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(54) **A window treatment system with a single cord**

(57) A window treatment system (10) for covering an architectural opening includes a window treatment with a sheet wound in a first direction; a housing (12) having a longitudinal axis and receiving said window treatment; a shaft (40) disposed coaxially within said housing for supporting said housing and a clutch (14) coupling said housing and said shaft and having a first position in which said housing is rotatable with respect to said shaft only in one direction, and a second position in which said housing is rotatable in both directions. A spool (18) is mounted coaxially with the longitudinal axis and is coupled to said clutch. The spool includes an elongated member such as a ribbon (94) wound in a second direction and arranged to raise said window treatment when said elongated member is pulled from said spool.

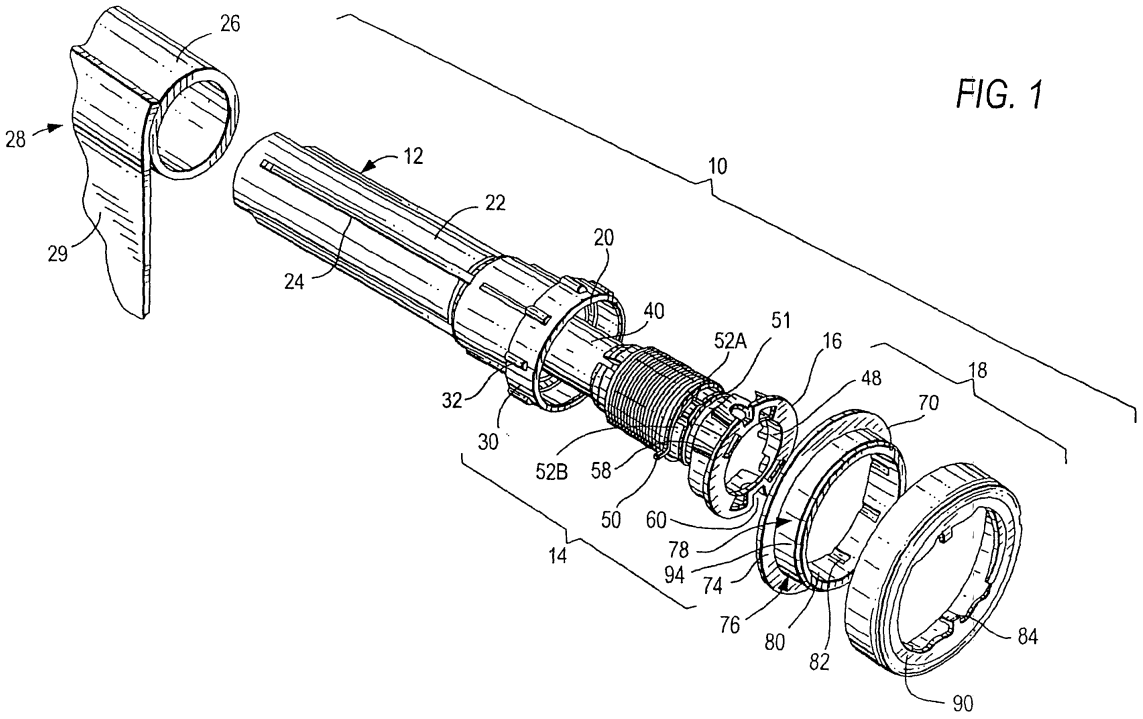

FIG. 1

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Description

[0001] RELATED APPLICATIONS: This application claims priority to U.S. provisional application S.N. 60/845,319 filed on September 18, 2006 and incorporated herein by reference.

BACKGROUND OF THE INVENTION

a. Field of Invention

[0002] This invention pertains to a window shade and other window treatment systems, and more particularly to a system in which a single cord is used to operate the shade.

b. Description of the Prior Art

[0003] A typical window treatment system consists of a mandrel attached to a window treatment, such as a window shade, a pulley receiving a cord used to operate the element, and a clutch coupling the pulley to the mandrel. The clutch may include a break mechanism arranged so that pulling the cord causes the window treatment to move up or down but the weight of the window treatment or a manual tug on the covering does not cause it to lower.

