrating a stack of nested containers stored horizontally; and

FIGURE 20 is a partially schematic elevational view illustrating a stack of containers placed vertically with the nesting feature used to lock the containers together between relatively movable book ends.

Turning now to the drawings, the container of this invention is indicated in its entirety as 10 and comprises a top or cover member 12 and a bottom or base member 14, both of which are of any suitable material such as a high impact styrene. The top and base members each have circular, relatively thin side walls 16 and 18 and are each provided with peripheral flanged end walls 20 and 24, which end walls complement one another to form the enclosure as illustrated in FIGURE 4 to hold a reel 26 of magnetic tape. The end walls 20 and 24, in this illustration, are tapered and the base member 14 is provided with an outer peripheral groove 28 which holds a ring of elastomeric material 30 which is engaged by the edge of the end wall 20 when the container is closed to seal the container against ambient moisture, etc. Cover member 12 and base member 14 are also each provided with locating rings indicated in their entirety as 32 and 34, respectively. Each locating ring in the embodiment disclosed comprise inwardly directed side walls 36 and 38,

cylindrical in configuration, which approximate the diameter of the capstan opening reel 26 so as to provide a means for locating and positioning the reel in the container.

Locating ring 32 is also provided with a gripping ring 40 of elastomeric material on the periphery of the locating ring side wall 36 which complements a similarly shaped ring 42 of elastomeric material placed about the locating ring side wall 38, which elastomeric rings 40 and 42 actually engage the walls of the capstan opening of the reel 26. Each elastomeric gripping ring is L-shaped in cross section and provided with horizontal bases or legs 44 and 46 which actually engage the side walls of the reel adjacent the capstan opening, as illustrated in FIGURE 4 at 48 and 50, to securely hold the reel within the container and space the side walls of the reel from the side walls of the container when the latter is closed.

The locating ring 32 of the cover member 12 forms a well 52 which opens in a direction facing the top side of the cover member. This well is formed as can clearly be seen in FIGURES 3, 4 and 8—10, inclusive, by a shoulder 54 which slopes inwardly toward the center of the well and which is integral with the locating ring side wall 36. This shoulder 54 connects with a pair of sloping side walls 56 and 58 which converge toward an integral bottom wall 60 to form a circular trough in the bottom of the well. Side wall 56 is integral with shoulder 54 and the side wall 58 terminates within the well 52 substantially midway between the plane of the circular side wall 12 and the plane of the bottom wall 60 and forms a small central opening 62 in the well. The shoulder 54 serves to space the side wall 56 from the side wall 38 of the base member to permit side wall 56 to be telescoped, or received, within the locating ring 34 of the base member when the cover member is to be closed onto the base member. The shoulder 54 and the locating ring side wall 36 are also provided with a plurality of openings 64 (eight shown) spaced uniformly around the well to permit a similar number of latching fingers 66 forming part of the locking mechanism, indicated in its entirety as 70, to be spaced between the side wall 56 and within the diameter of the locating ring side walls 36 and 38 as the cover member is placed in a position to be locked onto the base member.

Attention is now directed to FIGURES 3, 6 and 10—14, inclusive, which show the various parts of the locking mechanism 70 in detail which will be now described in detail.

Locking mechanism 70 comprises a concavo-convex snap ring or washer 72 which in the preferred practice of the invention is made of polypropylene and whose outer periphery has the aforementioned latching fingers 66 formed integral therewith and whose center is provided with an opening 74, the edges of which are in the form of a bead 76. The concavo-convex snap ring 72 engages the edges of the openings 64 and the shoulder 54 with the concave surface facing toward the bottom wall 60 of the well and with the latching fingers positioned through openings 64. The central opening 74 of the snap ring is connected to a snap ring actuating device 78. This snap ring actuating device 78 as shown in FIGURE 14 is formed of two parts 80 and 82. Parts 80 and 82 are in the preferred practice of the invention made of styrene and part 80 comprises a relatively large, flat, disc-shaped button 84 and an integral tapered extension 86 of reduced diameter which has a centrally located aperture 88 to receive the tapered end 90 of the reduced end portion 92 forming part of the second part 82. The reduced end portion 92 actually comprises four relatively flat walls formed at 90° to one another and which are provided with a shoulder 94 formed between the reduced end portion 90 and a larger portion 96 which terminate with a relatively large, flat disc 98 formed integral therewith. When the two parts 80 and 82 are permanently together as by sonic welding or by a suitable solvent, and assem-

