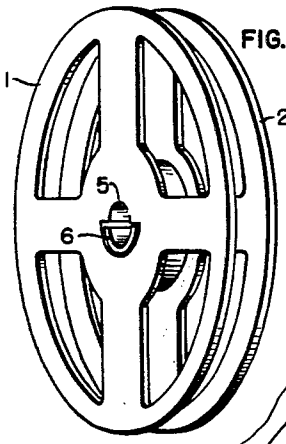
Aug. 4, 1964 A. Z. PURZYCKI 3,143,313

MOLDED SEPARABLE REEL

Filed Dec. 6, 1961

FIG. 1



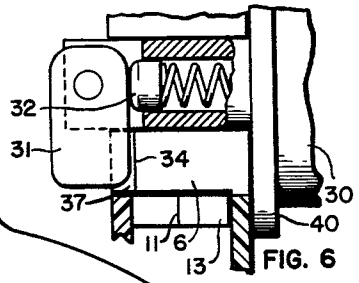


FIG. 6

FIG. 2

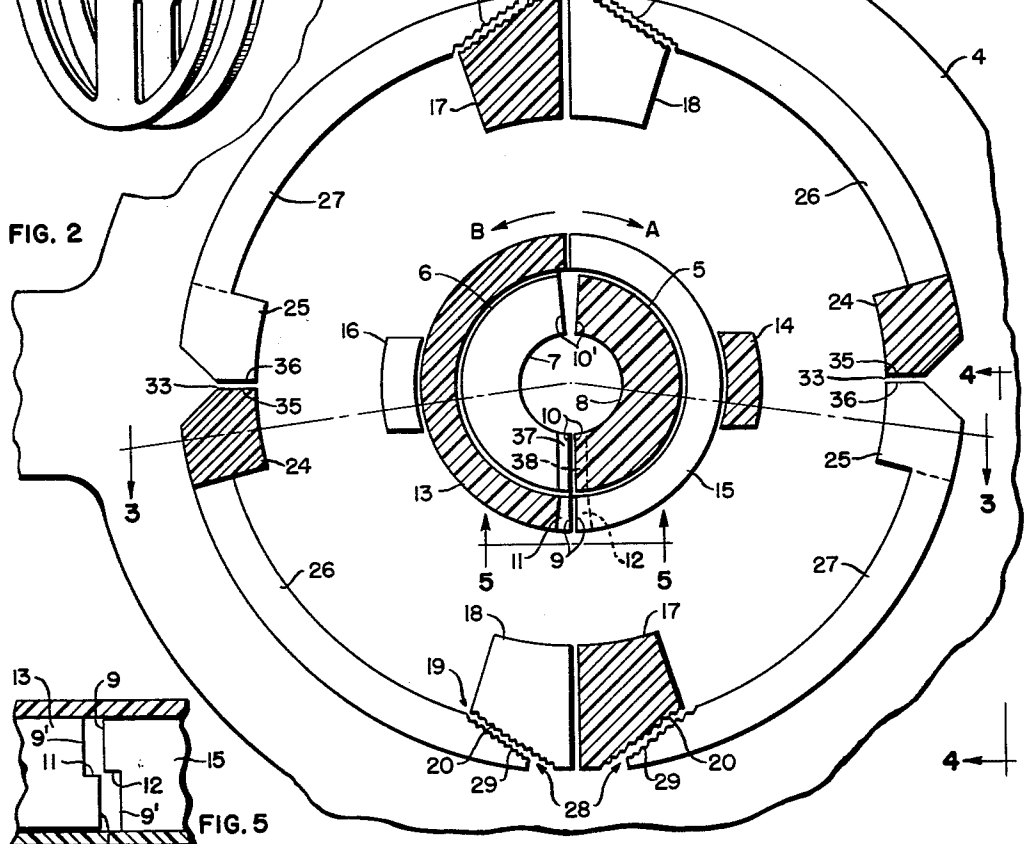


FIG. 5

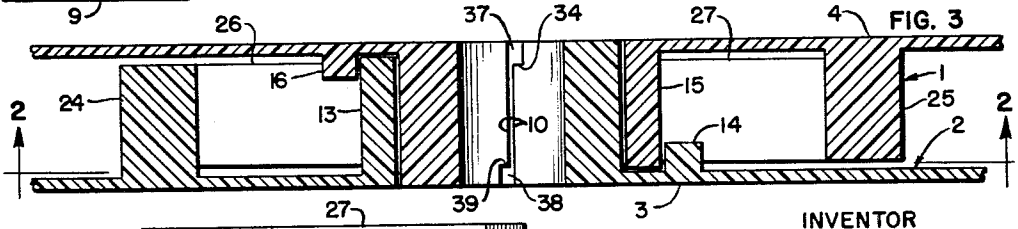


FIG. 3

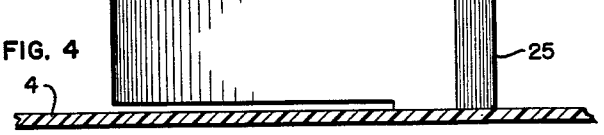


FIG. 4

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MOLDED SEPARABLE REEL

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This invention relates to a reel and more particularly to a reel for a ribbon or web of material such as the paper tape used with data processing machines.

An object of the invention is to provide an inexpensive reel made of a moldable plastic material.

Another object of the invention is to provide a reel that is constituted by two identical reel halves.

Another object of the invention is to provide a composite reel formed of two identical reel halves that can be molded from a plastic material in a single die.

Another object of the invention is to afford on each of the halves of a reel a simple interlocking means which will permit the reel to be readily assembled and disassembled.

Another object of the invention is to frictionally hold a pair of reel halves together to form a reel.

Another object is to provide a reel in which either side of the reel is capable of being secured to the reel driving means.

Another object of the invention is to provide a reel in which a coil of tape wound upon the reel can be easily removed while remaining in its coiled condition.

Another object of the invention is to provide an expandable and contractible tape supporting surface upon which a tape is wound into a coil while the tape supporting surface is expanded and from which the coil of tape is readily removable when the tape supporting surface is contracted.

Another object of the invention is to provide a two-piece reel wherein the pieces nest one within another and upon a simple twisting motion will be locked in a unitary reel structure.

Another object of the invention is to lock assembled reel halves against separation in the axial direction.

