July 3, 1962 J. W. H. BISHOP 3,042,180

INKING RIBBON SPOOL

Filed Feb. 12, 1960 3 Sheets-Sheet 1

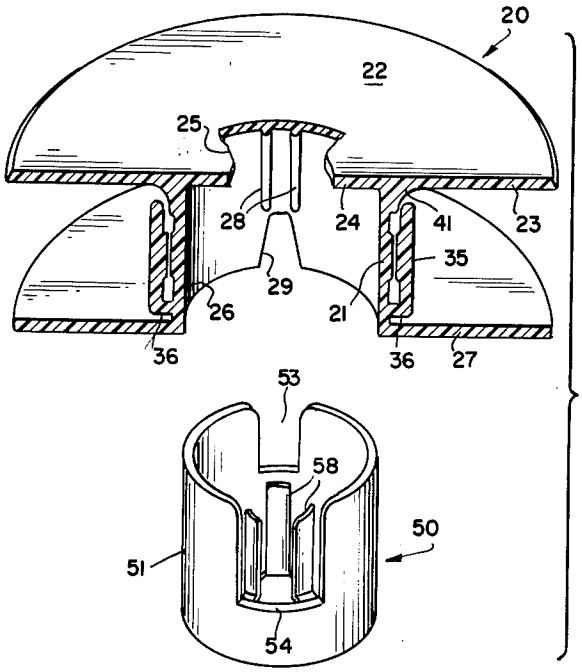


FIG. 1

FIG. 16

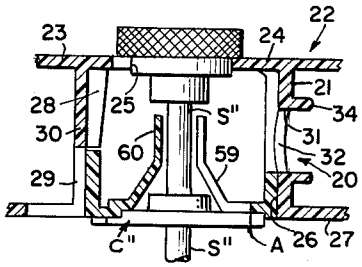
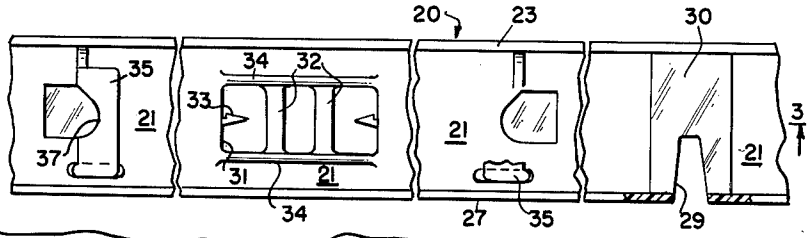


FIG. 2



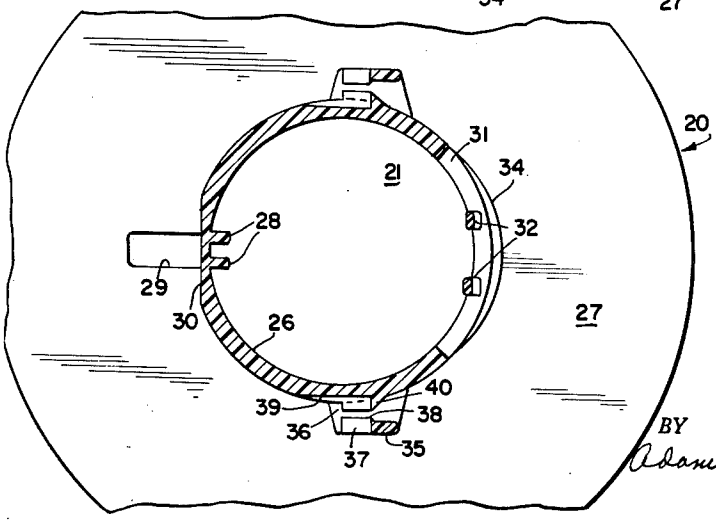


FIG. 3

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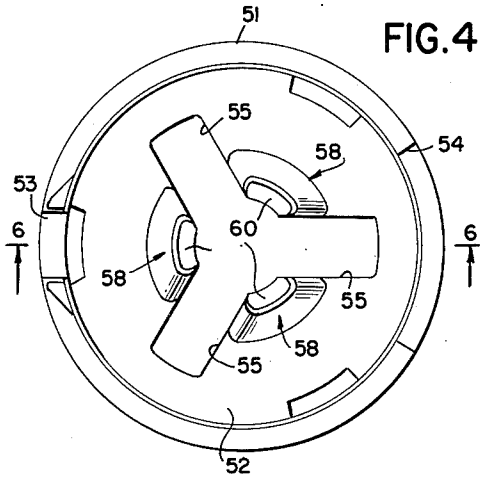
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July 3, 1962 J. W. H. BISHOP 3,042,180

INKING RIBBON SPOOL

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FIG.4



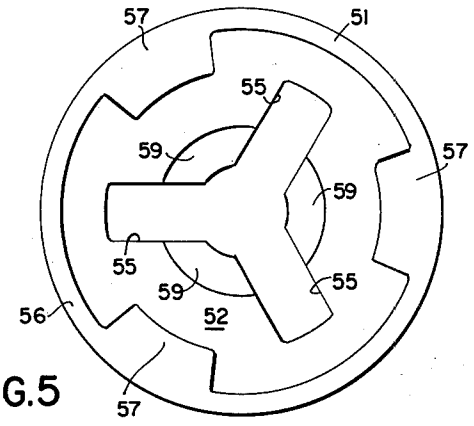
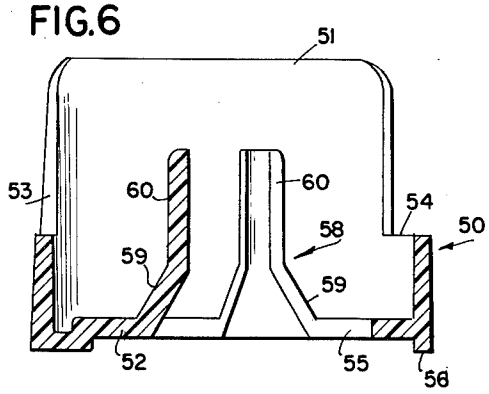


