# United States Patent

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[72] Inventor **Bevan H. Johnston**
**La Mesa, Calif.**



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[73] Assignee **Stromberg Datagraphix, Inc.**
**San Diego, Calif.**


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[54] **RETAINING DEVICE**
**5 Claims, 3 Drawing Figs.**


[52] **U.S. Cl.** ..... **242/68.3,** 242/72.1
[51] **Int. Cl.** ..... **B65h 17/02,** B65h 75/02
[50] **Field of Search** ..... 242/68.3, 72.1



[56] **References Cited**

UNITED STATES PATENTS

| | | | |
|---|---|---|---|
| 1,922,716 | 8/1933 | Robinett | 242/72.1 |
| 3,379,388 | 4/1968 | Gruczelak | 242/68.3 |

FOREIGN PATENTS

| | | | |
|---|---|---|---|
| 1,209,840 | 1/1966 | Germany | 242/68.3 |



*Primary Examiner*—George F. Mautz
*Attorney*—Anderson, Luedeka, Fitch, Even and Tabin


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**ABSTRACT:** A device is described for retaining a tubular member on a support member disposed interiorly of the tubular member. The device includes at least one pivotal arm for engaging an end of the tubular member to hold it in place. The arm is pivotal to a retracted position upon movement of a reciprocally movable knob, thereby enabling the tubular member to be removed axially over the retaining device.

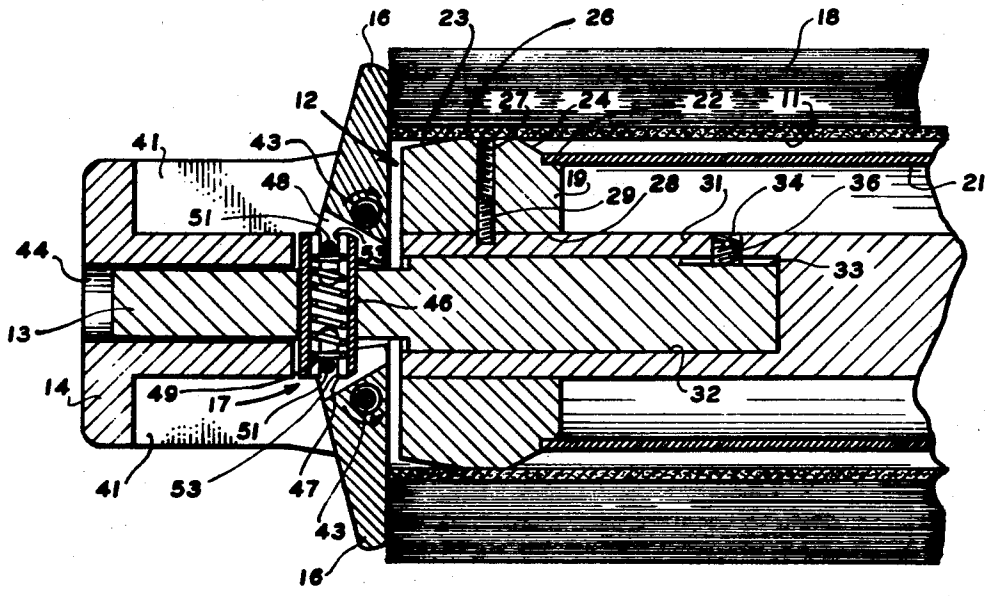



FIG. 1.