[0004] A clutch for window treatment systems is disclosed in U.S. Patent Nos. 5,791,393 and 5,927,370. The clutch includes a flat spring wound around a hub and having tangs at the ends. The tangs are arranged so that a rotation of the mandrel causes the spring to tighten around hub, thereby preventing the rotation of the window treatment. Rotation of the pulley causes the spring to loosen and allows the mandrel to rotate in one direction or another. In this arrangement, the cord has two ends disposed on either side of the pulley. Pulling on one end causes the window treatment to be raised and pulling on the other end-causes-the window treatment to be raised.

[0005] However, in certain instances it is desirable to have a window treatment system that is operated by a single cord. In such a system, the window treatment is raised by pulling on a cord and is lowered by pulling on the window treatment itself. However, the clutch described above cannot be used for this system because it locks up when any force is applied to the window treatment.

SUMMARY OF THE INVENTION

[0006] A window treatment system for covering an architectural opening constructed in accordance with this invention includes a window treatment including a sheet wound in a first direction; a housing having a longitudinal axis and receiving said window treatment; and a shaft disposed coaxially within said housing for supporting said housing. The system is further provided with a clutch coupling said housing and said shaft and having a first position in which said housing is rotatable with respect to said shaft only in one direction, and a second position in which said housing is rotatable in both directions with respect to the shaft. A spool is mounted coaxially with said longitudinal axis and coupled to said clutch. The spool includes an elongated member such as a cord or a ribbon wound in a second direction. The system is arranged so that when the clutch is in the first position, the window sheet can be raised by pulling on the elongated member. To lower the window sheet, the clutch is shifted or moved to the second position in which the housing is freely rotatable. The sheet can now be pulled down manually, either partially or all the way.

[0007] In one embodiment of the invention, the clutch includes a coil spring disposed around said shaft and an actuator which, in the first position, winds said springs in a first configuration, and in the second position, winds the spring into a second configuration. The spool is preferably coupled to said actuator and cooperates therewith to pivot said actuator between said first and second positions as the elongated member is pulled by a user.

[0008] Preferably, the spring has two tangs, one tang being engaged by said shaft and the second tang being engaged by said actuator. The housing includes a cylindrical surface and the spring selectively engages the cylindrical surface in the first position to form a friction fit and it disengages from said cylindrical surface in said second position.

[0009] In one aspect of the invention, a mechanism for operating a window treatment including a mandrel and a sheet wound in a first direction on said mandrel is disclosed, the mechanism including a support shaft mounting the mandrel to an opening, the support shaft being fixed within the opening; a housing rotatably mounted on the support shaft; and a clutch interconnecting the support shaft and the housing selectively in one of a first configuration in which the housing is rotatable in both directions with respect to said shaft and a second configuration in which said housing rotates about the shaft in a single direction. An elongated member wound coaxially with the shaft is arranged to raise said the sheet when pulled.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010]

Fig. 1 shows a partially exploded isometric view of a mechanism for supporting and operating a window treatment system in accordance with this invention;

Fig. 2 shows a side view of the mechanism of Fig. 1;

Fig. 3 shows an end view of the mechanism of Fig. 1; and

Fig. 4 shows a center portion of the mechanism of Fig. 1 with various adapters available as accesso-

ries.

DETAILED DESCRIPTION OF THE INVENTION

[0011] As shown in the Figs 1-3, a window treatment mechanism 10 constructed in accordance with this invention includes several components that fit together telescopically about a common longitudinal axis, including a housing 12, a clutch 14, an actuator 16 and a spool 18.

[0012] The housing 12 is tubular with a smooth inner cylindrical surface 20 and an outer surface 22. Outer surface 22 has a plurality of longitudinal fins 24. The purpose of fins 24 is to engage a mandrel 26 that support a window treatment 28. One end of housing 12 has an enlarged head 30 formed with a plurality of radially running teeth 32.

