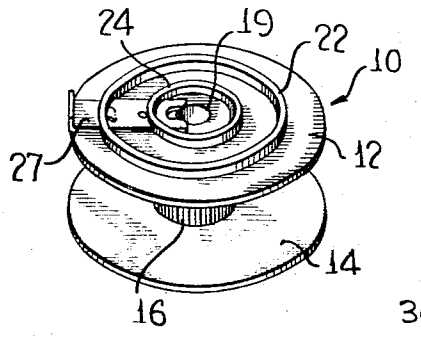
June 6, 1967 W. D. LANDGRAF 3,323,743

RIBBON SPOOL

Filed Sept. 27, 1965

FIG. 1



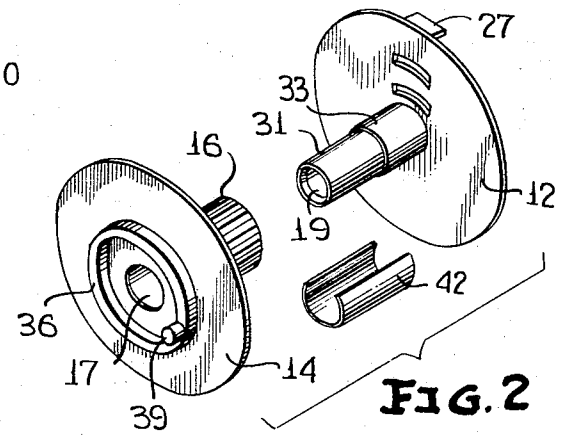


FIG. 2

FIG. 3

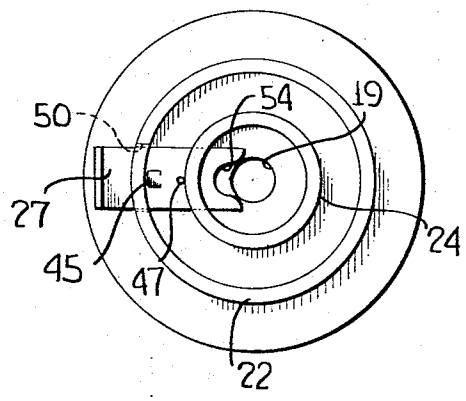
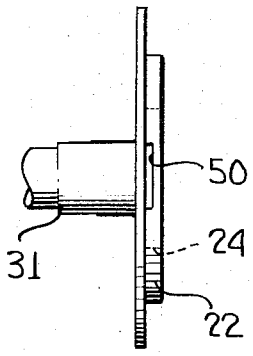


FIG. 4



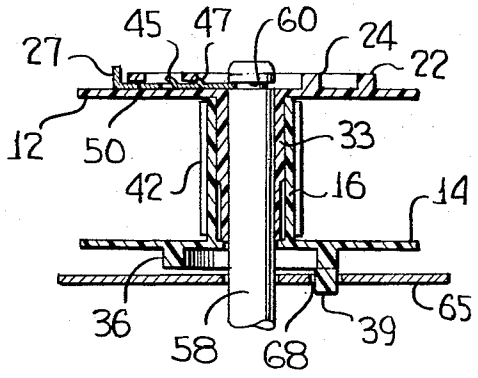


FIG. 5

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RIBBON SPOOL

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The present invention relates generally to ribbon spools for printing and business machines, and more particularly to a ribbon spool which is readily and economically manufactured and which includes improved means for locking thereof to the spool rotating mechanism of the machine in which it is to be employed.

Because of the necessarily disposable character of the conventional typewriter ribbon spool in view of the relatively short life of the ribbon in normal business operation, typewriter and ribbon spool manufacturers have sought, generally without success, to provide a spool which is at once sturdy, uncomplicated and inexpensive, and thus well suited to disposability. Typically, the printing machine includes a stationary spindle as a component of the ribbon spool drive-reverse mechanism, the spool itself including an axial hole through which the spindle projects when the spool is placed in operating position in the machine. A rotatable locking and bearing flange is generally provided on the machine to support and rotate the spool. The latter normally includes a plurality of tabs arranged to mate with apertures in the rotatable flange for purposes of driving the spool as the flange is rotated in response to the typing or printing of characters.