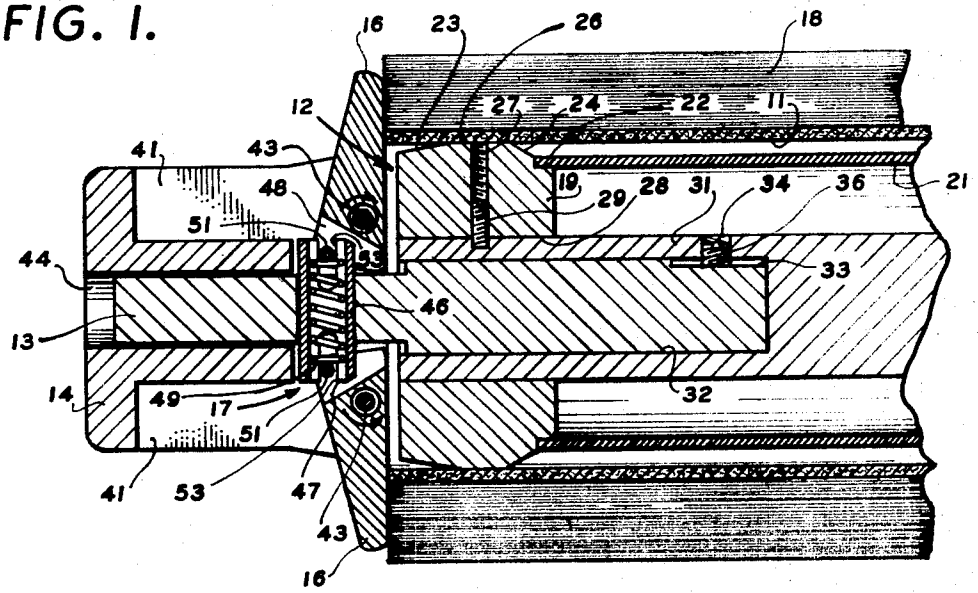



FIG. 2.

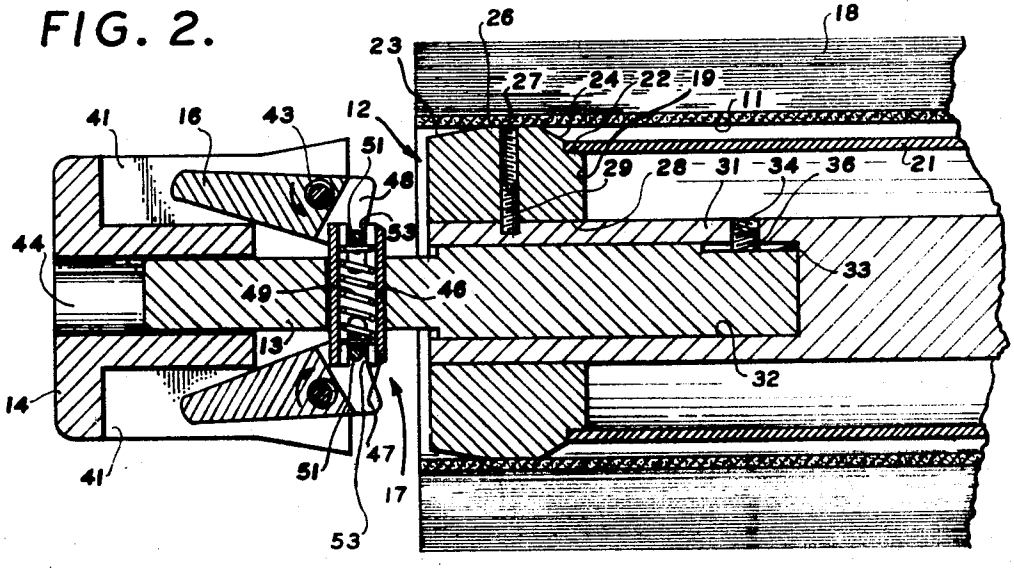
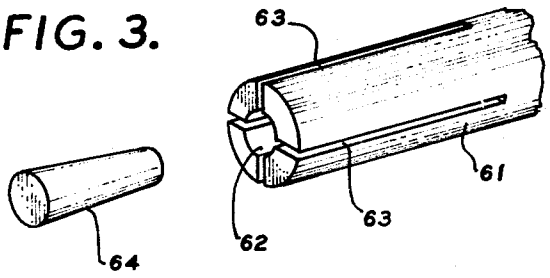



FIG. 3.




INVENTOR.
BEVAN. H. JOHNSTON
BY
Anderson, Luedeka, Fitch, Even & Tabin
ATTORNEYS

# RETAINING DEVICE

This invention relates generally to devices for retaining a tubular member on a support member disposed interiorly of the tubular member. More particularly, the invention relates to such a device which is useful for retaining a paper supply roll of the type used in electrostatic printing equipment.

Certain types of equipment may utilize a tubular member positioned on a support member, the latter being disposed interiorly of the tubular member. For example, in equipment wherein a sheetlike material must be dispensed, rolls of such material may be wound on a tubular member supported for rotation to dispense the sheet material. A particular example of such apparatus is in electrostatic printing equipment, wherein a roll of electrostatic printing paper is mounted on a holder and is rotated periodically to feed paper into other parts of the apparatus as required.

In operating such equipment, it may be desirable to hold the roll of sheet material firmly in alignment in order to prevent jamming of material in the feeding device of the equipment. Moreover, precision may be somewhat lacking in the rolling and cutting of the sheet material at the factory at which it is produced, complicating the problem of properly aligning the material.

