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Gotze

[11] **3,838,829**

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[54] **DEVICE FOR CENTERING ROLLS OF CONVOLUTED STRIP MATERIAL IN PHOTOGRAPHIC COPYING MACHINES OR THE LIKE**

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[51] **Int. Cl.** **B65h 19/02**

[58] **Field of Search** 242/68.4, 68, 68.5, 68.2, 242/129.51

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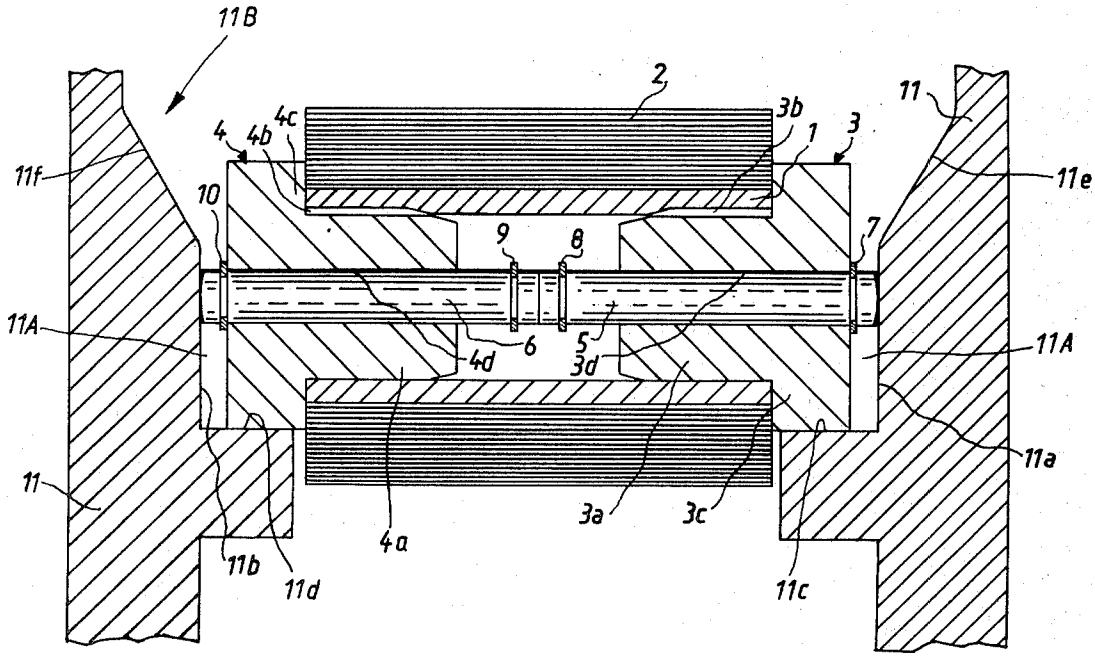
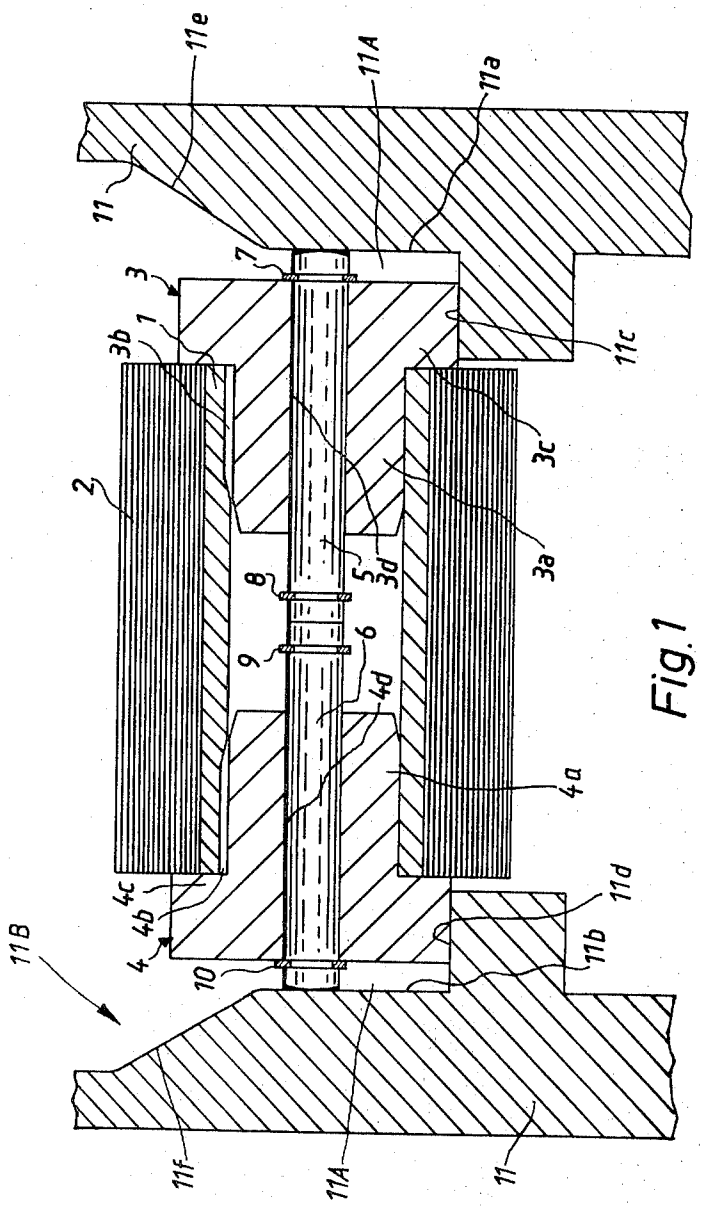
Primary Examiner—John W. Huckert
Assistant Examiner—Edward J. McCarthy
Attorney, Agent, or Firm—Michael S. Striker

