

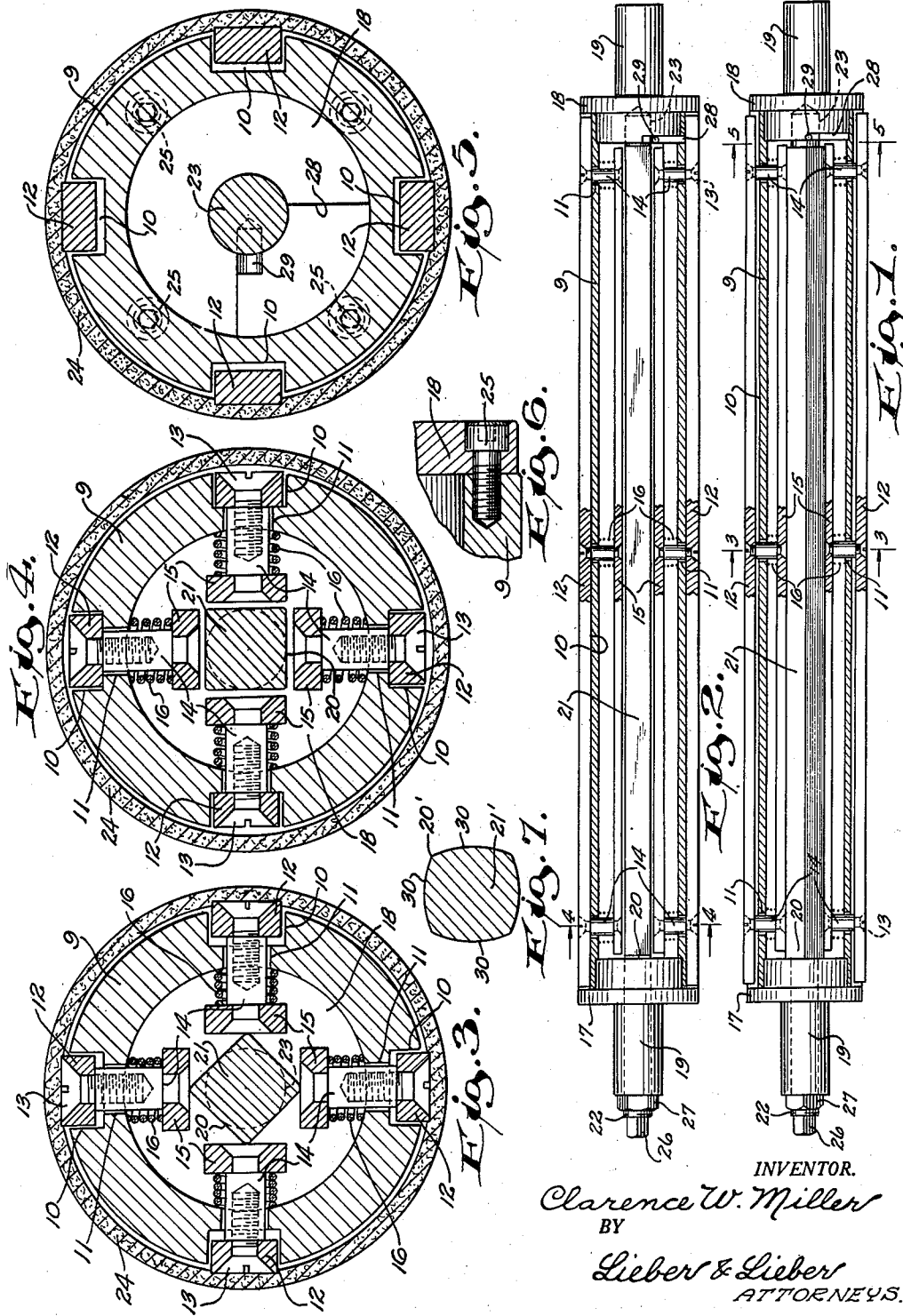
June 26, 1951

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2,558,689

VARIABLE DIAMETER WINDER SHAFT

Filed March 5, 1948



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2,558,689

VARIABLE DIAMETER WINDER SHAFT

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Application March 5, 1948, Serial No. 13,232

2 Claims. (Cl. 242—72)

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The present invention relates generally to improvements in arbors having variable diameters, and relates more specifically to improvements in the construction and operation of expansible and collapsible winder shafts such as are ordinarily employed in producing rolls of paper or the like.