[0013] The clutch 14 includes a hollow shaft 40. One end of shaft 40 is formed with two axially extending fingers 42 (seen in Fig. 4). The fingers 42 can be flexed inward toward the longitudinal axis of the shaft 40 and are sized and shaped to engage and trap the housing 12 when the housing 12 is in the operative position, as described more fully below and shown in Fig. 4.

[0014] The opposite end of the shaft 40 terminates with a tubular boss 42 having an enlarged diameter and holding a flat torsion spring 44 with two end tangs (with only one tang 50 being visible) near the end of the shaft 40. Tang 50 extends radially outward. The other tang extends radially inward and is received in a hole in the shaft 40 (not shown). Shaft 40 is provided at its opposite end with an annular rib 51.

[0015] Clutch 14 further includes a toroidal actuator 46. Actuator 46 has an inner cylindrical surface 48 with an annular groove (not shown) sized and shaped to accept the annular rib 51. Actuator 46 is also formed with one or more slots 60 on its outer surface. The actuator 46 is shaped to fit over the opposite end of the shaft 40, as shown in Fig. 1, with the annular rib 51 disposed within the annular groove to capture the actuator 46. Thus, the actuator 46 is attached to the shaft 40, but can rotate with respect to this shaft. The angular motion of the actuator is limited, as discussed in more detail below.

[0016] Shaft 40 of clutch 14 also includes a plurality of radial teeth 52A, 52B of said opposite end. Fig. 1 shows a set of these teeth; however, two or more sets of teeth may be used as well. The actuator 46 has a disc-shaped body with at least two fingers 54A, 54B extending tangentially. (see Fig 3) These fingers 54A, 54B are visible through two windows 56A, 56B in the actuator 46 and have a slight radial extension (not shown). Fingers 54A, 54B are flexible in a radial direction, and their function is described in more detail below. Finally, the actuator 46 also has at least one slot 58 for receiving tang 50 of spring 44.

[0017] Once the actuator 46 of clutch 14 is assembled, the teeth 52A, 52B of shaft 40 are disposed between the fingers 54A, 54B. Fingers 54A, 54B are oriented toward each other, as seen in Fig. 3, and are arranged and shaped to limit the rotational movement of the actuator 46 with respect to shaft 40. More particularly, in the position shown in Fig. 3, the actuator 46 can be rotated clockwise until the tooth 52A comes into contact with the finger 54A. Turning the actuator 46 further causes the finger 54A to flex radially outwards by the caming action of the tooth 52A against the radial extension 52C. Once the tooth 52A passes the tip of the finger 54A, the finger 54A snaps back, thereby engaging and trapping the tooth 52A. In this configuration, the tooth 52A and finger 52A define a first position for the actuator 46 with respect to the shaft 40. Tooth 52B cooperates in a similar manner with the finger 54B to define a second position for the actuator 46.

[0018] As previously mentioned, the tang 50 of spring 44 is received and engaged by slot 58 of the actuator 46. Since the other end of the spring 44 is captured by the shaft 40, the radial movement of the actuator 46 in the clockwise direction causes the spring 44 to wind tighter around the shaft 40, and radial movement of the actuator 46 in the counterclockwise direction causes the spring 44 to unwind so that it is separated slightly from the shaft 40.

[0019] Because of the properties described herein, the elements of the mechanism 10 (except for the spring 44) are preferably made of a suitable plastic material by molding or other well known means. The spring 44 is preferably made of steel or other similar material and has a square or rectangular cross section to present a larger contact surface with the surface of the shaft 40 and the inner surface of the housing 12. The diameter of housing 12 is chosen-so that when the spring 44 is unwound, the spring 44 is in intimate contact with the inner surface of housing 12. As a result of this arrangement, when the actuator 46 is in the first position, the shaft 40 of clutch 14 and the housing 12 are free to rotate with each other. When the actuator 46 is in the second position, the spring 44 is unwound sufficiently to come into contact with the inner surface of the housing 12. As a result, the housing 12 is free to rotate with respect to the shaft 40 in the clockwise because this type of rotation tightens the spring 44 just enough so that the outer surface of the spring 44 separates from, or slides with respect to, the inner surface of the housing 12. However, if the housing 12 is rotated in an opposite direction, the spring 44 expands and forms a frictional engagement with the inner surface of the housing 12, thereby effectively locking the housing 12 and the shaft 40 together so that one cannot rotate without the other.