FIG.5

FIG.6



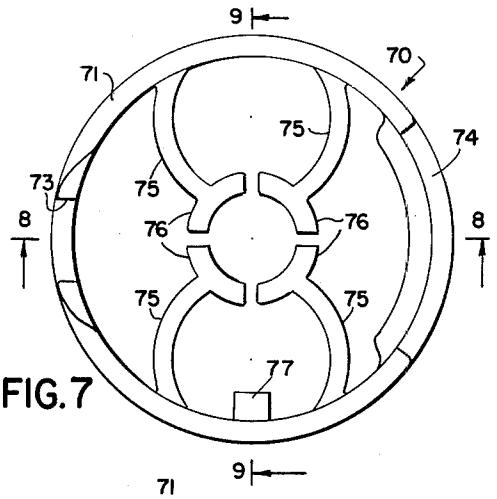


FIG.7

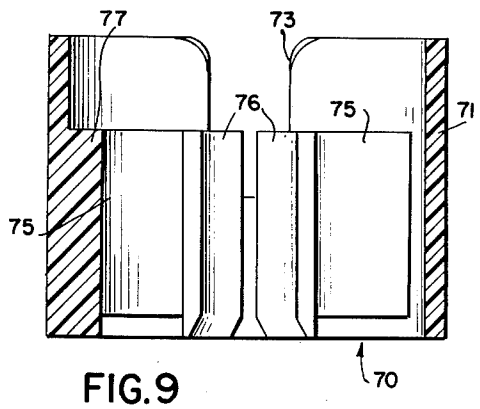


FIG.9

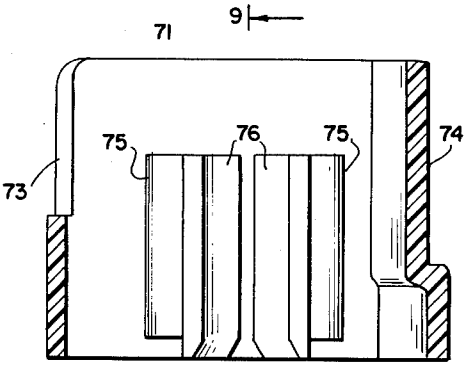


FIG.8

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INKING RIBBON SPOOL

Filed Feb. 12, 1960 3 Sheets-Sheet 3

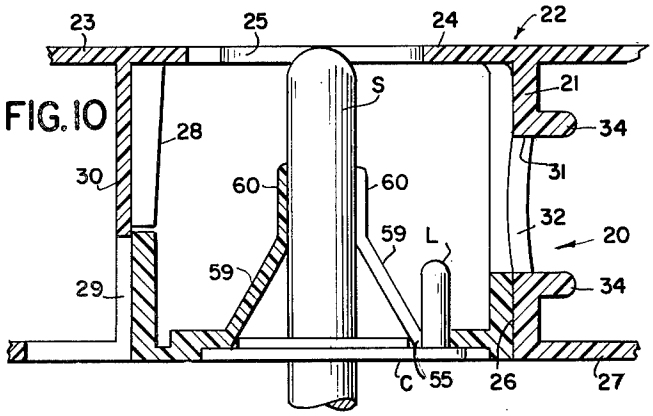


FIG. 10

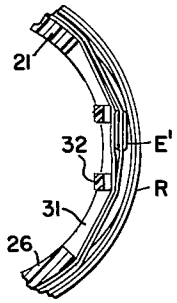


FIG. 14

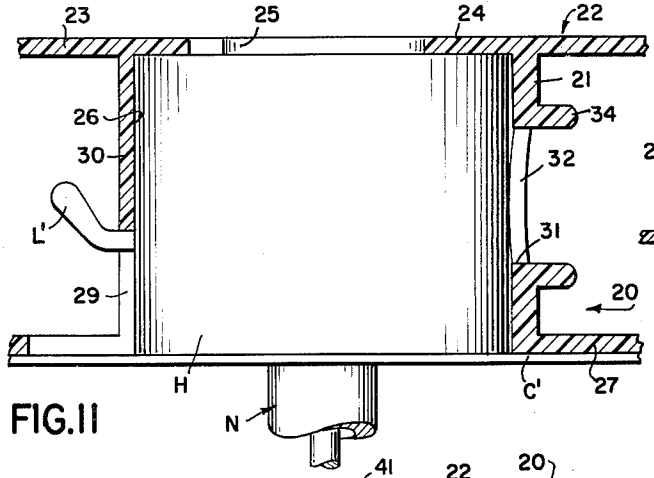


FIG. 11

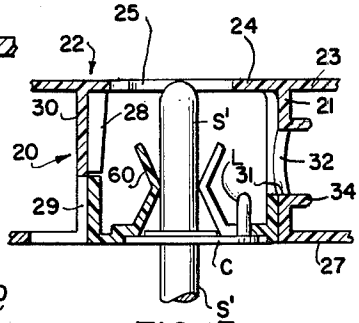


FIG. 15

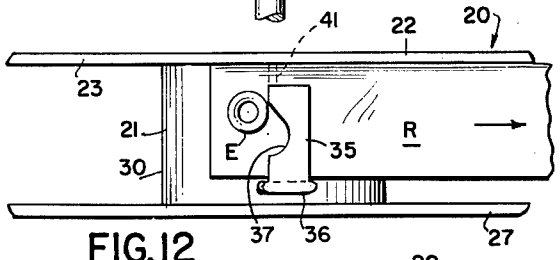


FIG. 12

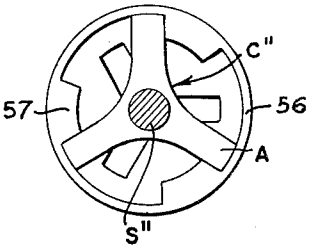


FIG. 17

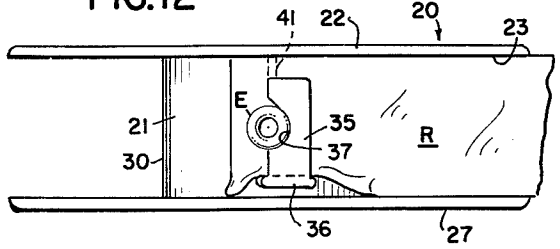


FIG. 13

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United States Patent Office 3,042,180 Patented July 3, 1962

3,042,180

INKING RIBBON SPOOL

John W. H. Bishop, Montreal, Quebec, Canada, assignor to Bishop Spools, Inc., New York, N.Y., a corporation of New York

Filed Feb. 12, 1960, Ser. No. 8,375
8 Claims. (Cl. 197—175)

My invention relates to business machine inking ribbon spools and in particular provides an inking ribbon spool accommodating a variety of different driving spindles and different ribbon fastening devices.