The primary object of my invention is to provide an improved variable diameter and collapsible roll supporting arbor, which is simple in construction and highly efficient in operation.

It is a common expedient in the paper industry, to employ so-called winder shafts in the production of rolls of paper stock of various dimensions. These winder shafts must be quickly and conveniently removable from within the completed rolls, and in order to effect such removal, various types of collapsible shaft assemblies have heretofore been proposed and utilized. In most of these prior heavy duty winder shafts, the roll supporting shaft or arbor was formed of several half or quarter round elongated sections which were interconnected by means of tiltable toggle links so that relative longitudinal shifting of the sections would either increase or diminish the shaft diameter by varying the angular dispositions of the connecting links. While these previous assemblies were quite satisfactory in actual use, they were not sufficiently durable, rather complicated and cumbersome in structure, and costly to manufacture and maintain in operation.

It is therefore an important object of my present invention to provide an improved collapsible winder shaft for producing paper rolls or the like, which is especially adapted for heavy duty service and which overcomes all of the difficulties and objections inherent in the prior heavy duty assemblies.

Another object of this invention is to provide an improved variable diameter and collapsible paper roll arbor, of great strength and which is adapted to coact with cylindrical roll cores of various diameter in a manner whereby these cores are always maintained truly circular regardless of their size.

A further object of the invention is to provide a relatively light but exceptionally durable collapsible arbor or shaft structure, which may be readily manufactured of few simple but sturdy parts adapted to be conveniently assembled or dismantled.

Still another object of my invention is to provide an improved expansible and collapsible roll winding shaft, which may be easily and quickly expanded or collapsed, and which may also be

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constructed in various sizes for diverse uses with the aid of simple equipment.

An additional object of the present invention is to provide an improved winder shaft which is readily manipulable to effect expansion and contraction thereof, and in which the parts are positively prevented from moving beyond predetermined limits.

These and other objects and advantages of the invention will be apparent from the following detailed description.

A clear conception of a typical embodiment of the improvements as applied to a heavy duty collapsible paper roll winder shaft, may be had by referring to the drawing accompanying and forming a part of this specification in which like reference characters designate the same or similar parts in the various views.

Fig. 1 is a longitudinal central section through one of my improved winder shafts, showing the parts in substantially fully expanded condition;

Fig. 2 is another longitudinal central section through the same winder shaft, but showing the parts in fully collapsed condition;

Fig. 3 is an enlarged transverse section through the expanded assemblage of Fig. 1, taken along the line 3—3, and showing a tubular roll core applied to the shaft;

Fig. 4 is a similarly enlarged transverse section through the collapsed assemblage of Fig. 2, taken along the line 4—4, and also showing a cylindrical roll core applied to the shaft;

Fig. 5 is a likewise enlarged transverse section through the expanded assemblage of Fig. 1, taken along the line 5—5, and again showing a tubular roll core applied;

Fig. 6 is a transverse section through a fragment of one end of the main shaft body and closure head; and

Fig. 7 is a transverse section through a modified central expanding and supporting member.

While the invention has been illustrated and described as being especially adapted for embodiment in heavy duty paper roll winding shafts, it is not my desire to unnecessarily restrict the scope or utility of the improved features by virtue of this limited showing; and it is also contemplated that specific descriptive terms used herein be given the broadest possible interpretation consistent with the disclosure.

Referring to the drawing, the improved collapsible winder shaft assemblage shown therein, comprises in general an elongated unitary tube or hollow body 9 having parallel longitudinal peripheral grooves 10 and local openings 11 extend-

ing therethrough at the bottoms of the grooves 10; an elongated strip or key 12 slidably confined in each of the grooves 10 by means of screws 13 coacting with guide elements or fittings 14 penetrating the adjacent openings 11, and having slats or flat bars 15 secured to their inner ends; a helical compression spring 16 surrounding each guide fitting 14 and coacting with the adjoining bar 15 and interior of the body 9; opposite end heads 17, 18 enclosing the ends of the body 9 and each having a cylindrical central journal portion 19 projecting outwardly therefrom; and an elongated expansion member or cam shaft 20 having a polygonal medial portion 21 and opposite cylindrical end portions 22, 23, the latter being journaled for rotation in the end heads 17, 18 respectively.