[0020] Spool 18 is formed of two circular elements 70 and 84 (see Figs 1 and 4) that cooperate to form a toroidal shaped space. The inner circular element 70 is formed with a ring-shaped base 74 and a tubular section 76 depending rearwardly from base 74. Base 74 has a forward surface 72. The tubular section 76 has an outer cylindrical surface 78 and an inner cylindrical surface 80 formed with a plurality of grooves 82. The other circular element 84 includes a cylindrical outer wall 86 with a slot 88 (see

Fig 3) and an outer ring-shaped wall 90 with two diametrically spaced prongs 92 extending axially therefrom. A ribbon 94 is wound around the surface 78 of member 84 and has a free end 94 A extending through the slot 88, as seen in Fig. 3.

[0021] Tubular section 76 of inner circular element 70, is assembled with ribbon 94 wound thereon to define spool 18. The spool 18 is attached to the housing 12 and the other elements inserted in the housing, with the teeth 32 of housing head 30 cooperatively engaging the grooves 82 of inner circular element 70. The prongs 92 of circular element 84 snap into slot 60 formed along the outer surface of actuator 4 to form an interference fit between the spool and the actuator 46.

[0022] A window treatment 28 with mechanism 10 is assembled and installed as follows. The inner surface of the shaft 40 is provided with a plurality of radial ribs 96 (see Fig 3). When the mechanism 10 is installed in a window or door opening, a bracket section (not shown) supports the mechanism 10 and engages the ribs 96 to prevent the shaft 40 from rotating in either direction. The outer surface of the housing 12 with its ribs 22 along outer surface 22 are fit telescopically into the mandrel 26 and form a frictional engagement therewith so that they rotate together. The mandrel 26 supports a window treatment 28 including a sheet 29.

[0023] The mechanism 10 operates as follows. Initially, sheet 29 of window treatment 28 is wound all the way on the mandrel 26 and the actuator 46 is thus in its first position. The ribbon 94 is unwound from surface 78 of element 70 and its free end 94 A is hanging unwound along a side of the window opening. In this configuration, the window mechanism 10 is in its open position in order to allow light and air to come through the window opening. In order to close the window treatment 28, the ribbon 94 is pivoted upward as at B (in Fig. 3) by a user and pulled slightly to cause the actuator 46 to pivot from its first to its second position. With the actuator 46 in the second position, the housing 12 is free to rotate in either direction with respect to the shaft 40. The user can now grab the end of the sheet 27 of treatment 28 downward, either all the way until the window treatment is closed, or to any intermediate position. As the sheet 29 of window treatment 28 is unwound from the mandrel 26, the housing 12 turns counterclockwise and the ribbon 94 is wound up into spool 18. When the desired position of the window treatment is reached, the user pulls on the ribbon 94 slightly downward, causing the actuator 46 to pivot back to its first position. In this position, the housing 12 is allowed to rotate clockwise but not counter clockwise and therefore the window treatment is blocked from being unwound any further. In this configuration, pulling the ribbon 94 causes the housing 12 to rotate clockwise to wind the sheet 29 into the mandrel 26.

[0024] The mechanism 10 can be modular to accommodate several different types of window treatments and several different types of window/door openings. For this purpose, as shown in Fig. 4, the mechanism 10 can be distributed with one or more mandrels 26A, 26B having different diameters, as well additional bracket adapters 98A, 98B that fit into shaft 40 as shown.

[0025] Numerous modifications may be made to this invention without departing from its scope, as defined in the appended claims.