[57] **ABSTRACT**

A device for centering rolls of convoluted strips in photographic copying machines has two shafts of identical length which, when placed end-to-end, are insertable from above into a chamber provided in a bearing structure. Each shaft has an outer stop and an inner stop and each shaft carries an annular insert which is movable axially between the corresponding stops. The inserts have hubs which are insertable into the ends of the core for a roll of convoluted strip material and flanges which abut against the respective ends of the core in response to complete insertion of the hubs. The inserts abut against the outer stops when their flanges abut against the ends of a core having a greater length and against the inner stops when their flanges abut against the ends of a core having a smaller length. Each insert further carries a spring-biased ball which can snap into a recess provided in the periphery of the associated shaft between the corresponding stops so that the inserts can center cores of an intermediate length.

11 Claims, 3 Drawing Figures




11e
11A
11a
11
7
3
1
3b
11c
3c
2
3a
5
3d
8
6
9
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4c
4b
4
10
11d
11b
11B
11f
11A
11

Fig. 1

Fig.2

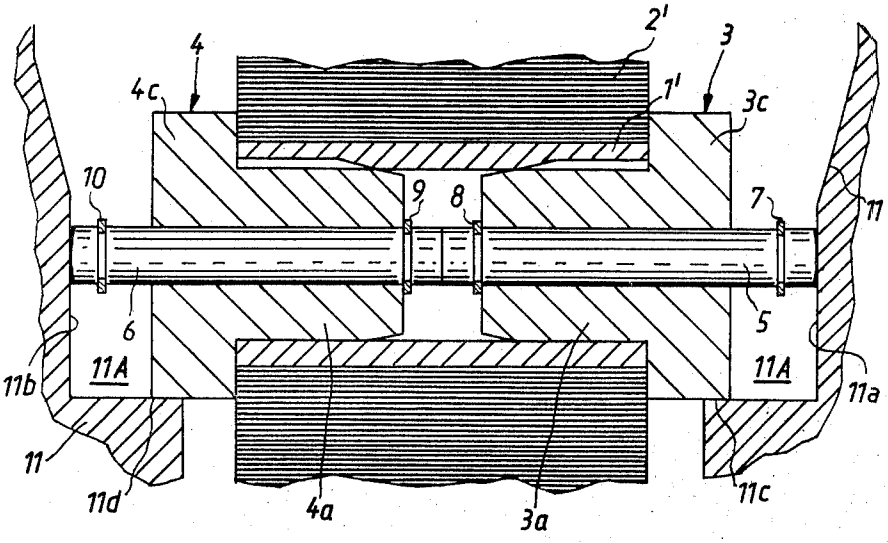
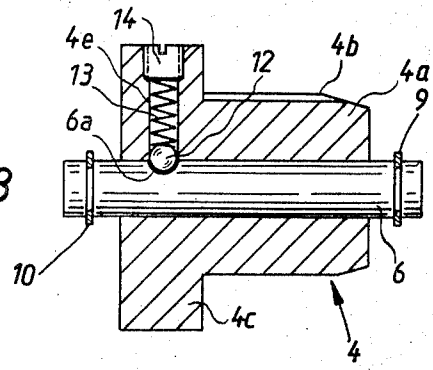

2'
3
4
4c
1'
3c
10
9
8
7
11
6
5
11A
11A
11b
11a
11
11d
4a
3a
11c

Fig.3


14
4e
13
12
4b
4a
9
6a
10
6
4c
4

DEVICE FOR CENTERING ROLLS OF CONVOLUTED STRIP MATERIAL IN PHOTOGRAPHIC COPYING MACHINES OR THE LIKE

BACKGROUND OF THE INVENTION

The present invention relates to improvements in devices for centering tubular bodies of different axial lengths in bearings or analogous supports. More particularly, the invention relates to devices which can be utilized to center tubular cores for rolls of convoluted strip material, for example, in a photographic roll copying machine or the like.