In order to hold the roll of material firmly in alignment, various roll-retaining devices have been developed to engage the end of the tubular member about which the sheet material is wound and hold it in a fixed position relative to the support member within the tubular member. Such devices have frequently taken the form of a flangelike attachment which secures to the end of the internal support member and engages the end of the tubular member supported thereon. Since the rolls of sheet material may have to be periodically replaced, previously known holding devices have typically had to be detached completely from the support member to enable the empty tubular member to be removed and a new full roll to be installed. Accordingly, there is a possibility that the detached holding device may be lost or mislaid while installing the new roll. Moreover, the person reloading the machine typically has to detach the holding device, set down the device, remove the old tubular member, replace it with a new roll, pick up the holding device and finally reattach it. This presents a degree of inconvenience in the use of equipment of this type.

It is an object of the present invention to provide an improved device for retaining a tubular member on a support member disposed interiorly of the tubular member.

Another object of the invention is to provide an improved device for holding, in alignment, continuous rolls of sheetlike material on a support member.

A further object of the invention is to provide a roll-retaining device which holds the rolls firmly in alignment and which enables removal and replacement of the rolls without the necessity of detaching the device from the remainder of the equipment.

Other objects of the invention will become apparent to those skilled in the art from the following description, taken in connection with the accompanying drawings wherein:

FIG. 1 is a full section view of a device constructed in accordance with the invention;

FIG. 2 is a full section view of the device of FIG. 1 showing an alternate position; and

FIG. 3 is an exploded perspective view of a portion of an alternative embodiment of the invention.

Referring now more particularly to FIG. 1, the device illustrated therein is for use in connection with electrostatic printing equipment. A continuous roll 18 of electrostatic printing paper is wound upon the tubular member 11. The support member 12 is disposed interiorly of the tubular member 11 and includes a pair or rollers or hubs 19, only one of which is shown, joined together by a metal tube 21. The metal tube 21 is joined to the rollers 19 at annular shoulders 22 provided in the rollers at the innermost facing edges thereof. The rollers are each provided with a pair of chamfered surfaces 23 and 24 and a mating surface 26 which forms the outermost or largest diameter portion of the rollers. The surface 26 is of a diameter which accommodates the cardboard tube 11, with a fit of a closeness which enables the tube to slip on the rollers if sufficient torque is exerted. The reason for this is explained below.

Each of the rollers is provided with a threaded hole 27 therein which extends downwardly to an axial opening 28. The axial openings 28 extend axially through the respective rollers 19. A setscrew 29 is provided in each of the openings 27, only one setscrew being shown, and is tightened against a roller or hub shaft 31. The shaft 31 extends through the opening 28 in the rollers or hubs 19. Thus, the rollers are mounted on the shaft 31 to turn therewith. The shaft 31 is suitably journaled and cantilevered at the end not shown within the electrostatic printing equipment.

The shaft 31 is provided with an axial opening 32 therein near one end of the shaft. The stub shaft 13 has a region of enlarged diameter which fits within and mates within the opening 32. A pair of flats 33, only one of which is shown in the drawings, are provided toward the interiormost end of the stub shaft 13. A threaded hole 34 is provided in the shaft 31 opposite each of the flats 33, and a setscrew 36 is provided in each of the holes 34 to be tightened against the flats 33 and thus cause the shaft 31 to lock to and be rotatable with the shaft 13. As an alternative, the shaft 13 and the shaft 31 may be made in a single piece.

At the end of the support member 13 which is unillustrated, a suitable guide or flange is provided against which the end of the hollow tube 11 may abut. This flange aids in aligning the paper roll 18 relative to the rest of the equipment. In order to hold the tube 11 against the unillustrated flange or guide, the device of the illustrated invention provides two arms 16. The arms 16 exert a pressure, as will be explained subsequently, against the end of the tubular member 11 and thus force it against the unillustrated flange or guide for proper alignment. The two arms, 180° apart, hold the roll of material 18 firmly in alignment and thus prevent jamming of material in the feeding apparatus through which the paper passes after it is removed from the roll.

When the supply of paper 18 on the roll is depleted, it is necessary to replace the empty tubular roller 11 with a new one. This means that the arms 16 must be moved out of the way to enable the tube 11 to be slipped off (to the left in the drawings) and a new one slipped on over the rollers or hubs 19. In accordance with the invention, the arms 16 are moved out of the way to enable such operation without necessitating their physical removal. This makes the manual procedure more simple and eliminates the possibility of the arms becoming misplaced.