In accordance with the invention, a reel half is provided with an arcuate spring arm attached to a flange at only one end and adapted to be flexed outwardly by a protrusion on the flange of the opposite reel half. The flexed spring arm forms an expanded surface upon which the tape is wound into a coil. The coil of tape can be removed by twisting the reel halves relative to one another to allow the spring arm to collapse inwardly from its flexed position whereby the spring arm no longer tightly grips the inner coil of tape.

Other features and advantages of the invention will become apparent from the following detailed description when considered in conjunction with the accompanying drawing wherein:

FIG. 1 is a perspective view of the reel according to the preferred embodiment of the invention;

FIG. 2 is an enlarged sectional view taken along the line 2—2 of FIG. 3 in the direction of the arrows showing the reel halves in their nested and unlocked state;

FIG. 3 is a cross section taken at line 3—3 of FIG. 2 to show the halves of the reels in an unlocked nesting position;

FIG. 4 is a section view taken along the lines 4—4 of FIG. 2 in the direction of the arrows to show the relationship of a spring arm to its flange;

FIG. 5 is a sectional view taken along the line 5—5 of FIG. 2 and in the direction of the arrows showing axial interlocks on retainer rings, and

FIG. 6 is a fragmentary view showing a tab of a winder shaft accommodated in a recess therefor.

Referring momentarily to FIG. 1, there is illustrated two identical reel halves 1 and 2 preferably made of a moldable plastic material and cast from a single mold. As will be observed in FIG. 3, the upper reel half 1 has a circular flange 4 and the lower reel half has a circular flange 3 for guiding the edges of the tape as it is being wound or unwound within the reel halves 1 and 2. Each of these flanges 3 and 4 has integrally formed therein substantially semicircular hubs, designated respectively as 5 and 6, that extend laterally a sufficient distance from their respective flanges 3 and 4 to provide large internal semicircular bearing surfaces 7 and 8 for engaging a winder shaft 30 (FIG. 6) which drives the reel.