Claims

1. A window treatment system for covering an architectural opening comprising:

   a window treatment including a sheet wound in a first direction;
   a housing having a longitudinal axis and receiving said window treatment;
   a shaft disposed coaxially within said housing for supporting said housing;
   a clutch coupling said housing and said shaft and having a first position in which said housing is rotatable with respect to said shaft only in a first direction, and a second position in which said housing is rotatable in said first direction and a second opposite direction; and
   a spool including an elongated member disposed in the spool and coupled to the clutch to raise said window treatment when said elongated member is pulled from said spool.

2. The system of claim 1 wherein said clutch includes a coil spring disposed around said shaft and an actuator which in said first position of said clutch said actuator winds said spring into a first configuration, and in said second position of said clutch said actuator winds said spring into a second configuration.

3. The system of claim 2 wherein said spool is coupled to said actuator.

4. The system of claim 3 wherein said actuator and spool cooperate to pivot said actuator between said first and second positions as said elongated member is activated by a user.

5. The system of claim 2 wherein said spring has two tangs, one tang being engaged by said shaft and the second tang being engaged by said actuator.

6. The system of claim 2 wherein said housing includes a cylindrical surface and said spring selectively engages said cylindrical surface in said first position and disengages from said cylindrical surface in said second position.

7. The system of claim 1 wherein said spool includes a toroidal chamber and a ribbon wound within said chamber and forming said elongated member.

8. A mechanism for operating a window treatment including a mandrel and a sheet wound in a first direction on said mandrel, said mechanism comprising:

a support shaft for fixedly mounting said mandrel;
a housing rotatably mounted on said support shaft;
a clutch interconnecting said support shaft and said housing selectively in one of a first configuration in which said housing is rotatable in both directions with respect to said shaft and a second configuration in which said housing rotates about said shaft in a single direction; and
an elongated member wound coaxially with said shaft and arranged to raise said the sheet when pulled.

9. The system of claim 8 wherein said clutch includes a coil spring having at least a rectangular surface to define a contact surface with at least one of said shaft and said housing, a first tang engaged by said shaft and a second tang; and
a circular actuator engaging said second tang and pivotable between two positions, a first position in which said coil spring has its contact surface engaging one of said shaft and said housing and a second position in which said coil spring is disengaged.

10. The system of claim 9 wherein said elongated member in disposed in a spool, said spool being engaged to said actuator.

11. The system of claim 10 wherein said spool cooperates with said actuator to selectively pivot said actuator to one of said first and second positions.

12. The system of claim 9 wherein said actuator is coupled to said shaft and is pivotable between a first and a second angular orientation.

13. The system of claim 12 further comprising a detent securing said actuator in one of said first and second positions.

14. The system of claim 13 wherein said detent includes a tooth formed on one of said shaft and said actuator and a finger selectively engaging said tooth.

15. The system of claim 14 wherein said detent is formed of a tooth disposed on said shaft and a flexible finger disposed on said actuator.