It is a primary object of my present invention to provide a business machine inking ribbon spool generally in accordance with the teaching of my Patent No. 2,873,839, dated February 17, 1959, but in which the spool construction is modified in a manner permitting its fabrication from relatively rigid synthetic plastic material, such as polypropylene, polystyrene, and poly methylmethacrylate, rather than from sheet metal for which the specific construction shown in my aforenoted patent is designed.

As pointed out in my aforenoted patent (column 1, line 23—column 2, line 9), the ribbon driving spindles on typewriters and other business machines of various manufacture are usually designed to receive the inking ribbon spool in one of either of two ways: in one case, the spool holder has been designated as the "shaft type" in which the spool is received on a collared shaft of relatively small diameter, substantially less than the diameter of the hub of the spool; and in the other case the spool holder has been designated as the "noiseless core-type" in which the spool is received on an enlarged hub of a size closely fitting the hub of the spool.

It will be also noted that typewriters and other business machines employing inking ribbons are provided with varying types of reversing mechanisms. Generally in the noiseless core-type the enlarged hub of the spool holder contains a pivoted lever which is linked to the reversing mechanism within a spindle on which the hub is mounted and which is arranged to swing outwardly through a slot in the hub of the spool holder unless restrained by ribbon retained on the spool, the spool being provided with a corresponding slot to receive the free end of the reversing lever. On the shaft type the reversing mechanism is sometimes sensitive to the presence of the ribbon on the spool and more often is arranged to sense an eyelet or other enlarged marker located a short distance from the bitter end of the ribbon.

It should also be recognized that in the industry a variety of ribbon attaching devices are employed. These can include spears mounted on the hub of the ribbon spool for piercing the end of the ribbon, arms spaced above the hub of the spool on which loops or hooks on the end of the ribbon can be employed to secure the ribbon to the spool, hooks mounted on the end of the ribbon received in openings in the hub of the spool, eyelets on the end of the ribbon received on lugs outwardly projecting from the hub of the spool and varying other devices. Thus, in accordance with my present invention, I contemplate providing a typewriter or other business machine inking ribbon spool having a hollow hub of a size to fit the noiseless core-type spool holder and an adapter which is received in the hollow hub which is provided centrally with a split resilient sleeve to accommodate spool holders of differing diameter of the shaft type. The spool and adapter are so constructed that when the adapter is received in the spool, the adapter engages the spool in a manner causing the two to rotate together as a unit.

It is also an important object of my present invention

to provide a spool and adapter unit in accordance with my aforenoted patent, which is designed to accommodate the varying reversing mechanisms most commonly employed in the typewriter and business machine industry and which is capable of being secured to the bitter end of the inking ribbon, whether eyelets, hooks or loops, or whether no fastening devices are employed on the end of the ribbon.

It is another important object of my present invention to provide a spool and adapter unit in accordance with my aforenoted patent in which the hub of the spool is interiorly provided with a partially cut out portion providing a leaf spring which projects into the bore of the hub frictionally to engage the enlarged hub of a noiseless core-type spool holder.

It is further an important object of my present invention to provide an improved spool construction accommodating the reversing lever of a noiseless core-type spool holder.

It is still another important object of my present invention to provide a novel ribbon end fastening arrangement specifically constructed to accommodate plastic molding techniques.

It is yet another object of my present invention to provide an adapter construction in accordance with my aforenoted patent which is amenable to plastic molding techniques.

These and other objects of my invention, which will become more apparent hereinafter, are essentially achieved by utilizing a hollow hub spool constructed of a relatively hard, rigid, synthetic plastic material, such as polypropylene, polystyrene and poly methylmethacrylate, and an adapter for axial engagement in such hub constructed of a relatively more flexible although still self-supporting, resilient synthetic plastic material such as polyethylene.

In accordance with my aforenoted patent, the adapter is itself a hollow hub which is centrally provided with a split resilient sleeve adapted to fit driving spindles of differing diameter of spool holders of the shaft type and is engageable within the hub of the spool in a manner preventing relative rotation between the spool and adapter in order that the spool can be driven with the adapter as a unit.

Also in accordance with my aforenoted patent, the hub of the spool proper is arranged resiliently to receive the enlarged hub of spool holders of the noiseless core-type, when the adapter is removed, by providing a window in which spring leaves are positioned. Similarly, the hub and bottom flange of the spool proper are apertured at the usual location of the reversing lever on noiseless core-type spool holders and splines are provided within the hub of the spool at the location of the reversing lever aperture for keying the spool on the noiseless core spool holder. The same splines cooperate with a slot in the adapter to key the adapter and spool. In accordance with my aforenoted patent, the hub of the spool is also provided with exteriorly accessible fastening devices for securing the end of a ribbon to the spool.

In accordance with my present invention, the adapter accommodated to plastic molding techniques fundamentally includes a cylindrical side wall portion, a lower end which is open at its center to receive the driving spindle of a shaft-type spool holder and which is adapted to abut the supporting collar of the spool holder. The lower end of the adapter is also provided with apertures for receiving the upstanding driving lug or lugs typically found on many of the shaft-type spool holders. Desirably, the bottom of the adapter is also provided with a boss or bosses adjacent the sidewall portion of the adapter for engaging the arms found on shaft-type spool holders having clover leaf collars. Internally, the split

sleeve can be formed on arms extending inwardly from the sidewall portion but preferably is formed by upwardly turned arms extending parallel to each other from the bottom of the adapter. In order to permit proper molding techniques, the top of the adapter is left open and in order to accommodate hook-type fastening devices at the ribbon ends, the sidewall of the adapter adjacent the window in the hub of the spool proper is either recessed or cut away.