The hubs 5 and 6 extend circumferentially almost 180° and when nested together as in FIG. 2 the internal bearing surfaces 7 and 8 have almost 360° of contact with the winder shaft 30 for adequately supporting the reel on the shaft 30. The hubs 5 and 6 terminate circumferentially in end walls 10 and 10', respectively, which are in close proximity to one another and, as shown in FIG. 2, the gap between the end walls 10' is larger than the gap between the end walls 10 of the hubs 5 and 6. This larger gap is necessary to prevent the abutment of the end walls 10 of the hubs 5 and 6 when, for reasons brought out hereinafter, the hub 5 is rotated counterclockwise and the hub 6 is rotated clockwise to narrow the gap existing between end walls 10' of the hubs 5 and 6 and conversely to expand the gap existing between the end walls 10 of the hubs 5 and 6.

As the expanded gap between end walls 10 is of insufficient width to accommodate winder tab 31 of the winder shaft 30, recesses 37 and 38 are formed in each of the end walls 10 to accommodate the winder tab 31. The recesses 37 and 38 terminate in the axial direction with shoulders 34 and 39 that define the depth of the recesses 37 and 38 and which cooperate with a flange 40 on the winder shaft 30 to limit therebetween the axial movement of the hubs 5 and 6 on the winder shaft 30. As will be apparent from FIG. 3, either the recess 37 or the recess 38 is accessible to the winder tab 31 of the winder shaft irrespective of which flange 3 or 4 is placed against the flange 40 on the winder shaft 30.

To provide additional support and stability to the reel halves 1 and 2 and the hubs 5 and 6 thereof, substantially semicircular retainer segments 13 and 15 are provided on flanges 3 and 4 and are radially disposed a slight distance from their respective flanges 3 and 4 to nest around the outer periphery of the opposed hub 5 or 6 on the opposed reel half. As will be observed in FIG. 3, these retainer segments 13 and 15 extend laterally to within close proximity of the opposed flange.

The retainer segments 13 and 15 extend circumferentially almost 180° and terminate in stepped end walls having shoulders 11 and 12 separating projecting lugs 9 and recesses 9', the recesses 9' being formed between the shoulders 11 and 12 on the end walls and the flanges 3

and 4. That is, those portions of the retainer segments 13 and 15 attached to the respective flanges 3 and 4 do not extend arcuately about the flange for as great a distance as do those portions of the retainer segments remote from their respective flanges. The projecting lug 9 of one retainer segment is matched for entry into the recess 9' on the opposite flange. Accordingly, if the retainer segment 13 is rotated counterclockwise and the retainer segment 15 is rotated clockwise, the projecting lug 9 on the retainer segment 13 moves counterclockwise into the recess 9' of the retainer segment 15 and the projecting lug 9 of the retainer segment 15 moves clockwise into the recess 9' of the retainer ring 13 whereupon the shoulders 11 and 12 abut to form an interlock preventing axial separation of the heel halves 1 and 2 so long as they remain angularly disposed relative to one another. Movement of the reel halves 1 and 2 in opposite directions to those specified above, will remove the projecting lugs 9 from their respective recesses 9' in the opposite retainer segments thereby disengaging the shoulders 11 and 12.

Also, secured to the flanges 3 and 4 respectively are nesting projections 14 and 16 which extend only a slight distance across the width of the tape reel, as best shown in FIG. 2, and which extend only for a small arcuate distance about the hubs 5 and 6 and retainer segments 13 and 15. As their nomenclature suggests, these nesting projections 14 and 16 serve to align and nest together the reel halves 1 and 2.

Extending outwardly from the respective flanges 3 and 4 in a lateral direction and spaced outwardly from the retainer segments 13 and 15 are a pair of diametrically opposed inflexible projections 17 and 18 which substantially span the distance between the opposing flanges 3 and 4. Each of these projections 17 and 18 has an inclined surface 19 with friction surfaces 20 that are preferably toothed or serrated surfaces.

