Jan. 8, 1952 E. A. CROSBY 2,582,010

ARBOR

Filed April 5, 1949

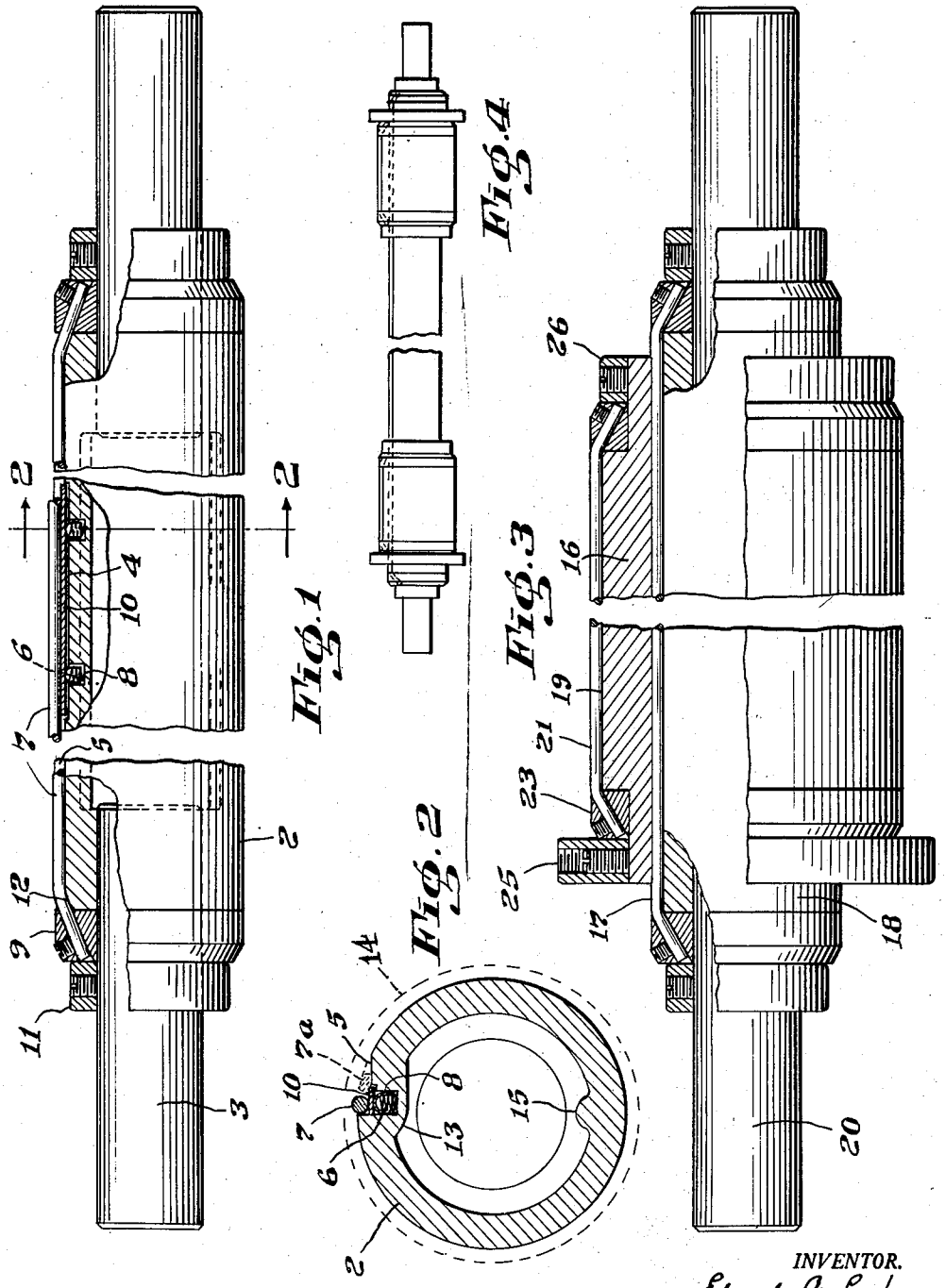

Fig. 1

Fig. 2

Fig. 3

Fig. 4

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Patented Jan. 8, 1952 2,582,010

UNITED STATES PATENT OFFICE

2,582,010

ARBOR

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Application April 5, 1949, Serial No. 85,650

6 Claims. (Cl. 242—72)

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This invention relates to apparatus principally for use in winding paper or other flexible sheet material on a tubular roll or in unwinding such material therefrom so that a positive connection is established between the arbor and a surrounding tubular roll of sheet material with either a paper or metal hollow core. Ordinarily the roll is supported and driven or braked through a heavy steel shaft, fitted either with a complicated expanding arbor or, more commonly, with wedges driven in between the surrounding core and the shaft to prevent the slipping of the core on the shaft. Such wedges frequently distort the core, preventing its reuse and damage the inner layers of the material on the roll with consequent waste of the material, unless a heavy expensive steel core is used.