In accordance with my present invention, the spool is formed as an integral unit including a pair of parallel circular disks joined by a tubular hub extending between them. The bottom disk, i.e. flange, has an open center coinciding with the bore of the hub while the top disk, i.e. flange, has an open center of substantially smaller diameter partly closing the top of the hub, thus permitting the adapter to be pushed into the hub from the bottom of the hub only and aiding in proper axial alignment of spool and adapter. The splines on the interior of the hub of the spool of my present invention, which function to key the spool to a noiseless core spool holder or to the adapter, extend parallel to each other and to the axis of the spool partly down from the top of the hub, terminating above the aperture provided for the reversing lever of the noiseless core spool holder. The thickness of the splines which is required to provide adequate structural strength prevents extension of the splines about the position of the reversing lever as normally provided in conventional metal spool constructions. Because even with metal spool constructions a limited clearance is provided for the reversing arm on the noiseless core spool holder to function, in accordance with my present invention I not only eliminate the conventional lower splines, but provide an aperture for the reversing lever having an inverted V-shape extending from the lower end of the splines to the bottom disk. The reversing lever aperture in conventional manner extends from the bottom of the hub out into the lower flange. Also, because construction in a plastic material requires the various parts of the spool to be somewhat heavier than corresponding metal parts, it is essential for proper reversing lever action that the sidewall portion of the hub be flatted at the location of the reversing lever aperture to permit the ribbon when wound about the hub to hold the reversing lever fully retracted.

The leaf spring construction in the plastic spool of the present invention for greater strength is made integral with the spool at both ends of each leaf spring in the form of ribs across the window in which the leaf springs are positioned. The ribs at their ends are flush with the interior wall of the hub and at their centers bow inwardly slightly to provide the necessary resilient frictional engagement of the ribs with the noiseless core spool holder. Although the ribs can extend across the window in a circumferential direction relative to the tubular hub, it is preferable to form them parallel to the axis of the hub. In this manner they cannot be caught on the top of the noiseless core spool holder, particularly where the latter is burred, and thereby slide more readily upon the enlarged hub of the noiseless core spool holder.

It will be apparent to a die-maker that in order to provide a relatively simple mold structure for a spool of the type of my present invention two parts of the mold must come together in a direction perpendicular to the axis of the spool and an insert or third mold part must be provided to form the bore of the hub. Such a mold structure necessitates the location of the aperture for the reversing lever diametrically opposite the window in which the leaf springs are located. The ribbon end fastening devices provided by my present invention by reason of the same mold arrangement are most conveniently located diametrically opposite each other, midway between the reversing lever aperture and the leaf spring window.

Many business machines using shaft-type spool holders employ a ribbon reversing action sensitive to the presence of an eyelet near the end of the ribbon. As a practical matter when the hub of the spool of my invention is properly sized to fit on a noiseless core machine and the ribbon end is attached to the fastening device at the position dictated by molding techniques, the reversing eyelet which must be utilized for such business machines will fall approximately one and one-quarter turns about the hub of the spool, either at the location of the reversing lever aperture or at the location of the leaf springs. The former location of the reversing eyelet cannot be tolerated, as proper operation of the reversing lever might be impaired, while the latter location of the reversing eyelet prevents proper resilient action of the leaf springs when the spool is used on noiseless core spool holders as the tightly wound ribbon will press the eyelet down upon the leaf springs. I have found that the latter situation, however, can be obviated, if the hub of the spool is exteriorly thickened at the leaf spring window to raise the level of the ribbon and reversing eyelet to a position clearing the leaf springs. Preferably, the thickening of the hub is accomplished by providing a pair of rails extending parallel to each other about the hub adjacent the upper and lower edges of the window across which the leaf springs extend.

The ribbon end fastening device of my invention is basically formed by providing an arm approximately parallel to the axis of the hub of the spool spaced outwardly from the side wall of the hub a distance greater than the thickness of the ribbon but less than the thickness of an eyelet. An end of the arm, preferably adjacent the top flange of the spool, is free to facilitate insertion of an edge of the ribbon between the arm and sidewall portion of the hub. As the inserted ribbon is drawn lengthwise under the arm an eyelet located at the end of the ribbon will catch between the hub and arm.

In forming such an arm in a plastic spool construction, there are several serious difficulties. Since most readily available rigid plastic materials are not truly rigid in the thicknesses and sizes requisite to the construction of such an arm, the winding of the ribbon about the spool, which will of necessity lie over the arm, will cause the arm to compress at its free end and bear against the hub of the spool, thereby providing effectively a conical hub on which the tightly wound ribbon will be stretched unevenly and imparting to the ribbon an undesirable slack along one edge. In addition, the securing of the ribbon attaching arm at one end to the top or bottom flange of the spool also has the undesirable result that when the ribbon is wound on the spool in a ribbon winding machine the great tension thereby placed on the ribbon attaching arm will cause a deformation of the flange to which the arm is attached, which interferes with proper winding of the spool and with proper reception of the spool in the typewriter or other business machine.

Basically, the construction of my present invention solves these problems by mounting the closed end of the ribbon attaching arm on the hub of the spool and by providing an outwardly extending projection on the hub directly beneath the free end of the ribbon attaching arm to limit the compression of that end beneath the tightly wound ribbon. A consequence of mounting the ribbon attaching arm at one end of the hub, however, is the undesirable reduction of the space for receiving the ribbon to less than the ribbon width. Accordingly, it is necessary to provide a centrally located pocket, i.e., notch in the ribbon attaching arm for receiving the ribbon attaching eyelet to assure that the ribbon beneath the arm will be properly centered on the spool. I have found it is also necessary to provide a corresponding recess in the exterior of the tubular hub of the spool registering with the pocket in the ribbon attaching arm to prevent the eyelet from being upended as it is drawn into tight contact with the ribbon attaching arm. The projection under the free end of the ribbon attaching arm, which is necessary to prevent substantial movement of the arm, is best

shaped as a curved fin leading from the inner side of the flange adjacent the free end of the ribbon attaching arm and tapering into the hub beneath the ribbon attaching arm. Such a curved flange also has the advantage of deflecting the ribbon as it is inserted beneath the arm facilitating such insertion.