As best seen in FIGS. 3 and 4, spring arms 26 and 27 are attached to their respective flanges 3 and 4 by supporting projections 24 and 25 integrally formed in their respective flanges 3 and 4. These spring arms are of cantilevered construction in that they are solely connected to the supporting projections 24 and 25 and are not otherwise attached throughout their entire length to their respective flanges 3 and 4 except by these supporting projections or posts 24 and 25. Accordingly, because these spring arms 26 and 27 are cantilevered and extend arcuately for almost 90° (FIG. 2) and are of relatively narrow thickness, the spring arms 26 and 27 are capable of being flexed upon the application of a force on their extremities 28. Two spring arms are mounted on each of the flanges 3 and 4 and due to their being equally disposed from the axes of their respective flanges and due to their extending almost a full quadrant, the spring arms constitute a circular hub or tape bearing surface, as will be brought out more fully hereinafter. Spring arms 26 and 27 are of a width to span substantially the entire distance between opposing flanges 3 and 4 and hence are able to engage tape over substantially the entire width of the tape being wound thereon. The free ends of the spring arms 26 and 27 have inclined surfaces 28 with friction surfaces 29, such as toothed or serrated surfaces. The inclined surfaces 28 are inclined to match the inclined surfaces 20 on the supporting projections 17 and 18.

Thus, when the reel half portions 1 and 2 are nested together as shown in FIGS. 1 and 2 and given a twisting motion to turn one reel half relative to the other reel half, e.g., when an operator twists the reel half 3 in the direction of the arrow B and the reel half 4 in the direction of the arrow A, the spring arms 26 move counterclockwise and their inclined surfaces 28 move up the inclined surfaces 19 of the projections 18 which move in a clockwise direction, thereby flexing the spring arms 26 radially outward from their nonflexed positions, shown in FIG. 1. Manifestly, the spring arms 27 associated with flange 4, as they move clockwise, likewise present their inclined surfaces 28 to the inclined surfaces 19 which move counterclockwise, thereby forcing the spring arms 27 radially outward. The tooth-like surfaces 29 on the inclined surfaces 28 of the spring arms 26 and 27 interlock with the tooth surfaces 20 on the inclined surfaces 19 of the projections 17 and 18 and frictionally lock and hold the two reel halves 1 and 2 in these rotatively displaced positions thereby forming a unitary reel structure.

Since the spring arms 26 and 27 exert radially directed downward forces on the projections 17 and 18 as they endeavor to slide down the inclined surfaces 19 of projections 17 and 18 and return to their non-flexed position and since their interlocked friction surfaces 20 and 29 prevent the opposed inclined surfaces 19 and 28 from returning to the original nonengaging position to relieve this downward force, the reel halves 1 and 2 are held interlocked until a sufficient twist is given to their respective halves in a direction opposite to that of the arrows A and B to overcome the interlocking force.

Also, it will be remembered that the shoulders 11 and 12 become engaged when the reel halves 3 and 4 are twisted relative to one another and thereby prevent separation of the reel halves in the axial direction while the reel halves remain frictionally interlocked.