16. The system of claim 12 wherein said angular orientations are defined by respective first and second detents.

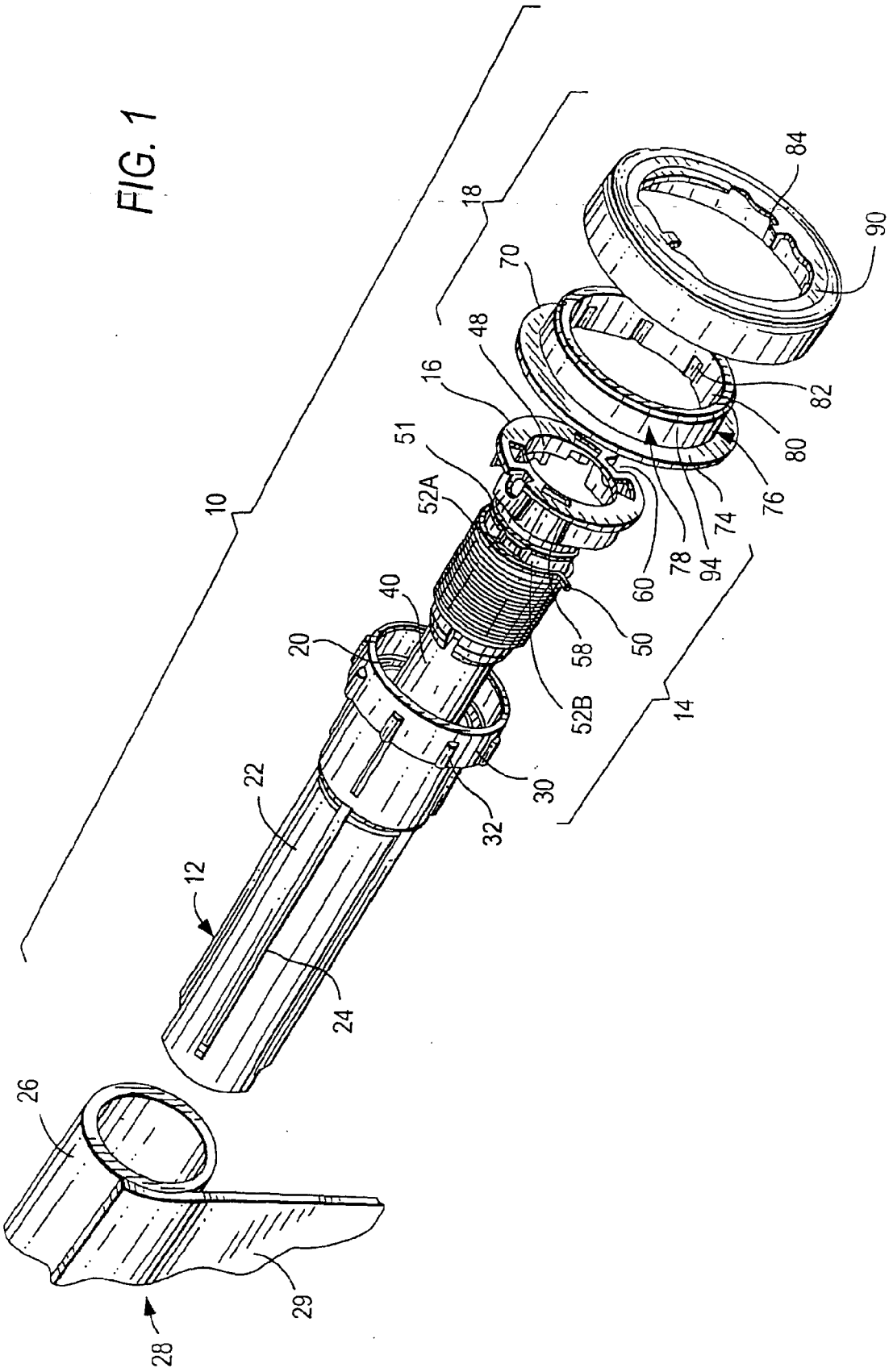
17. The system of claim 16 wherein each detent includes a first member attached to said shaft and a second member attached to said actuator.