Each of the arms 16 is mounted in a corresponding one of a pair of recesses 41 provided in the knob 14 at positions 180° apart. The arms 16 are mounted to the knob 14 by a pair of pivot-type shoulder screws 43, respectively, which extend across the recesses 41. The knob 14 contains a central opening 44 in which the projecting portion of the shaft 13 is accommodated. The diameter of the opening 44 is such with respect to the shaft 13 as to permit the knob 14 to be reciprocated axially on the shaft. The shaft 13 is provided with a bore 46 which passes diametrically through the shaft at a region near the pivot points of the arms 16. A sleeve 47 is force fitted within the bore 46 and projects radially from the shaft 13 at each end of the bore. In order to clear the projecting ends of the sleeve 47, each of the arms 16 is provided with a recess 48 therein of sufficient depth and which just exceeds, in width, the outer diameter of the sleeve 47.

In order to bias the arms 16 against the end of the tubular member 11 as shown in FIG. 1, the resilient means 17 are provided. The resilient means 17 include a compression spring 49 within and coaxial with the sleeve 47. A pin 51 extends transversely of each recess 48 in each arm 16 and bears against the corresponding end of the compression spring 49. Slots 53, in diametrically aligned pairs, are provided at each end of the sleeve 47. The slots extend axially of the sleeve at least as far

as the outer diameter of the shaft 13 for reasons which will be explained subsequently. The bias exerted against the pins 51 by the compression springs 49 produces a moment about the shoulder screws 43, indicated by the arrows, to cause the arms 16 to press against the end of the tubular member 11. This force holds the paper roll in place and properly aligned.

In accordance with the invention, the arms 16 may be moved into a position alongside the stub shaft 13 so they will be within the periphery of the interior of the tubular member 11 when the tubular member is removed from the support member 12. To do this, the knob 14 is pulled to the left in the drawings. The movement of the knob is from the position shown in FIG. 1 to the position shown in FIG. 2. Force exerted on the knob while it is being pulled outwardly overcomes the moment produced by the compression spring about the shoulder screws 43 and, because the pins 51 are confined in the slots 53, the arms pivot about their pivot screws. This pivoting continues until the arms reach the position shown in FIG. 2. In this position, the compression spring exerts a force on the pins 51 such as to produce a moment about the shoulder screws 43 in the direction of the arrows in FIG. 2. This holds the arms 16 in the retracted position. The knob is prevented from further travel away from the paper support hub by the reaction forces of the arms bearing on the knob 14 in the recesses 41 therein. Accordingly, an over center toggle action is produced upon axial movement of the knob, enabling the arms 16 to be switched easily from the position shown in FIG. 1 to the position shown in FIG. 2 and back again. When the arms are in the position shown in FIG. 2, the tubular member 11 may be slipped off of the rollers 19 and passed freely over the retaining device.

When a new paper roll is first installed in the equipment, it may be necessary to rotate the tubular member 11 to take up slack in the paper between the paper roll and the feeder mechanism, not illustrated. This may be done by rotating the knob 14. The torque from the rotating knob is transferred through the shoulder screws 43 and the arms 16 to the sleeve 47, the arms bearing against the sleeve in the recesses 48 therein. The sleeve thus turns the shaft 13 and rotates the shaft 31, turning the rollers 19. Friction between the support rollers and the tubular member 11 is limited so that rotation of the knob will rotate the roll of paper until slack is removed, but so that the roll will stop rotating and slide on the rollers when the slack is removed so as not to tear the paper.

In the exploded perspective view of FIG. 3, an alternative embodiment of the invention is shown. The embodiment of FIG. 3 affords an alternate way of attaching the shaft of the retaining device to the shaft 31 of the support member. In this embodiment, the shaft 61 (corresponding to the end of shaft 13 extending into opening 32 as seen in FIGS. 1 and 2) is provided with a coaxial opening 62 therein and a plurality of radial slots 63 passing from the opening 62 to the outer surface of the shaft 61. The slots extend axially along the shaft 61 a distance sufficient to make the slotted end of the shaft expansible. The small end of a tapered plug 64 is loosely inserted into opening 62. Once the shaft 61 is inserted into an appropriate opening in the shaft of the support member 12, as shown in FIGS. 1 and 2 a tapered plug 64 is inserted into the hole 62, which is also tapered, to expand the expansible section of the shaft 61 into engagement and tight fit with the inner walls of the opening in the support member shaft.