The advantages of my invention include the establishment of a positive connection for either driving for winding, or breaking for unwinding, without the necessity of wedges or complicated arbors between any type of hollow core and the arbor of this invention, which in its preferred form may be made of aluminum or other light material suitably attached to a central shaft or a portion thereof of an existing device. Further advantages of my invention include a saving of sheet material by the non-destructive means of gripping, and with a saving in weight and of driving power needed in older devices requiring the use of a longer central steel shaft and heavy steel cores. The present construction is inexpensive to manufacture and repair, and automatically achieves the necessary positive gripping. Also, cores of larger interior diameter may be used on the arbor by the use of of adapter arbors of various external diameters which may be installed on the permanent arbor as hereinafter described.

The functioning of the various parts of my invention is best understood in connection with the drawings illustrating the preferred form of the permanent and adapter arbors constructed according to my invention, in which:

Fig. 1 is a side elevation, partly broken away, showing the novel device of this invention;

Fig. 2 is a cross section of the device of Fig. 1 taken on line 2—2 thereof;

Fig. 3 is a side elevation, partly broken away, showing a modification of the device of Fig. 1; and

Fig. 4 is a side elevation view, showing a further modification of my device.

Referring to Fig. 1, the device includes a hollow arbor 2, mounted on stub shafts 3, which may either be driven or supplied with a braking device. Of course, a continuous single central shaft may be employed but is heavier and more expensive. A cord 7 lies in an axially extending slot or groove 5 of special form in the exterior surface of the arbor 2 and is anchored at the ends of the arbor to movable collars 9, loosely mounted on shafts 3, so that as the cord moves laterally or circumferentially within the slot or groove 5, it will rotate the collars 9 with respect to the shafts 3 so that the cord will tend to remain at all times substantially parallel to the axis of the arbor. Fixed collars 11 may be used to hold the movable collars 9 against separation and excessive tautness in cord 7. To aid in ready rotation of collars 9, the end edges 12 of the groove 5 may be chamfered as shown to prevent binding of the cord by too sharp angular contour at the edges of the arbor 2, since if binding occurs, the cord 7, due to its flexibility, will bend and so tend to grip a surrounding core in its central portion only. The cord 7 is distortable to provide a substantially continuous contact along its length with the surrounding hollow core 14 despite any undulations or variations in the interior surface of the core, and having a coefficient of friction such that a slight rotation of the core with respect to the arbor will move the cord laterally or circumferentially and bind the arbor to the core.

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Referring to Fig. 2, the mounting of the cord 7 in the slot may be readily seen. The slot or groove 5 is of greater depth at one side than at the other (formed by a chord and a radius in the device shown), so that when a rotative force is applied in one direction, the friction between the cord 7 and the contacting internal opposing surface of the surrounding core (however smooth said surface may be) forces the cord 7 towards the shallow side of the groove 5 where shown as deformed and in displaced position, indicated as 7*a*, to provide positive gripping of the surrounding core 14. When a rotative force is applied in the opposite direction, the friction between the cord 7 and core with its roll of sheet material forces the cord 7 into the deep side of the slot or groove 5, where the gripping action is slight, permitting the easy axial removal of the core with its roll of sheet material from the arbor 2 following a a slight conter rotation to release the grip. The arbor 2 is constructed with a heavier portion of the sidewall 13 at the slot or groove 5 to provide an arbor of uniform strength, and with an extension of the sidewall 15 on the

opposite side of the arbor 2 for balancing the arbor.