For a more complete understanding of the practical application of the principles of my invention reference is made to the appended drawings in which:

FIGURE 1 is an exploded, partially sectioned perspective view of a spool and adapter in accordance with my present invention;

FIGURE 2 is a development of the side of the spool shown in FIGURE 1;

FIGURE 3 is a plan section taken at line 3—3 in FIGURE 2;

FIGURE 4 is a plan view of the adapter shown in FIGURE 1;

FIGURE 5 is a bottom view of the adapter shown in FIGURE 1;

FIGURE 6 is a vertical section taken at line 6—6 in FIGURE 4;

FIGURE 7 is a plan view of another adapter useful with the spool shown in FIGURE 1;

FIGURE 8 is a vertical section taken at line 8—8 in FIGURE 7;

FIGURE 9 is a vertical section taken at line 9—9 in FIGURE 7;

FIGURE 10 is a vertical section of the assembled adapter and spool shown in FIGURE 1 illustrating the spool and adapter mounted on a shaft-type spool holder;

FIGURE 11 is a vertical section of the spool shown in FIGURE 1 mounted on a noiseless core-type spool holder;

FIGURE 12 is a side view of the spool shown in FIGURE 1 illustrating a partially attached ribbon;

FIGURE 13 is a view similar to FIGURE 12 illustrating a fully attached ribbon;

FIGURE 14 is a fragmentary plan section of the spool shown in FIGURE 1 illustrating a reversing eyelet in a ribbon positioned at the leaf spring window;

FIGURE 15 is a vertical section of the assembled adapter and spool shown in FIGURE 1 illustrating these parts mounted on a shaft-type spool holder of different construction from that shown in FIGURE 10;

FIGURE 16 is a vertical section of the assembled adapter and spool shown in FIGURE 1 illustrating these parts mounted on a shaft-type spool holder of further different construction from those shown in FIGURES 10 and 15; and

FIGURE 17 is a bottom view of the assembly shown in FIGURE 16.

Referring more particularly to FIGURE 1, the construction of my present invention includes a spool 20 and adapter 50.

Spool 20 has a tubular hub 21, a disk-like top 22 formed across the upper end of hub 21 providing an annular flange 23 extending radially outward from the upper end of hub 21 and a top closure 24 covering the upper end of hub 21. Closure 24 is centrally apertured, as indicated by the reference numeral 25, aperture 25 being of substantially smaller diameter than the bore 26 of hub 21. Spool 20 is also provided with an annular disk-like bottom 27 formed as a flange extending radially outward of the lower end of hub 21, the interior opening of which flange is coincident with the bore of hub 21.

Referring also to FIGURE 3, the interior of hollow hub 21 is provided with a pair of closely spaced parallel splines 28 extending downwardly from the under side of top closure 24 approximately six-tenths of the distance from the top of hub 21 to its bottom. Immediately beneath the lower ends of splines 28 the sidewall of hub 21 is apertured at 29, the edges of the aperture defining an inverted V or U, the lower end of which opens into the bottom 27 of the spool 20 and extends outwardly a short distance in bottom 27 from hub 21. Aperture 29, which is a reversing lever aperture, has an effective width equal to or greater than the aperture of the opening in the noiseless core-type spool holder through which the reversing lever extends, except that at its upper end aperture 29 is tapered to a slightly smaller opening strengthening the supporting structure for splines 28. Exteriorly, the sidewall of hub 21 at the location of splines 28 and aperture 29 is flatted as indicated by the reference numeral 30 to reduce the thickness of hub 21 adjacent aperture 29 sufficiently to enable proper action of the reversing lever as described hereinafter.

Hub 21 diametrically opposite splines 28 and aperture 29 and centrally between its ends is provided with a cutout portion or window 31 extending circumferentially approximately 90° about hub 21 and extending axially approximately half the height of hub 21. Window 31 is provided with a pair of ribs 32 extending axially, which are affixed at their ends in the upper and lower edges of window 31 dividing window 31 into three separate openings circumferentially displaced about hub 21, as can be seen more clearly referring to FIGURE 2. Ribs 32, which are essentially of the same thicknesses as hub 21 and which at their ends are flush interiorly with the bore 26 of hub 21, are bowed inwardly at their centers to project into the bore 26, typically about 0.008 inch.

The open areas adjacent the ends of window 31 can be provided with spear prongs 33 such as are conventionally employed in metal spools for emergency attachment at the end of a ribbon where a proper fastening device on the ribbon is not available. In forming such spear prongs in plastic, however, it is preferable to form them with the spear shape on one side, as illustrated in the drawings, since this shape permits a sharper point on the spear.

At the upper and lower edges of window 31 the sidewall of hub 21 is provided with a pair of circumferentially extending rails 34 which at their centers adjacent the ends of ribs 32 project outwardly substantially greater than the thickness of a reversing eyelet and which at their ends are tapered in flush with the cylindrical contour of hub 21.

Referring more particularly to FIGURES 2, 3 and 14, on each side of and midway between the axial plane centered on window 31 and aperture 29, the sidewall of hub 21 is exteriorly provided with a ribbon attachment arm 35. Arms 35 are relatively flat, parallel to each other, oppositely directed (with reference to the axis of spool 20) and positioned closely spaced above the sidewall of hub 21 extending in an axial direction. The lower ends of arms 35 are connected to legs 36 projecting outwardly from the sidewall of hub 21 closely adjacent bottom flange 27, while the upper ends of arms 35 are free and terminate closely adjacent top flange 23.