18. The system of claim 17 wherein said second member includes two fingers tangentially arranged on said actuator.

19. The system of claim 18 wherein said first member includes teeth engaged by said fingers.

20. The system of claim 9 wherein said elongated member is a ribbon wound in a direction opposite said sheet.

FIG. 1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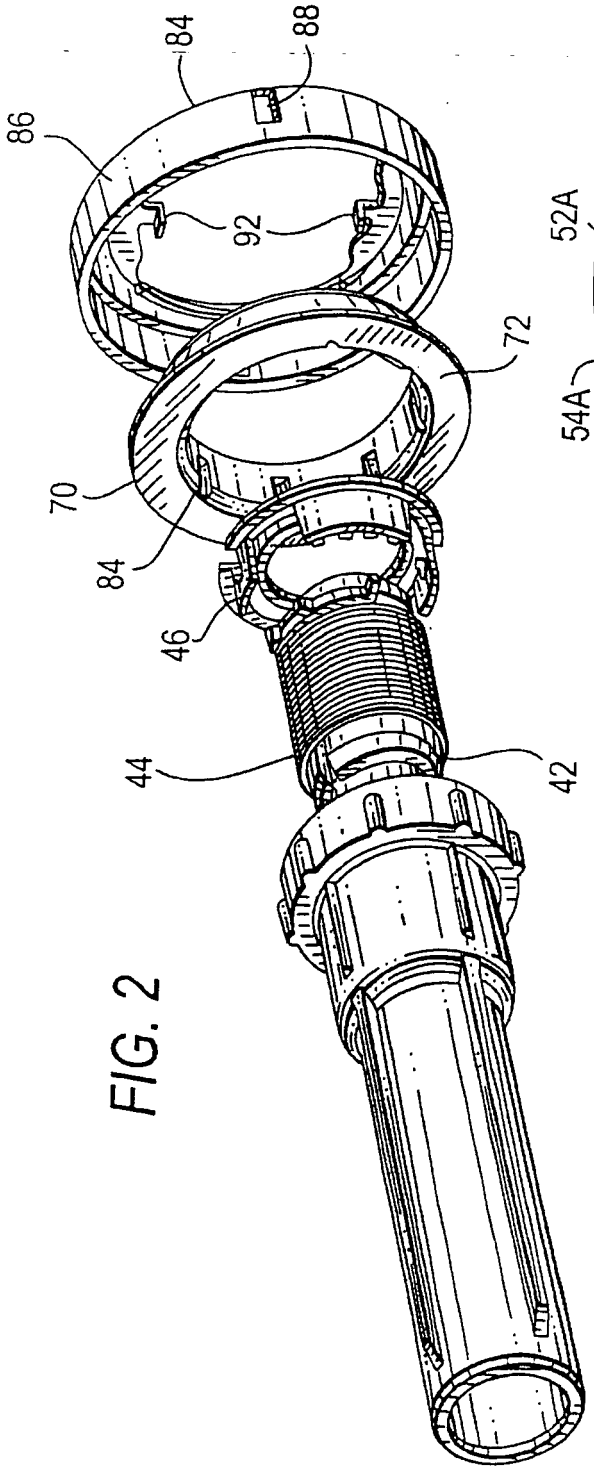
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FIG. 2

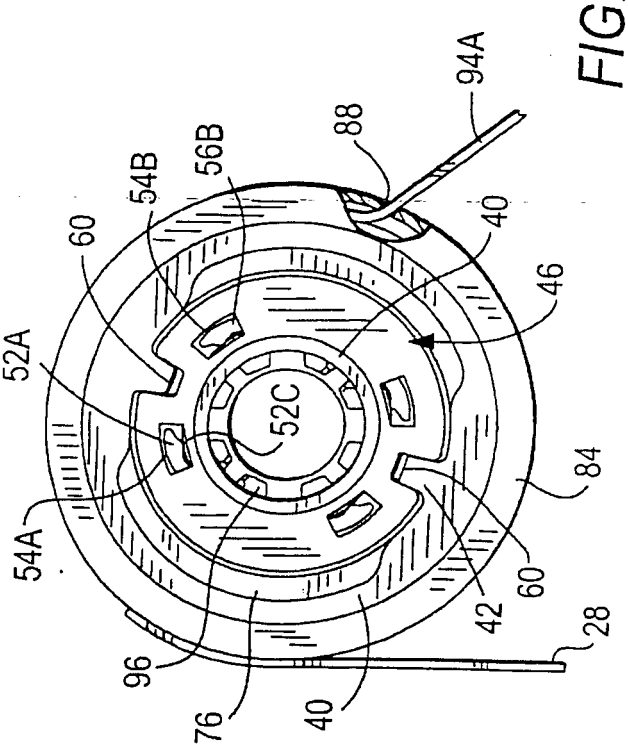
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FIG. 3