The unitary main tubular body 9 may be formed of any relatively light but durable metal, and the four key-ways or grooves 10 may be milled in the tube periphery while the local openings 11 may subsequently be drilled, thus providing an exceedingly strong one-piece and constantly cylindrical support adapted for free endwise reception of tubular fibrous roll cores 24 such as shown in Figs. 3, 4 and 5. These roll cores 24 may be formed of paper stock or the like and frequently vary to some extent in internal diameter, and the paper is wound snugly about these cores 24 while they are being held firmly upon the rapidly rotating winder shaft, so that the cores become part of the successive rolls. The elongated rectangular keys 12 which are slidably confined within the grooves 10 by the screws 13 and guide fittings 14, may be constructed of metal bar stock, and both the keys 12 and the key-ways 10 should extend throughout the entire length of the hollow body 9.

The openings 11 with which the fittings 14 rather snugly but slidably coact, are preferably spaced uniform distances along and around the tubular body 9, and have cylindrical transverse cross-section; and the inner slats 15 which are also formed of metal bar stock, may be welded or riveted to the inner ends of these fittings 14 while the screws 13 coact with threaded sockets therein to firmly but detachably secure the key strips 12 to the outer fitting ends after the fittings 14 have been projected through their receiving openings 11. The helical compression springs 16 which embrace the fittings 14, tend to constantly urge the keys 12 into the grooves 10, and the bars 15 inwardly toward the shaft axis, and these slat bars 15 are also disposed parallel to each other and extend throughout the major length of the body 9.

The end closure heads 17, 18 are disposed coaxially of the tubular body 9, and are firmly but detachably secured thereto as by means of cap screws 25 shown in Figs. 5 and 6; and the cam shaft 20 may be formed of a square or otherwise polygonal metal bar having its opposite end portions 22, 23 turned cylindrical. The polygonal portion 21 of the cam shaft 20 is disposed between the flat bars 15, and is of such size that rotation of the shaft member in one direction will cause the corners of the polygonal section to engage the slats 15 and to force the keys 12 outwardly within the grooves 10 as in Figs. 1, 3 and 5; while the opposite rotation of the shaft 20 will cause the flat faces of the polygonal shaft portion 21 to lie parallel to and spaced from the flat inner faces of the bars 15 as in Figs. 2 and 4.

The cylindrical shaft end 22 is journaled for such relative rotation of the cam shaft 20 and

end heads 17, 18, within the journal projection 19 of the head 17, while the other cylindrical cam shaft end 23 is likewise journaled in the opposite end head 18; and the protruding cam shaft end 22 is provided with a polygonal extreme end portion 26 for effecting rotation of the shaft 20, and with a nut 27 for locking the cam portion 21 in expanding condition. In order to limit the rotary motion of the shaft 20 relative to the end heads 17, 18 to ninety degrees, the end head 18 is provided with a quadrant cut-out 28 in which a stop pin 29 carried by the shaft 20 is swingable as illustrated in Fig. 5; and when this pin 29 is disposed as in Figs. 1 and 5, the winder shaft is fully expanded, whereas disposition of the pin 29 at the opposite side of the cut-out indicates that the winder shaft has been fully collapsed.

When the various parts of the improved winder shaft unit have been properly constructed as hereinabove described, these parts may be readily assembled and manipulated in the following manner. After the fittings 14 have been attached to their respective slat bars 15 and the springs 16 have been placed loosely over the fittings, these bar and fitting assemblages may be slid longitudinally through one open end of the body 9 until the guide fittings are in alinement with the openings 11, whereupon the fittings 14 may be projected through the adjacent openings and the keys 12 may be attached to the outer fitting ends with the aid of the screws 13. This operation may be repeated with respect to each of the four bars 15 and keys 12; and after the screws 13 have been applied so as to force the outer ends of the fittings 14 into firm engagement with the keys 12, the springs 16 will be compressed and will urge the keys toward and in contact with the bottoms of the grooves 10. The end head 18 should then be applied and fastened to the body 9 by means of screws 25, and the cam shaft 20 may thereafter be inserted longitudinally through the opposite open end of the body 9 whereupon the other end head 17 may likewise be fastened to the body by means of screws 25. The lock nut 27 may then be applied to the threaded cam shaft end 22 to complete the assemblage, and the parts will be in collapsed position as shown in Fig. 4.