By reason of the mold structure adverted to above, it is not feasible to contour the under surface of arms 35 such that the space between arms 35 and the sidewall of hub 21 is uniform. Accordingly, the eyelet receiving edges of arms 35 are located on a common axial plane perpendicular to the planes in which the top and bottom faces of arms 35 lie, thus presenting the eyelet engaging edges of arms 35 as closely as possible to the surface of the sidewall of hub 21. The eyelet engaging edges of arms 35 are notched, as indicated by the reference numeral 37, essentially conforming to the shape of the eyelet to be engaged, such that notches 37 form pockets for receiving the eyelets. The under edge of each notch 37 is further provided with a downwardly extending lip 38 to reduce further the spacing between arm 35 and the sidewall of hub 21.

In addition, a pair of flats 39 are formed in the side-

wall of hub 21, one flat adjacent each arm 35, with the surfaces of flats 39 parallel to the under sides of arms 35. Each flat 39 extends toward the eyelet engaging edge of its associated arm 35 and terminates at its inner end exactly conforming to and registering with the notch 37 in the associated arm 35, thereby defining a pocket for receiving the under side of the eyelet on the ribbon as will be more fully explained hereinafter. The recessed edge of each flat 39 lying beneath the edge of each notch 37 is further provided with an upstanding lip 40 which is aligned with the associated lip 38 further reducing the space between arm 35 and hub 21. The depth of the pocket formed by each flat 39 at the vicinity of its associated lip 40 is sufficient to receive the lower half of the thickest eyelet which would be employed on the ribbon.

Adjacent the free end of arm 35 there is further provided a fin 41 having one face lying essentially in the plane of the eyelet engaging edge of arm 35 and having its other face parallel to the first and located beneath arm 35. Each fin 41 is positioned in the corner formed between the exterior of sidewall 21 and the under side of top flange 23 with its edge concave, curving downwardly from the under surface of top flange 23 at a position removed from hub 21 approximately the same distance as the top of the associated arm 35 to a position under the free end of such arm 35 spaced just more than a ribbon thickness from the under side of such arm 35. From the latter position the edge of fin 41 is convex and curves inwardly into the sidewall of hub 21 immediately adjacent the upper end of the pocket formed by flat 39.

It will be further noted, specifically referring to FIGURES 2 and 12, that the edges of the pockets formed by notches 37 and flats 39 are of generally circular curvature with the center of the circular curvature located midway between flanges 23 and 27. The upper third of the edges of such pockets are, however, straight to extend the upper end of each pocket more closely to the under side of top flange 23 than the distance of the lower end of each such pocket to the upper side of bottom flange 27.

It will be understood that spool 20, as described above, is molded as an integral unit bringing the mold halves together, as suggested before, in confronting directions parallel to the center line between aperture 29 and window 31 and preferably employing an insert to form the bore 26 of hub 21.

Adapter 50 is hollow and includes an almost cylindrical sidewall 51, an essentially flat bottom closure 52 having an open center and an open upper end. Sidewall 51 is provided with a notch 53 extending downwardly from the open upper end of adapter 50 a distance equal to the length of splines 28. The height of sidewall 51 is equal to the height of the interior of hub 21 from its bottom to the under side of top closure 24, while the diameter of cylindrical sidewall 51 at its lower end is a few thousandths of an inch larger than the interior diameter of bore 26, a half of a degree of taper being provided toward the upper end of adapter 50 to reduce the diameter of that end to just less than the diameter of bore 26.

Diametrically opposed to notch 53 side wall 51 of adapter 50 at its upper end is provided with a cut out portion 54 extending downwardly from the upper edge of side wall 51 approximately two-thirds the distance to bottom 52 and occupying approximately 70° circumferentially about side wall 51.

Bottom 52 of adapter 50 is provided with three radial apertures 55 located at equal arcuate intervals about bottom 52 with their inner ends forming a common open center in bottom 52. The outer ends of apertures 55 terminate about two-thirds the distance from the center of bottom 52 to sidewall 51, the lower edge of which extends just below the under surface of bottom 52 forming a rim 56 about bottom 52. Equidistant between the outer ends of radial apertures 55 rim 56 projects inwardly a short distance forming three equally displaced bosses 57.

The inner ends of the V-shaped portions of bottom 52 defined by each adjacent pair of radial apertures 55 are provided with upwardly projecting arms 58 which at their lower ends 59 are inclined inwardly and upwardly such that the lower ends 59 of arms 58 generate a slotted, truncated one. The upper ends 60 of arms 58 extend upwardly from lower ends 59 in an axial direction and thus form an axially slotted cylinder. The upper ends 60 of arms 58 terminate about two-thirds of the distance from bottom 52 to the top end of adapter 50. It will be observed that arms 58 thus define a split resilient sleeve slightly wider at its lower end than at its middle and upper end which are of constant diameter (see particularly FIGURE 6).

In assembly, adapter 50 is axially aligned with bore 26 of spool 20 on the under side of spool 20 with notch 53 registering with splines 28 (see FIGURE 1). In this position adapter 50 is pushed into bore 26 with notch 53 receiving splines 28 and with the upper end of adapter 50 abutting the under side of top closure 24 of spool 20. By reason of the taper in side wall 51, the last third of the inserting movement is effected with radial compression of the lower end of adapter 50 as its diameter exceeds that of bore 26 providing a positive frictional engagement between spool 20 and adapter 50. It will be noted, referring particularly to FIGURE 10, that cutout 54 of adapter 50 registers with window 31 thus facilitating the attachment of a ribbon end by means of a hooked eyelet engaging either of ribs 32 (where such a fastening device is to be employed) without interference with sidewall 51 of adapter 50. As particularly contemplated by my invention, however, ribbon attachment will be accomplished by means of a plain eyelet located at the end of the ribbon.