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bled as shown in FIGURES 3, 4, 5 and 7, the shoulder 94 and the end 100 form a peripheral groove 102 to position the bead 76 in such a manner that the snap ring is moved by actuation of the snap ring actuating device. In this assembly, the enlarged disc 98 on the second part 82 of the snap ring actuating device acts as a stop means by engaging a shoulder 104 on the periphery of the opening 62 in the well of the cover member to limit further upward movement of the snap ring actuating devices beyond the position where the disc 98 engages the shoulder 104. The position of the stop means engaging the shoulder 104 is clearly shown in FIGURE 7.

The locking mechanism 70 is also provided with a polypropylene retaining ring 106 which is shown in FIGURES 3, 4, 5, 7 and in the enlarged showing thereof in FIGURES 11 and 12. The retaining ring 106 is provided with a shoulder 108 on its outer diameter which when positioned faces toward the snap ring 72 so as to engage a shoulder 110 formed on the inner surface of the locating ring wall 36. The retaining ring is also provided with a plurality of oppositely directed projections 112 (eight shown) which form with shoulders 114 to engage the top edges 116 of the openings 64 in the locating ring shoulder 54.

The cooperation between the shoulders 108 and 114 of the retaining ring and the shoulder 110 and edges 116 of the cover member serve to lock the retaining ring in the well of the cover member and at the same time serve to hold the locking mechanism 70 in the cover member, yet permit movement of the outer periphery of the concavo-convex snap ring 72 on the edges of the sloping shoulder 54 and the edges of the opening 64 when the snap ring is actuated by the actuating device 78. This slight movement is accommodated in the space between the shoulder 54 and the lower terminal end 120 of the retaining ring 106.

From the foregoing description, it can be seen that when the cover member 12 is placed on the base member 14 in a manner such as shown in FIGURE 4, the push-pull button is in its uppermost position out of the well 52 so that the snap ring 72 is positioned with its concave surface facing the well. This position of the snap ring positions the latching fingers 66 so that they may easily be inserted with the side wall 38 of the locating ring 34 of the base member. When in this position, the movement of the push-pull button toward the cover member will cause the snap ring 72 to invert, that is, the snap ring acts like a Belleville washer and the concave surface becomes the convex surface, as can be seen in FIGURE 5. This movement of the concavo-convex snap ring snaps the latching fingers outwardly toward the locking shoulder 122 on the uppermost end of the side wall 38 to cause engagement of the shoulder 124 with the locking shoulder 122 to mechanically lock the cover member to the base member, such movement of the fingers being indicated by the arrows 126 in FIGURES 5 and 14.

With this mechanical latching of the latching fingers to the locking shoulder, the legs 46 and 50 of the gripping rings grip the edges of the reel 26 securely and under constant and uniform compression. Also, with the locking of the cover on the base member, the terminal end 128 of the side wall 38 engages the terminal end of the elastomeric gripping ring 40, causing the latter to expand slightly toward the wall of the capstan opening of the reel to additionally secure the reel within the container.

To open the container, it is simply necessary to pull the latching ring actuating device 78 out of the well, that is, in a direction away from the top of the cover member so that the snap ring 72 will revert to its original position. This reversion of the snap ring causes the latching fingers to snap out of engagement with the locking shoulder 122 so that the cover member can then be easily removed from the base member.

Turning now to FIGURES 16 and 17, there is shown therein a modified form of gripping rings which serve to