The typical prior art spool includes three major components, viz. a pair of sheet metal circular flanges and a hollow hub interposed therebetween, the hub normally including a plurality of tabs or projections at either end which are arranged to mate with corresponding apertures in the flanges so that when the tabs are inserted into the apertures and are bent against the exterior portions of the respective spool flanges the components form a rigid spool structure. Alternatively, the hollow hub is aligned with axial holes in the two spool flanges and a hollow cylindrical headless rivet or eyelet axially employed to fasten the spool components in rigid relationship. Means are provided on the hub, or on the flange which is to be placed adjacent the rotatable flange of the machine, typically in the form of additional projections, disposed to register with corresponding holes in the rotatable flange, to permit fixing the spool in driven relation with the ribbon driving mechanism of the machine.

An alternative prior art spool structure comprises a single flange to which the hollow hub is fastened, the projecting end of the hub including tabs to be inserted in apertures of the rotatable flange of the machine.

In each case means are provided, either integral with the hub or in the form of an additional component, for securing the inked printing ribbon to the spool. The ribbon is, of course, wound about the hub or unwound from the hub in accordance with the direction of rotation of the spool during machine operation.

The spindle or shaft upon which the spool is placed typically includes a circumferential groove adjacent its free end for purposes of locking the spool to the spindle. To this end a separate spool element is provided, usually in the form of either a slide element or a pivotal lever secured to the far spool flange relative to the rotatable flange of the machine. In the slide element form, the flat slide is secured to the spool flange by means of bent over tabs stamped from the flange itself, sufficient freedom being provided to permit the slide to move back and forth across the axial hole of the spool under force applied by the operator's fingers during spool replacement. A slot in the slide element is adapted to move longitudinally across

the axial hole of the spool as the slide is pushed in either direction. The slot width is of any suitable dimension intermediate the dimensions of the inner diameter of the spindle groove and the outer diameter of the spindle. An enlarged area is also provided in the slot which, when aligned with the axial hole of the spool, will initially permit the spindle to pass therethrough, the slide element then being pushed in the appropriate direction to lock the spool in position in the machine.

In the alternative pivotal locking lever arrangement, a sheet metal lever is riveted or swaged to the appropriate spool flange in pivotal relation to the surface thereof and an indentation is provided in one edge of the lever to mate with the spindle groove when the spool is placed in operative position in the machine.

It will readily be observed that the production of the above mentioned prior art spool structures requires a plurality of machining operations such as cutting, stamping, bending, swaging, riveting, and so forth. Such operations, of course, are cumulative in spool production costs and defeat the desirable low purchase cost which should accompany the relatively short-lived and disposable character of the purchased item.

Accordingly, it is a primary object of the present invention to provide a low cost ribbon spool readily capable of efficient mass production.

It is another object of the present invention to provide a ribbon spool requiring a substantially smaller number of machine operations during production than have generally been required in the manufacture of prior art types of ribbon spools.

A further object of the present invention is to provide a rigid low cost ribbon spool which includes all of the desirable features of prior art spools without requiring the burdensome production cost of the latter.