If desired, an increased clearance between the arbor 2 and a surrounding core can be provided if a portion of the groove is fitted with a metal strip 10 seated in a depression 4 on the bottom of the groove, said strip being urged radially outwardly through the action of springs 6 lying in holes 8. The central portion of cord 7 extends over the metal strip 10 and is urged thereby in a direction radially of the arbor far enough to contact the internal opposing surface of the surrounding core, so that the wedging and gripping action will take place. The metal strip 10 need not extend the entire length of the groove 5 and is preferably positioned near the deep side of the groove and midway of its length. This arrangement also requires less effort to slide the core on the arbor because frictional contact between the core and the cord is limited to a small central portion until this central portion forces the entire cord into frictionally gripping relation when the rotating action takes place.

Fig. 3 shows one form of adapter arbor 16, in place on an arbor 18, permanently installed on a shaft 20. The adapter arbor is hollow and of such inside diameter to fit over the permanent arbor 18 and be gripped by the cord 17 in the slot or groove on the permanent arbor in the same manner as the core of a roll of sheet material would be gripped. On the exterior surface of the adapter arbor, an axially extending slot or groove 18 contains a cord 21 which together function as just described in connection with the similar cord 7 and groove 8. The cord 21 is gripped at its ends by movable collars 23, which permit the cord to move laterally or circumferentially within the slot or groove, while remaining at all times substantially parallel to the axis of the arbor. Fixed collars 25 and 26, may be of lesser diameter than the arbor, or of greater if a stop for the roll of sheet material is desirable. The wedging and gripping action of the cord on the adapter arbor on the core of a roll of sheet material is the same as that of the permanently installed arbor on a roll of sheet material. The adapter arbor need not extend the entire length of the permanent arbor, as shown in Fig. 4, but may be of a shorter length and adapted to be used in pairs to support a roll of sheet material, in order to increase the ease of handling and reduce the weight in large sizes of adapter arbors.

My novel arbor provides an inexpensive and practical means for holding a roll of sheet material, and by the use of my adapter arbors, can accommodate rolls of sheet material with various diameters of cores without complicated and expensive changes.

Though I have described and shown the preferred form of my device including a rubberized or other friction-surfaced cord secured at the ends of the arbor with movable collars, any distortable, that is, flexible as well as deformable, longitudinally extended cord including a wire cable having a sufficient frictional coefficient to render back and forth laterally of the groove and bind the arbor and the surrounding unyielding smooth suface of a metal, paper, or fibre core will achieve a similar result.

I claim:

1. An arbor adapted for use in winding or unwinding a roll of paper or the like on a rigid hollow cylindrical core, said arbor having a wall portion defining a depression in the surface of said arbor extending longitudinally thereof, a part of said wall portion extending from a line of less radius at the bottom of said depression at an angle to said radius towards a line of greater radius, thereby providing a wedging surface in said depression, a longitudinally extending distortable cord of substantially circular cross-section disposed in said depression and movable along said wedging surface between said lines, the diameter of said distortable cord being slightly greater than the depth of said depression at said line of less radius and the surface of said distortable cord having a coefficient of friction adapted to cause it, when contacted by a surrounding smooth unyielding internal wall of a hollow core positioned over said arbor, to move along said wedging surface to lock the core against further rotation relative to said arbor in one direction as the cord moves up said wedging surface and to release the core from said lock upon rotation of said core relative to said arbor in the opposite direction as said cord moves down said wedging surface.

2. An arbor as claimed in claim 1 having means for anchoring said distortable cord at the ends of said arbor, said means being mounted for movement relative to said arbor while said distortable cord moves in said depression to and from wedging position to hold said cord against separation from said arbor while permitting wedging movement of said cord along substantially the entire length of said depression.

3. An arbor as claimed in claim 1 having means for anchoring said distortable cord at the ends of said arbor, at least one of said anchoring means being of less diameter than said arbor to permit a core of only slightly greater diameter than the diameter of said arbor to be passed over said anchoring means onto said arbor.

4. An arbor as claimed in claim 3 in which said distortable cord is a wire cable.

5. An arbor as claimed in claim 1 having a pair of anchoring means for said distortable cord, one at each end of said arbor, each being mounted for rotation relative to said arbor as said distortable cord moves in said depression to and from wedging position to hold said cord against separation from said arbor while permitting wedging movement of said cord along substantially the entire length of said depression.

6. An arbor as claimed in claim 5 wherein the anchoring means are of a diameter no greater than the diameter of said arbor and the distortable cord is bent downwardly over the ends of the arbor to anchoring position on said anchoring means, ends of said depression wall portion being chamfered to reduce the angle of the bend of said cord over said arbor ends.

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