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grip the reel of magnetic tape in the container. In this embodiment, gripping ring 40a (which corresponds in function with the gripping ring 40) comprises a pair of side walls 130 and 132 which define a ring substantially U-shaped in cross section. The ring is placed within the cover member 12a so that the wall 132 will engage the locating ring side wall 36a under slight compression by flexing the web 134 joining the walls 130 and 132 so as to secure the locating ring side wall 36a. The gripping ring 40a is also provided with a horizontal leg 44a which corresponds in function to the leg 44 of gripping ring 40, and the latter is provided with a plurality of circumferentially spaced ribs 136, 138, 140 and 142. These ribs serve to engage the reel and securely hold the latter in position. In this embodiment also, the base member 18a is provided with a gripping ring 42a (which corresponds in function to gripping ring 40) and which is also provided with a pair of side walls 142 and 144 to form a ring substantially U-shaped in cross section but opening in the opposite direction from the ring 40a. The ring 42a is likewise in compressive engagement with the locating ring side wall 38a by flexing its web 146 to secure the ring therein and is also provided with a plurality of circumferential ribs 148, 150, 152 and 154 on the horizontal leg 46a which serve to grip the ring when the cover member is located on the base member. Leg 46a corresponds in function to the leg 46 of the gripping ring 42. These rings function in a manner similar to the elastomeric rings 40 and 42 to grip the reel when the container is locked, but are less apt to deteriorate and lose their gripping force during use. It should be noted also that in this embodiment, the upper ring 40a is urged in a direction radially toward the wall of the capstan opening of the reel by the action of the terminal portion 128a of the side wall 38a in a manner similar to that described in connection with the previous embodiments. In this embodiment, however, the base member 18a is provided with an inwardly directed ring 156 which prevents collapse of the ring 42a at the time the cover member 46a is placed on the base.

It will be noted that when the actuating device 78 is in its unlocked position, it protrudes slightly above the top surface of the cover member 12 and serves to indicate to the user that the container is not locked. This feature is important since it will prevent the inadvertent opening of the cover, causing an un-spooling of the tape should the container be lifted by its cover when it lies flat on the surface. When the push-pull button is in its locked position, as can be seen from FIGURES 18, 19 and 20, various containers can be nested either vertically or horizontally without interference from the locking mechanism. To accommodate this nesting, the outer surface of the cover and base members are provided with peripheral ridges 160 and 162, the latter being only slightly larger than the ridges 160 so as to engage one another during the nesting position as illustrated in FIGURE 18.

While any suitable high impact styrene may be used to form the cover member and base member, one suitable styrene is that produced by the Dow Chemical Company, Midland, Michigan, and sold under the trademark "Styron." The polyethylene used to form the gripping rings 40a and 42a may be any suitable polyethylene, one such being that sold by the E. I. du Pont de Nemours Company under the trademark "Alathon" and, finally, the polypropylene used to form the locking fingers and the concavo-convex snap ring may be any suitable polypropylene, one such suitable polypropylene being sold by the Enjay Chemical Co., a subsidiary of the Standard Oil Company of New Jersey, under the trademark "Escon."

While there are several embodiments of the present invention disclosed and described herein, it will be readily apparent to persons skilled in the art that numerous changes and modifications may be made without departing from the scope of the invention. Accordingly, the foregoing disclosure and description thereof are for illustrative purposes only and do not in any way limit the invention which is defined only by the claims which follow.

What is claimed is:

1. In a container to store a reel of magnetic tape, said container having a cover member and base member which form a flat drum-like enclosure, each member having a centrally disposed locating ring to position the reel within the container,
 - a locking mechanism for locking the cover member to the base member, comprising,
 - a plurality of latching fingers on the cover member for engagement with a locking shoulder on the base member, and
 - means including a snap ring constructed of a polypropylene material operatively connected to said latching fingers for causing engagement of said latching fingers with said locking shoulder to lock the cover member on the base member and to cause disengagement of said latching fingers from said locking shoulder to unlock said cover member and to permit removal of said cover member from said base member.
2. In a container to store a reel of magnetic tape, said container having a cover member and base member which form a flat drum-like enclosure, each member having a centrally disposed locating ring to position the reel within the container,
 - a locking mechanism for locking the cover member to the base member, comprising,
 - a plurality of latching fingers on the cover member for engagement with a locking shoulder on the base member,
 - means for causing engagement of said latching fingers with said locking shoulder to lock the cover member on the base member and to cause disengagement of said latching fingers from said locking shoulder to unlock said cover member and to permit removal of said cover member from said base member, and
 - gripping rings constructed of a polyethylene material disposed around said locking ring for resiliently gripping said reel upon locking of said cover member to said base member to secure said reel within said container.
3. For storing a reel of magnetic tape:
 - a cover member having a circular side wall and a depending end wall,
 - a base member having a circular side wall and a depending end wall,
 - said end walls adapted to telescope when the cover member is placed on the base member to form a relatively flat cylindrical drum-like container,
 - said cover member and said base member each having central locating rings comprising cylindrical walls of a diameter substantially equal to the capstan opening of the reel to be stored in the container,
 - said cylindrical walls extending in the same direction as the end walls,
 - means including latching fingers connected to a resilient plastic belleville washer in the locating ring of said cover member for engaging cooperative means in the locating ring of said base member to mechanically lock said cover member to said base member, and
 - means for actuating said plastic belleville washer so that in one position of said washer the latching fingers are free of said cooperative means and when moved to another position said latching fingers engage said cooperative means.
4. The storage means as claimed in claim 3, wherein said means for actuating said belleville washer extends beyond the side wall of said cover when said container is unlocked and is within the planes of the side walls of the cover and base member when said container is locked.
5. In a container for storing a reel having a central opening therein, the combination of:
 - a base member having a generally centrally disposed locating section;