When a roll core 24 is to be applied to the assembled and collapsed winder shaft, this core 24 may be slipped longitudinally over an end of the assemblage. The cam shaft 20 should then be rotated relative to the body 9 in a clockwise direction as viewed in Fig. 5, by applying a wrench to the polygonal cam shaft end 26 while holding the body 9 against rotation, thus causing the pin 29 to swing within the cut-out 28 of the end head 18 and also causing the corners of the polygonal cam portion 21 to engage the bars 15 and to thereby force the keys 12 outwardly within their guide grooves 10 and into firm engagement with the interior of the core 24 as shown in Figs. 3 and 5. Since these cores 24 are usually relatively soft and somewhat pliable, the keys 12 will sink into the adjacent portions of the cores as illustrated, thus firmly anchoring the cores to the winder shaft at equally spaced intervals around the shaft periphery. The winder shaft and core assembly may thereafter be mounted in suitable bearings coacting with the journal portions 19, and may subsequently be rotated in these bearings in a well known manner to wind the paper about the core 24; and in order to release the finished roll with the core 24 confined therein, it is only necessary to restore the winder shaft assemblage to the position shown in Figs. 2 and 4 by reversely rotat-

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ing the cam shaft 20 and to thereafter remove the paper roll and its core 24 endwise from the winder shaft.

From the foregoing detailed description it will be apparent that my present invention provides an exceptionally rigid and durable winder shaft assemblage composed of relatively few simple parts, and which may be readily manipulated to quickly but effectively attach the cores 24 and to release the finished rolls of paper. The cam shaft 20 while being provided with square transverse cross-section in Figs. 1 to 5 inclusive, may be formed otherwise polygonal, and may also be modified in cross-section as shown in Fig. 7 wherein the shaft 20' has been provided with a medial cam portion 21' having outwardly convex surfaces 30 thereon. The number of keys 12 may also be varied to suit the external diameter of the winder shaft, from three to six or eight, and the cross-section of the cam shaft should then be likewise varied so as to effect simultaneous actuation of all of the keys; but in all cases these keys should be uniformly spaced about the winder shaft axis in order to apply uniform gripping pressure to the interior of the cores 24 and to thus maintain these cores approximately cylindrical after they have been attached and to thereby insure the production of truly cylindrical final rolls.

The radially movable keys 12 are constantly confined and effectively guided within the grooves 10 by the fittings 14 which likewise guide the bars 15 for radial motion, and the compression springs 16 quickly withdraw the keys into the grooves 10 whenever the cam shaft 20 is rotated to release the bars 15. The various parts of the improved winder shaft may be conveniently assembled and dismantled, and may also be readily manipulated to attach and release the successive roll cores 24, while the lock nut 27 serves to firmly hold the cam shaft 20 in core attaching condition. The stop pin 29 coacting with the cut-out 28 also provides simple means for preventing over-travel of the cam shaft in either direction, and the entire assemblage may obviously be manufactured at moderate cost in diverse sizes and for various uses.

It should be understood that it is not desired to limit this invention to the exact details of construction or to the precise mode of operation and use of the winder shaft herein specifically shown and described, for various modifications within the scope of the appended claims may occur to persons skilled in the art.

I claim:

1. In a collapsible winder shaft, a one-piece hollow cylindrical body having a series of equally spaced outwardly open parallel peripheral recesses therein extending throughout the body

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length, each recess having spaced radial openings extending inwardly from its bottom into the body interior, an elongated key confined within each of said recesses and being radially movable therein, a series of parallel fittings detachably secured to each of said keys and projecting into the interior of said body through the adjacent openings, an elongated bar permanently attached to the inner ends of each series of fittings within said body, a polygonal shaft revolvable centrally within said cylindrical body and having longitudinal peripheral corners simultaneously cooperable with all of said bars throughout their lengths to move the outer faces of said keys outwardly beyond their confining recesses, and resilient means embracing each of said fittings between the adjacent bar and body interior for urging said keys into their confining recesses.

2. In a collapsible winder shaft, a one-piece hollow cylindrical body having a series of equally spaced outwardly open parallel peripheral recesses therein extending throughout the body length, each recess having a central and opposite end openings extending inwardly from its bottom into the body interior, an elongated key confined within each of said recesses and being radially movable therein, a cylindrical fitting slidable through each of said openings and having its outer end detachably secured to the adjacent key and its inner end projecting within the interior of said body, an elongated flat faced bar permanently attached to the inner ends of each set of central and end fittings within said body, a polygonal shaft revolvable centrally within said cylindrical body and having longitudinal corners simultaneously cooperable with the inner flat faces of all of said bars throughout their lengths to move the outer faces of said keys outwardly beyond their confining recesses, and a helical compression spring embracing each of said fittings between the adjacent bar and body interior for urging said keys into their confining recesses.

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