Since the normal ribbon winding machines desirably will employ driving spindles of the diameter of the hub of a noiseless core spool holder, ribbon winding on the spool of my present invention will normally be accomplished prior to insertion of adapter 50. Referring more particularly to FIGURE 12, the eyeleted end of the ribbon R is inserted edgewise into the opening between top flange 23 and bottom flange 27 of spool 20 toward the space between a deflector fin 41 and the free end of its associated ribbon attaching arm 35 with the end of the ribbon R and ribbon attaching eyelet E on the side of arm 35 containing notch 37. It will be apparent, referring particularly to FIGURE 12, that, as the ribbon R is slipped beneath arm 35, the lower edge of ribbon R will abut leg 36 with eyelet E off-center of notch 37 and with the upper edge of ribbon R curving out over fin 41 beyond the upper, free end of arm 35. A slight pull on ribbon R in a direction forcing eyelet E against arm 35 will cause eyelet E to slide along the upper straight edge of notch 37 downwardly into a position centered in notch 37 (see FIGURE 13). Absent such straight portion on the edge of notch 37, eyelet E would tend equally in the reverse direction with a consequent failure of proper ribbon attachment. When ribbon R is properly seated, as shown in FIGURE 13, it can then be wound on spool 20 in a conventional manner.

Since it is intended that the spool of the present invention be suitable for use on business machines employing an inking ribbon reversing eyelet and since the diameter of bore 26 is intended to receive a standard size noiseless core spool holder, the proper location of reversing eyelet E' is such that, as the first turn of ribbon R about hub 21 is completed, eyelet E' falls in the next succeeding turn at a location in the vicinity of ribs 32 (see FIGURE 14). The subsequent turns of ribbon as they are wound over eyelet E' tend to force the latter downwardly toward ribs 32. By reason of the ribbon lifting action of rails 34, however, the inward movement of eyelet E' is insufficient

to cause the latter to bear against either of ribs 32, thus permitting the latter to yield resiliently outwardly as they engage the enlarged hub of the noiseless core spool holder. When the ribbon is fully wound on the spool, insert 50 is inserted, as described above, and the assembly is packaged for subsequent use.

As will be seen referring to FIGURE 10 which shows the employment of the spool and adapter on a shaft-type spindle S of the standard size employed in this country, the engaging end of the spindle S is inserted into the center opening of bottom 52 of adapter 50 with the lower ends 59 of arms 58 serving to guide the spindle end into the cylindrical opening defined between upper ends 60 of arms 58, which describe an internal diameter slightly less than the diameter of spindle S enabling them to engage spindle S in resilient, frictional contact. As the upstanding drive lug L on spindle S reaches bottom 52 spool 20 is rotated to permit lug L to enter one of radial apertures 55, thus providing axial engagement between the spool and adapter assembly and spindle S. The spindle S is further inserted until its collar C abuts the under side of bottom 52 of adapter 50, at which point spool 20 is in proper position for use.

Referring more particularly to FIGURE 11, which illustrates the employment of the spool of my present invention with a noiseless core spool holder N, adapter 50 is first removed, typically by inserting the eraser end of the pencil through top aperture 25 against the tips of upper end 60 of arms 58 and pushing to expel adapter 50 through the bottom of bore 26. Spool 20 is then positioned over the upper end of the hub H of noiseless core spool holder N and rotated to a position at which splines 28 register with the reversing lever opening O (not shown) at which point spool 20 drops over hub H to a position at which bottom flange 27 rides on the collar C' of spool holder N. As shown in FIGURE 11, the reversing lever L' freely falls through reversing lever aperture 29 which, by reason of the enlargement at its lower end, is as wide as opening O, preventing any interference by spool 20 with the proper movement of reversing lever L. FIGURE 15 illustrates the employment of the spool and adapter of my present invention with a different but commonly employed shaft-type spool holder S' having a larger diameter than spindle S referred to in connection with FIGURE 10. The spool 20 in this case is employed with adapter 50 inserted, as will be evident referring to FIGURE 15. The enlarged spindle S', as it is inserted into the opening defined between arms 58 of adapter 50, bears against the joint between the lower ends 59 and upper ends 60 of arms 58 forcing upper ends 60 to splay outwardly providing a strong resilient grasp on spindle S' at the joint between such lower and upper ends 59 and 60, respectively.

FIGURES 16 and 17 illustrate the employment of the spool and adapter of my present invention with a further different shaft-type spool holder S'' having a smaller diameter than spindle S referred to in connection with FIGURE 10. In this case, the spindle S'' is threaded at its upper end and is provided with a clover leaf collar C''. The spool 20 in this case is employed with adapter 50 inserted, as will be evident referring to FIGURE 16. The smaller spindle S'' as it is inserted into the opening defined between arms 58 of adapter 50 does not bear against the arms 58 and centering of the spool is accomplished by the lower portion of a nut being threaded down on the threaded top of spindle S'' to sufficient extent that said lower portion of said nut enters into the top aperture 25 of spool 20 and the wider upper portion of such nut exerts downward pressure on the upper side of the top closure 24 to hold spool 20 against collar C''. At the same time the arms A of collar C'' are received against bottom 52 of adapter 50 with their tips riding against such bottom just inside rim 56, thus rotational movement of spindle S'' will cause the tips of arm A to bear against bosses 57, thereby to drive adapter 50 and through it spool 20.

FIGURES 7, 8 and 9 show more particularly a modification of the adapter which, in this case, is designated by the reference numeral 70. Adapter 70 has a sidewall 71 dimensionally substantially identical with sidewall 51 of adpater 50. Structurally, sidewall 71 also includes a notch 73 (sized to receive the splines 28 of spool 20) of identical shape and configuration to notch 53 of adapter 50. Sidewall 71, however, diametrically opposite notch 73 instead of being provided with a cutout portion has a rectangular recess 74 extending approximately 70° circumferentially about sidewall 71 and extending approximately two-thirds the distance down from the top of sidewall 71. Recess 74 is functionally equivalent to cutout portion 54 in that it facilitates the use of hook fastener engaging ribs 32 in the above described alternate way of fastening the end of a ribbon to the hub 21 of spool 20. At that point the structural similarity of adapter 70 to adapter 50 is ended.

Adapter 70 is bottomless and in defining the expansible split sleeve required in my aforenoted patent is provided with four reentrant arms 75 which, as can be best seen in FIGURE 7, extend inwardly from sidewall 71 in a figure-eight pattern. The four arms 75, however, rather than joining at their centers carry four sections 76 forming a cylindrical split sleeve co-axially positioned in adapter 70. Each of the arms 75 terminate a short distance above the bottom end of sidewall 71 while the ends of sections 76 are in a common plane with the bottom end of sidewall 71. Both arms 75 and sections 76 terminate at their upper ends in a common plane positioned about one-third the distance down from the upper end of sidewall 71.