- a cover member having a generally centrally disposed locating section, said cover member being interconnectible to said base member to form a generally tubular reel receiving enclosure for the reel with the locating sections of said cover and base members being receivable in the central opening of the reel, said reel receiving enclosure having an inner peripheral region;
- a locking shoulder on one of said members adjacent the inner peripheral region of said tubular reel receiving enclosure;
- a plurality of movable latching fingers on the other of said members adjacent said inner peripheral region of said tubular reel receiving enclosure for engagement with said locking shoulder; and
- actuator means for causing engagement of said latching fingers with said locking shoulder to lock the cover member to the base member and to cause disengagement of said latching fingers from said locking shoulder to unlock said cover member and to permit removal of said cover member from said base member.
6. A combination as defined in claim 5 wherein said locking section of said one member defines said locking shoulder and said movable fingers are carried by said locating section of said other member.
7. A combination as defined in claim 5 wherein said one member is said base member and said other member is said cover member, said locating section of said base member includes a sidewall defining said locking shoulder and resilient means are provided on said cover member for snapping said fingers into and out of engagement with said locking shoulder.
8. A combination as defined in claim 5 including means surrounding said locking shoulder and said latching fingers to separate said locking shoulder and said latching fingers from said tubular reel receiving enclosure.
9. In a container for storing a reel, the combination of:
 - a base member having a generally centrally disposed locating section and a locking shoulder;
 - a cover member having a generally centrally disposed locating section, said locating section of said cover member having a wall portion defining an outwardly opening well in said cover member, said wall portion having opening means therein for providing communication to said locking shoulder, said members being interconnectible to form an enclosure for containing the reel; and
 - a latching assembly in said well and including a plurality of movable latching fingers extending through said opening means and lockingly engageable with said latching shoulder and actuator means in said well for causing engagement of said latching fingers with said locking shoulder to lock the cover member on the base member and to cause disengagement of said latching fingers from said locking shoulder to unlock said cover member and to permit removal of said cover member from said base member.
10. A combination as defined in claim 9 wherein the actuator means includes a snap ring in said well and push-pull means attached to said snap ring for operating said snap ring.
11. In a container for storing a reel having a central opening therein, the combination of:
 - a base member having a generally centrally disposed locating section;
 - a cover member having a generally centrally disposed locating section, said cover member being interconnectible with said base member to form a reel receiving enclosure for the reel with the locating sections of said cover and base members being receivable in the central opening of the reel;
 - a locking shoulder on one of said members;
 - a movable latching finger on the other of said members for engagement with said locking shoulder;
 - actuator means for causing engagement with said latch-

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ing finger with said locking shoulder to lock the cover member on the base member and to cause disengagement of said latching finger from said locking shoulder to unlock said cover member and to permit removal of said cover member from said base member; and

means surrounding said locating sections expandable in response to bringing said members together to tightly hold the reel within said enclosure.

12. A combination as defined in claim 11 wherein said last-mentioned means includes first and second expandable rings surrounding said locating sections, respectively.

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13. A combination as defined in claim 12 wherein each of said rings has a generally U-shaped cross section.

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