It may therefore be seen that the invention provides an improved device for retaining a tubular member on a support member disposed interiorly of the tubular member. The device affords a distinct advantage in that alignment of the tubular member, such as may be used for supporting continuous sheet material rolls, is effected in a positive way, and yet the device is operable to enable removal of the tubular member without separation of the device from the remainder of the apparatus. This reduces the possibility that the device may become misplaced when rolls of paper are being replaced, and simplifies installation procedures as well.

Various modifications of the invention in addition to those shown and described therein will become apparent to those skilled in the art from the foregoing description and accompanying drawings. Such modifications are intended to fall within the scope of the appended claims.

What I claim is:

1. A device for retaining a tubular member on a support member disposed interiorly of the tubular member, said device comprising, a shaft of smaller cross section than the interior of the tubular member, said shaft being adapted to extend axially from an end of the support member, a knob of smaller cross section than the interior of the tubular member, said knob being mounted on said shaft and being selectively manually movable axially along said shaft between a first and a second position with respect thereto, two arms pivotally mounted to said knob and being pivotal on parallel axes between a first position alongside said shaft and generally parallel thereto and a second position engaging an end of the tubular member and generally perpendicular to said shaft to retain the tubular member on the support member, and resilient means comprising a compression spring supported coaxially within a hollow sleeve extending transversely through an opening in said shaft, said resilient means acting on said arm at a point displaced from the pivot point of said arm at each of said first and second positions of said knob to provide an overcenter toggle action upon axial movement of said knob, said arm in said first position projecting from said shaft a distance which is small enough to lie within the periphery of the interior of the tubular member to allow the tubular member to be moved on and off the support member.

2. A device according to claim 1 wherein each of said arms is provided with a recess therein accommodating an end of said sleeve, respectively, whereby when said knob is turned, torque is transferred to said shaft through said arms and said sleeve.

3. A device according to claim 2 wherein a pair of diametrically aligned axially elongated slots are provided at each end of said sleeve, and wherein a pivot rod is provided extending across said recess on each of said arms for engaging said spring at respective ends, each of said rods extending through both slots in the adjacent pair of slots to be retained and guided thereby.

4. A device for retaining a tubular member on a support member disposed interiorly of the tubular member, said device comprising, a shaft of smaller cross section than the interior of the tubular member, said shaft being adapted to extend axially from an end of the support member, said shaft having a plurality of flats thereon to enable said shaft to be secured in a receiving opening in the support member by setscrews, a knob of smaller cross section then the interior of the tubular member, said knob being mounted on said shaft and being selectively manually movable axially along said shaft between a first and a second position with respect thereto, at least one arm pivotally mounted to said knob and being pivotal between a first position alongside said shaft and generally parallel thereto and a second position engaging an end of the tubular member and generally perpendicular to said shaft to retain the tubular member on the support member, and resilient means acting on said arm at a point displaced from the pivot point of said arm at each of said first and second positions of said knob to provide an overcenter toggle action upon axial movement of said knob, said arm in said first position projecting from said shaft a distance which is small enough to lie within the periphery of the interior of the tubular member to allow the tubular member to be moved on and off the support member.

5. A device for retaining a tubular member on a support member disposed interiorly of the tubular member, said device comprising, a shaft of smaller cross section than the interior of the tubular member, said shaft being adapted to extend axially from an end of the support member, said shaft including an opening therein and a plurality of elongated slots communicating between said opening and the exterior surface

of said shaft and extending axially from the end adapted for insertion within a support member opening thereby forming an expansible portion of said shaft, and a tapered plug for insertion in the opening in said shaft at the slotted end thereof for expanding said shaft into engagement with the support member when the expansible end of said shaft is disposed within said opening in the support member; a knob of smaller cross section than the interior of the tubular member, said knob being mounted on said shaft and being selectively manually movable axially along said shaft between a first and a second position with respect thereto, at least one arm pivotally mounted to said knob and being pivotal between a first position alongside said shaft and generally parallel thereto and a second position engaging an end of the tubular member and generally perpendicular to said shaft to retain the tubular member on the support member, and resilient means acting on said arm at a point displaced from the pivot point of said arm at each of said first and second positions of said knob to provide an overcenter toggle action upon axial movement of said knob, said arm in said first position projecting from said shaft a distance which is small enough to lie within the periphery of the interior of the tubular member to allow the tubular member to be moved on and off the support member.