It is to be noted that the arms 75 and sections 76 of adapter 70 and the upwardly turned arms 60 of adapter 50 are of a lesser axial length than the side walls of the adapters so that clearance is allowed for the nut shown in FIGURE 16 to protrude downwardly through opening 25.

Between a pair of arms 75 midway between the center line of notch 73 and recess 74 on one side only of adapter 70 a boss extends inwardly from sidewall 71 running in an axial direction from about one-third the distance down from the top of sidewall 71 to its bottom edge.

It will be apparent that by reason of its dimensions and the provision of notch 73 and recess 74, adapter 70 can be utilized in connection with spool 20 in a manner identical to that of adapter 50. The diameter of the split cylindrical sleeve formed by section 76 is made slightly smaller than the diameter of the shaft-type spool holders currently in use in this country, such that sections 76 will frictionally receive such spindles, as spindle S referred to in FIGURE 10, with the collar C of such a spindle sitting on the lower ends of arms 75 and with the upstanding lug L received between a pair of adapter arms 75 to engage one or the other when driving the assembled spool and adapter. Similarly, by reason of the curved construction of arm 75, spool holders of the shaft type typified by spindle S'' shown in FIGURES 15 and 16 are accommodated by compression of arm 75 allowing sections 76 to expand outwardly to the necessary greater diameter. In such cases, the clover leaf type collar C'' supports the underside of arms 75 with the tip of one arm A engaging boss 77 to drive the assembled spool and adapter.

In the preceding description, it will be apparent that my present invention provides a business machine inking ribbon spool which, like that of my aforenoted Patent 2,873,839, will accommodate both principal types of spool holders now in use, generally in accordance with the principles of my invention described in such patent and thereby, accordingly, obtaining the quasi-universal aspects of the spool there described. In addition, it will be observed the present spool has the advantage that a rela-

tively simple mechanism for attaching the ribbon end can be employed which is amendable to automatic ribbon winding techniques, such that regardless of the intended business machine, a single ribbon type will suffice, obviating the need to wind one kind of ribbon for shaft-type spool holder machines employing reversing eyelets and a different type ribbon for noiseless core machines.

I claim:

1. A spool for an inking ribbon including a tubular hub, a pair of ribbon end fastening devices positioned on said hub diametrically opposite each other, means defining a window in said hub midway between said fastening devices, said window having a pair of opposite edges extending circumferentially on said hub, a rib extending across said window projecting at its center into the interior of said hub, and means positioned along said pair of circumferentially extending edges of said window projecting outwardly from said hub.

2. A spool for an inking ribbon including a tubular hub, a pair of ribbon end fastening devices positioned on said hub diametrically opposite each other, means defining a window in said hub midway between said fastening devices, said window having a pair of opposite edges extending circumferentially on said hub, a pair of inwardly bowed ribs extending across said window joined at their ends to said opposite edges of said window, and a pair of rails positioned along said pair of edges of said window projecting outwardly from said hub at the location of said ribs and tapered into said hub at their ends.

3. A spool according to claim 1 in which a said fastening device includes a leg mounted on said hub projecting outwardly therefrom, an arm affixed to the outer end of said leg extending across said hub defining with said hub a ribbon receiving space, a projection on said hub positioned beneath said arm at a location remote from said leg, means along one edge of said arm defining an eyelet receiving pocket therein, the end of said pocket remote from said leg extending closer to the adjacent end of said hub than the other end of said pocket to the end of said hub adjacent to it, and means defining a pocket in said hub registering with said pocket in said arm.

4. In a spool for inking ribbon having a tubular hub, a ribbon fastening device which includes a leg mounted on said hub projecting outwardly therefrom, an arm affixed to the outer end of said leg extending across said hub defining with said hub a ribbon receiving space, a projection on said hub positioned beneath said arm at a location remote from said leg, means along one edge of said arm defining an eyelet receiving pocket therein, the end of said pocket remote from said leg extending closer to the adjacent end of said hub than the other end of said pocket to the end of said hub adjacent to it, and means defining a pocket in said hub registering with said pocket in said arm.

5. A spool according to claim 1 which further includes an axially extending spline on the interior of said hub at one end thereof, and means defining an aperture in said hub at the other end thereof axially aligned with and extending to said spline, said aperture at said other end of said hub having a circumferential width at least as great as the spacing of the opposed faces of said spline.

6. A spool according to claim 1 which further includes an axially extending spline on the interior of said hub at one end thereof, means defining an aperture in said hub at the other end thereof axially aligned with and extending to said spline, said aperture at said other end of said hub having a circumferential width at least as great as the spacing of the opposed faces of said spline, a resilient, approximately cylindrical, hollow adapter frictionally engaged in said hub, means defining an axially extending notch in the end of said adapter at said one end of said hub receiving said spline, means on said adapter at said other end of said hub defining an open centered seat across said end of said adapter, and means defining an axially split sleeve coaxially positioned in said adapter extending from said seat toward said one end of said hub.

7. In a ribbon spool having a hollow hub, a resilient approximately cylindrical hollow adapter frictionally engaged in said hub, means defining an axially extending notch in one end of said adapter, means on said adapter at the other end thereof defining an open centered seat across said other end of said adapter and means defining an axially split sleeve coaxially positioned in said adapter extending from said seat toward said one end of said adapter.

8. In a spool for inking ribbon having a tubular hub, a ribbon fastening device which includes a leg mounted on said hub projecting outwardly therefrom, an arm affixed to the outer end of said leg extending across said hub defining with said hub a ribbon receiving space, means along one edge of said arm defining an eyelet receiving pocket therein, the end of said pocket remote from said leg extending closer to the adjacent end of said hub than the other end of said pocket to the end of said hub adjacent to it, and means defining a pocket in said hub registering with said pocket in said arm.

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