Briefly, in accordance with the present invention the ribbon spool comprises a pair of flange elements, preferably circular in shape, each having a hollow hub extending from one surface thereof. The spool elements are formed of molded plastic, thus significantly reducing production cost over prior art spools. One of the hubs is of greater diameter than the other and is provided with a knurled or grooved exterior surface for reasons which will become apparent in the subsequent detailed description. Its axial hole is of sufficient diameter to permit entry of the other hollow hub for the greater portion for the length of the latter without interference. However, a relatively short length of the internal hub, adjacent the flange from which it projects, is of a diameter sufficient to produce an interference fit with the hole in the exterior knurled or grooved hub. Thus once the two spool elements are joined they are locked together in substantially permanent configuration, a substantial force being required to separate these elements. The internal hub has a hole or passageway therethrough of sufficient diameter to accept the spindle of the business machine in which the spool is to be used. That spool flange which is to be placed adjacent the rotatable flange of the business machine has molded integrally therewith a single projecting pin to be accepted by any of the driving holes in the rotatable flange of the machine. The other spool flange includes along the exterior surface thereof a pair of cylindrical hollow bosses, one internally of the other, and each concentric with the axial hole of the spool. Along a radius of the flange the hollow cylindrical bosses are provided with slots aligned to permit entry of a slidable spool locking lever having a depressable tab and inverted dimple of sufficient height to secure the lever to the flange in radial sliding relation therewith. The edge of the lever closest to the central hole includes an indented portion of such diameter that when the lever is pushed inwardly the identation will be securely accepted by the spindle groove.

The above and still further objects, features and attendant advantages of the present invention will become apparent from a consideration of the following detailed description of a particular embodiment thereof especially when taken in conjunction with the accompanying drawings, in which:

FIGURE 1 is a perspective view of an assembled complete ribbon spool in accordance with the present invention;

FIGURE 2 is an exploded perspective view of the ribbon spool of FIGURE 1 and including a ribbon securing means;

FIGURE 3 is a plan view of the exposed spool flange including the slidable locking lever;

FIGURE 4 is an end view of the flange of FIGURE 3 without the locking lever; and

FIGURE 5 is a partial sectional view of the ribbon spool of FIGURE 1 in operating position on the ribbon driving mechanism of a typical business machine.

Referring now to the drawings, wherein like reference numerals are used to refer to like components, an assembled ribbon spool **10** (FIG. 1) comprises a pair of flanges **12** and **14**, preferably circular in form, each including an integral hollow hub **31** and **16**, respectively, projecting axially from one surface of the flange. Internal hub **31** includes a larger diameter portion **33** adjacent the flange surface than the diameter of the remainder of that hub. External hub **16** includes a hole **17** extending axially therethrough of sufficient diameter to permit easy initial insertion of the smaller diameter portion of internal hub **31**, but which provides an interference or force fit with the larger diameter portion **33** of the internal hub. Central hole **19** extending through internal hub **31** is of sufficient diameter to accept the stationary spindle **58** of the drive mechanism of a business machine in which the spool is to be employed, with sufficient clearance to permit spool rotation thereon. Each flange and its associated hub is of one-piece construction and is preferably composed of a cured plastic appropriately formed and shaped in any suitable mold.

The exterior surface of external hub **16** is longitudinally grooved (or knurled) to frictionally grip an inked ribbon end (not shown) when the ribbon end is secured between the grooved surface of the hub and a semi-cylindrical spring element **42**, the latter being adapted to be pushed on the hub and to mate securely therewith.

The surface of flange **12** opposite the hub projecting surface includes a pair of hollow cylindrical bosses **22** and **24** molded integrally therewith and disposed concentrically with axial hole **19** at different radial dimensions of the flange. Each of these hollow cylindrical bosses includes a slot **50** radially aligned with a similar slot in the other boss to permit entry of a sheet metal locking element **27**. The element **27** is sufficiently thin relative to the height of each slot **50** so that it is readily slidable therein. Element **27** includes a pair of spaced projections **45** and **47** along the center line thereof, projection **45** comprising an upwardly extending tab cut from the material of the slide element and acting in barb-like fashion to prevent a complete withdrawal thereof once the latter has been inserted fully into slots **50**. The second projection **47** is an inverted dimple of slightly greater height than that of either of slots **50**.