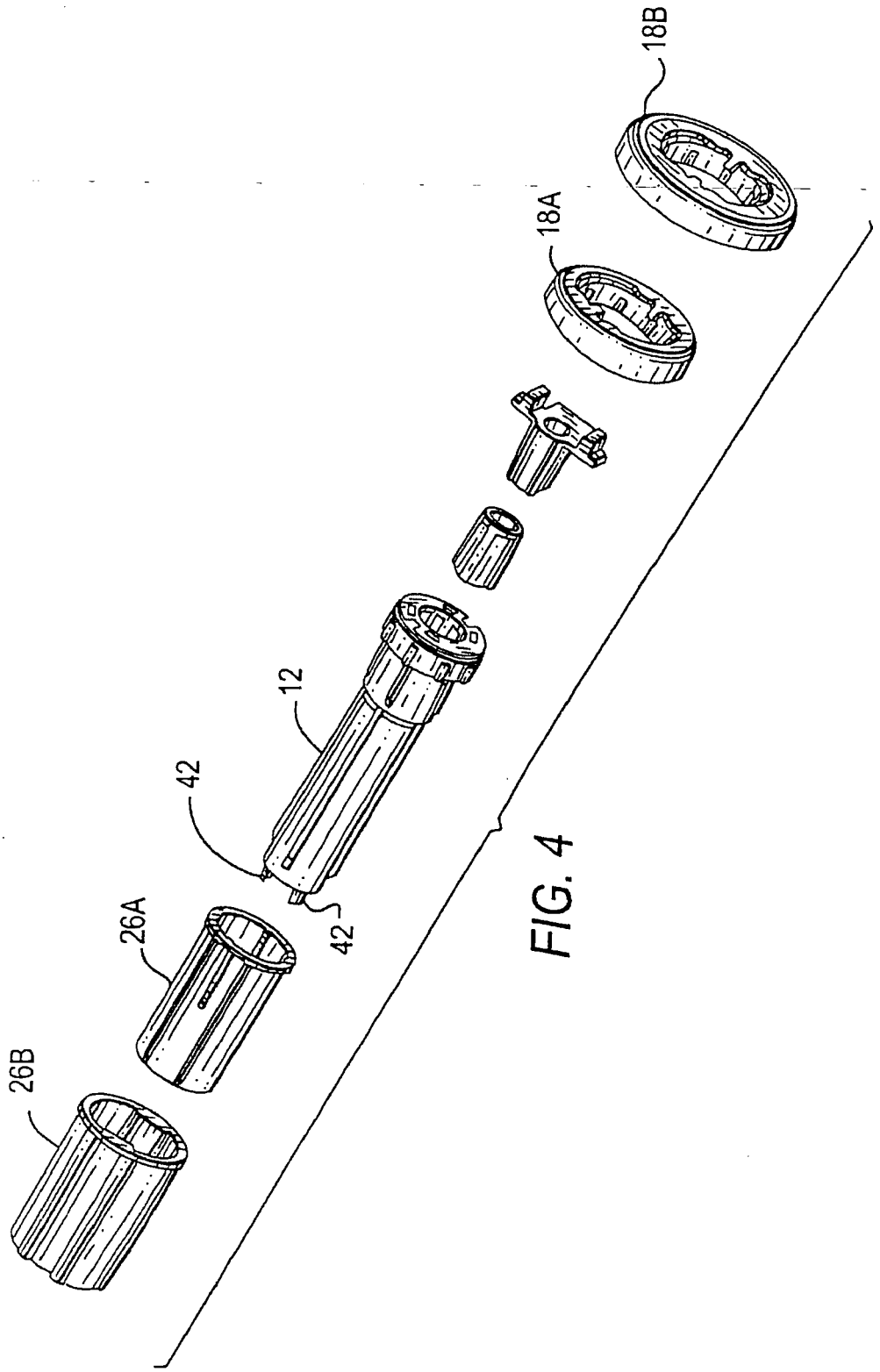

FIG. 4

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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- US 5791393 A **[0004]**
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