After the two reel halves have been thus frictionally joined together to form a single unitary structure, a piece of tape can be threaded between the radial surfaces 35 and 36 on supporting projections 24 and 25. These radial surfaces 35 and 36 forming therebetween a tape entry slot 33 for reception of the free end of a tape to the reel. As the tape is wound about the outer surfaces of the radially flexed spring arms 26 and 27 the innermost turns of the tape tightly grasp the outer surface of the spring arms 26 and 27. It should be noted that after the entry of the tape within slot 33, driving of the reel in either direction urges the inclined surfaces 28 of the spring arms 26 and 27 to move up on the inclined surfaces of the projections 17 and 18 thereby more firmly holding the reel halves together. For instance, if the winder tab 31 is in driving engagement with the hub 5 of flange 3 and the winder shaft is rotating in a counterlockwise direction as seen in FIG. 2, i.e., in the direction of arrow B, the flexible arms 26 secured to the flange 3 will be rotated in a counterclockwise direction and their inclined surfaces 29 will move up the opposed inclined surfaces on projections 18 of reel half 1, which reel half, due to inertia, resists any initial counterclockwise movement. Similarly, the projections 17 in moving counterclockwise with the flange 3 will engage their friction surfaces 20 with the friction surfaces 29 on spring arms 27. Conversely, if the winder tab 31 is rotated in the clockwise direction, winder tab 31 would engage the hub 7 on the flange 4 of reel half 1 and move reel half 1 relative to reel half 2 thereby rotating the spring arms 27 in a clockwise direction and moving their inclined surfaces 29 upwardly on the inclined surfaces 20 of the projections 17 on reel half 2, which reel half, due to inertia, resists any initial clockwise movement. In the last described relative movement of the flange 4, it will carry the surfaces 20 on projections 18 into binding engagement with the surfaces 29 on arms 26. Likewise, when stopping the reel the inertia of the reel half being driven through the spring arms tending to continue to rotate causes the spring arms and projections to move relative to one another thereby forcing the spring arms outwardly and thereby increasing the force tending to hold the reel halves together.

After having wound a tape on the reel, it is often desired to remove the tape in its coiled condition without unwinding the coil or disturbing the innermost coils which are tightly gripping the tape supporting surfaces of radially flexed spring arms 26 and 27. As will be readily understood, upon the twisting of the flanges 3 and 4 in the direction opposite to the arrows A and B, the inclined surfaces 28 of the spring arms 26 and 27 slide downwardly across the inclined surfaces 20 of the projections 17 and

18 thereby permitting the spring arms 26 and 27 to move from their flexed position to their normal nonflexed position. This inward movement of the spring arms 26 and 27 thus releases the innermost turns of the coil of tape and permits the ready removal of the entire coil of tape upon separation of the reel halves 3 and 4 in the axial direction.

Although only one embodiment of the invention is shown in the drawing and described in the foregoing specification it will be understood that invention is not limited to the specific embodiment described but is capable of modification and rearrangement and substitution of parts and elements without departing from the spirit of the invention

What is claimed is:

1. A reel half for cooperation with a like reel half to form a tape supporting reel comprising: a circular flange; arcuately shaped tape supporting arms forming segments of an expandable hub for frictional engagement with the inner course of a supply of tape wound on said reel, said arms each having one end rigidly fixed to an inner face of the flange and the remainder of said arm adjacent said inner face extending along and spaced from said inner face for flexure outwardly with respect to the axis of the circular flange in a path parallel to the face of the flange from a relaxed position out of frictional engagement with said inner course to a flexed position to engage said inner course; and means for moving said free ends of said arms from the relaxed to the flexed position upon interengagement of said reel half with a like reel half and rotation of said halves relative one to the other.

2. A reel half for cooperation with a like reel half to form a tape-supporting reel, said reel half comprising: a sheet-like, generally circular flange; a first post projecting from the inner face of said flange; a flexible arm connected to extend from said first post arcuately along and spaced from the inner face of said flange for flexure outwardly with respect to the axis of the flange in a path parallel to the face of the flange, said arm being oriented to form a portion of a tape-supporting hub for frictional engagement with the inner turn of a supply of tape wound on said reel; and a second post extending from the same face of said flange as said arm, said post being located to cooperate with the free end of the flexible arm of a like reel half to wedge the free end of such arm on the like reel half outwardly of said axis from a relaxed position out of frictional engagement with the inner turn to a flexed position in engagement wtih the inner turn of the supply of tape on the reel upon interengagement of said reel half with said like reel half and rotation of said halves relative one to the other.

3. A reel half for cooperation with a like reel half to form a readily assembled and disassembled reel, each reel half comprising: a flange having a plurality of supporting projections mounted on one face of said flange; a plurality of flexible arms extending arcuately along and spaced from the one face of said flange to form expandable tape-supporting hub portions for frictional engagement with the inner course of a supply of tape wound on said reel, said arms each having one end rigidly fixed to one of the supporting projections on the flange and the other end of each of said arms being free; and a plurality of protrusions extending from the same face of said flange as said arms to flex the free ends of the flexible arms of the like reel half outwardly from a relaxed position out of frictional engagement with said inner course to a flexed position to engage said inner course when said reel halves are interengaged and rotated relative to one another.