Upon initial insertion of slide element **27** in operating position on the surface of flange **12** slight force is required to push each of projections **45** and **47** through slot **50** in cylindrical boss **22**. The spacing between the two projections is sufficiently small to permit both to reside within the annular space between bosses **22** and **24**, element **27** being locked in this position and prevented from easy withdrawal by the diagonal upward and rearward direction in which tab **45** extends. During insertion of lever **27** projection **45** will depress sufficiently to permit its passage through the slot, but once disposed internally of cylindrical boss **22** is prevented from returning through the slot by virtue of its structural characteristics. Inverted dimple **47** on the other hand is of sufficient strength to push the bridge portions of boss **22** and **24** forming the slots upwardly for interfering passage therethrough when slide element **27** is initialy inserted in the slots and when spool **10** is locked and unlocked relative to spindle **58**. Projection **45** is prevented from passing through slot **50** in cylindrical boss **24** by the push tab portion of the slide element with the outer surface of boss **22** when the element is in its maximum inward position. At that point indentation **54** in the inward edge of lever **27** is in mating relation with the groove **60** of spindle **58** (FIG. 5).

Another hollow cylindrical boss **36** is molded integrally with the outer surface of flange **14** and adapted to be placed adjacent the rotatable flange **65** of the business machine spool driving mechanism. A pin **39** projecting from boss **36** is arranged to mate with any of the customary holes **68** provided in driving flange **65**.

When the spool is to be placed in position in the business machine, locking slide element **27** is positioned as shown in FIGURE 3 so that spindle **58** will pass freely through central hole **19** of spool **10**. The spool is rotated relative to flange **65** until pin **39** is accepted by one of holes **68**, at which time element **27** is pushed to its maximum inward position to lock the spool securely to spindle **58**. The inked ribbon secured to hub **16** by spring element **42** (FIG. 5) will, of course, unwind from and wind on the spool according to the direction of rotation of the spool as the latter is driven in the forward and reverse directions in a conventional manner during machine operation.

Since each of the two flange and hub elements of the spool are molded in separate integral parts and may be readily joined in a substantially permanent fashion the production costs of my ribbon spool are significantly reduced over those required in the manufacture of prior art ribbon spools. Moreover, the structure of the locking slide and mating portions of the spool are particularly suited to low cost production and attachment in a rapid and simple fashion.

While I have illustrated and described one specific embodiment of my invention it will be apparent to those skilled in the art that various changes and modifications in the specific details of my invention may be resorted to without departing from the true spirit and scope of the invention as defined in the appended claims.

I claim:

1. A ribbon spool for use in business machines of the type having a ribbon driving mechanism including a spool-retaining grooved spindle and a spool drive-reverse flange rotative in response to the printing of type characters by the machine, said spool comprising a pair of relatively rigid molded plastic components; each of said components comprising a flange portion and a hub projecting axially therefrom, the hub associated with a first of said components having a grooved exterior surface, the hub associated with the second of said components having an outer diameter sufficient to provide an interference fit with an axial hole extending through the flange portion and hub of said first component so that said components are securely joinable to form a double flange spool, a pair of hollow concentric cylindrical bosses projecting from a surface of the flange portion of one of said components opposite the hub-projecting surface, a slot adjacent the flange surface in each of said bosses, the slots being in radial alignment, a central hole extending through the flange portion and hub of said second component for accepting said spindle; and a locking element slidably positioned through said slots and including an indented portion for mating with the groove in said spindle to lock said spool in position thereon.

2. The combination according to claim **1** wherein said locking element includes a barb-like projection to prevent

complete withdrawal of said element from said slots and a further projection in cooperative relation with the interior one of said bosses along the slot thereof to maintain said element in spool-locking position.

3. The combination according to claim 2 wherein is further provided means for securing said spool in drive relation with said drive-reverse flange.

4. The combination according to claim 3 wherein is further provided a semi-cylindrical spring element adapted to mate with said grooved exterior surface of said hub to secure the end of an inked ribbon therebetween.

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