4. A two-piece tape-supporting reel comprising: a first circular flange having a projecting cam surface thereon; a first flexible arm having one end rigidly fixed to an inner face of the first circular flange and the remainder of the arm adjacent said inner face extending along and spaced from said inner face in an arcuate path from said one end; a second circular flange having a projecting cam surface

thereon engageable with said first flexible arm to flex said first flexible arm outwardly with respect to the axis of the first circular flange in a path parallel to the inner face of the first flange; and a second flexible arm having one end rigidly fixed to an inner face of the second circular flange and the remainder of the second arm adjacent said inner face of said second circular flange extending along and spaced from said inner face of said second circular flange in an arcuate path from said one end with the other end free for engagement with said projecting cam surface on said first flange for movement from a relaxed position to a flexed position upon interengagement of said first and second flanges and rotation of said flanges relative to one another.

5. A plastic reel according to claim 4 including: a first projecting lug on said first flange and a second projecting lug on said second flange to engage with and abut on said first projecting lug in order to interlock said flanges against axial displacement when said flanges are rotated relative to one another.

6. A molded reel structure comprising two reel halves to form a readily assembled and disassembled reel, each reel half comprising: a circular flange; a flexible arm extending arcuately about the axis of the circular flange and in close proximity to said flange to form a segment of an expandable hub for frictional engagement with the inner course of a supply of tape wound on said reel, said arm having one end molded integrally on the inner face of said flange and the remainder of said arm adjacent said inner face extending along and spaced from said inner face for movement outwardly with respect to the axis of the circular flange in a path parallel to the face of the flange from a relaxed position out of frictional engagement with said inner course to a flexed position to engage said inner course; and means for moving said free end of said flexible arm from the relaxed to the flexed position upon interengagement of said reel halves and rotation of said halves relative one to the other.

7. A molded reel according to said claim 6 including: an axial abutting interlock on each of said flanges to lock said reel halves against axial movement when said reel halves have been twisted relative to one another to cam said flexible arms outwardly.

8. A reel structure composed of a pair of identical molded plastic reel halves arranged to be nested one within another and angularly displaceable to one another while nested to form a composite reel structure wherein each of the reel halves is comprised of a tape guiding flange for rotation about a central axis, a plurality of flexible protrusions secured to said flange and arcuately extending about the said axis constituting a circular surface upon which to wind tape, a plurality of inflexible protrusions secured to said flange and adapted to engage and flex the flexible protrusions on the opposite reel half when said reel halves have been angularly displaced, a central hub protrusion arcuately extending about said axis and having a surface to engage a driving means for said reel, and an interlocking protrusion secured to said flange having an overhanging lug portion thereon whereby when said flanges are moved angularly relative to one another said overhanging lugs on opposed flanges interlock to hold said flanges against axial movement and said flexible protrusions are flexed outwardly by said inflexible protrusions to constitute an expanded tape supporting surface that is collapsible when said flanges are returned from their angularly displaced positions.

9. In a reel structure comprising two identical reel halves interlocked together wherein each reel half comprises a circular side flange having a retainer hub segment projecting therefrom and extending about the axis of the flange a distance less than 180 degrees, said retainer segment having a projecting lug spaced from and parallel to the inner face of the flange to cooperate with a like lug formed on the retainer segment of the other reel half to lock said reel halves from axial separation, first supporting projections formed on the inner face of the flange and

radially spaced from the retainer segment, second projections formed on the inner face of the flange and radially spaced from the retainer segment, said second projections having inclined serrated surfaces extending toward the first projections formed on the other reel half, and resilient arms extending arcuately from said first supporting projections to overlie the inclined serrated surfaces, said resilient arms provided with inclined serrated tips to interlock with the inclined serrated surfaces to lock the reel halves against relative rotary movement.

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