It is already known to provide a centering device with a one-piece shaft having in its periphery two sets of notches for reception of disks which flank the core for a supply of convoluted strip material. The shaft is inserted into the core and the disks are thereupon introduced into the corresponding notches to hold the core against axial movement and to center the core between the ends of the shaft. A drawback of such centering devices is that the axial positions of the disks must be changed whenever a relatively long core is replaced with a shorter core or vice versa. Moreover, at least one disk must be removed from the shaft prior to insertion of the shaft into and prior to withdrawal of the shaft from a core. Still further, an operator is likely to forget to change the positions of disks, especially when a relatively long core is followed by a shorter core, so that the failure to properly center the core is detected only when the core is rotated to pay out the convoluted material. It was further found that proper adjustment of the just described centering devices takes up relatively long periods of time and that such devices are too complicated, bulky and expensive for use in all types of photographic printing machines or the like.

SUMMARY OF THE INVENTION

An object of the invention is to provide a novel and improved centering device for tubular bodies, such as cores for and/or rolls of convoluted strip material, which can be used to properly center shorter, longer or medium-length tubular bodies, whose manipulation during change-over from centering of longer tubular bodies to centering of shorter tubular bodies or vice versa takes up a minimal amount of time, and which can be used as a simpler, less expensive, more reliable, longer-lasting and more versatile substitute for presently known centering devices.

Another object of the invention is to provide a centering device whose components need not be taken apart, adjusted and/or otherwise manipulated when a relatively long tubular body is followed by a shorter tubular body or vice versa.

A further object of the invention is to provide a centering device which can accept and center tubular bodies or two or more different lengths and which can automatically center tubular bodies of at least two different lengths.

The invention is embodied in a device for centering tubular bodies of different axial lengths, particularly for centering cores for and/or rolls of convoluted strip material in a photographic roll copying machine or the like. The centering device comprises a bearing or support having a chamber of predetermined length which is preferably accessible from above, a pair of shafts

each of which has spaced-apart inner and outer stops and which are insertable into the chamber of the bearing when placed end-to-end whereby the combined length of the two shafts preferably equals or closely approaches the length of the chamber, and an annular insert axially movably mounted on each of the shafts between the respective inner and outer stops. The inserts have hubs which are insertable into a tubular body (e.g., into a core for or into a roll of convoluted strip or web material) from opposite ends of the tubular body and flanges which abut against the respective ends of the tubular body in response to complete insertion of the hubs. The inserts abut against the inner stops of the respective shafts when the hubs are inserted into a tubular body having a first axial length and against the outer stops of the respective shafts when the hubs are inserted into a tubular body having a greater second axial length and while the shafts are disposed in the chamber of the bearing end-to-end.

The novel features which are considered as characteristic of the invention are set forth in particular in the appended claims. The improved centering device itself, however, both as to its construction and its mode of operation, together with additional features and advantages thereof, will be best understood upon perusal of the following detailed description of certain specific embodiments with reference to the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is an axial sectional view of a centering device which embodies the invention, the inserts being shown in axial positions they assume during centering of a relatively long core for a roll of convoluted strip material;

FIG. 2 is a similar axial sectional view of the centering device with the inserts shown in positions they assume during centering of a shorter core; and

FIG. 3 is a side elevational view of one shaft and an axial sectional view of the corresponding insert, showing a detent structure which can releasably hold the insert in an intermediate position between the corresponding stops.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 illustrates a centering device which comprises five discrete parts, namely, a bearing or support **11**, two shafts **5, 6** having identical lengths, and two annular inserts or plugs **3, 4** which respectively surround and are movable axially of the shafts **5** and **6**. The bearing **11** defines a chamber **11A** which extends between two parallel vertical surfaces **11***a*, **11***b* and whose length is identical with or closely approximates the combined length of the shafts **5** and **6**. The bearing **11** has an open upper side **11B** which is flanked by two surfaces **11***e*, **11***f* converging toward each other in a direction toward the chamber **11A** so that the outer ends of the shafts **5, 6** can slide along and are guided by the surfaces **11***e*, **11***f* during insertion into the chamber **11A**.

The shafts **5, 6** are respectively provided with inner stops **8, 9** and outer stops **7, 10**. The stops **7, 8** of the shaft **5** are mirror symmetrical to the stops **10, 9** of the shaft **6** with reference to a plane which is normal to the axes of and extends between the shafts **5, 6** when the shafts are received in the chamber **11A** in a manner as shown in FIG. **1**. Thus, the distance between the inner

end of the shaft **5** and the inner stop **8** is identical with the distance between the inner end of the shaft **6** and the inner stop **9**, and the same applies for the outer stops **7, 10**. Each stop is preferably a split ring which extends in part into a circumferential groove of the respective shaft. However, it is equally within the purview of the invention to provide the shafts **5, 6** with permanently installed or integral stops.

The inserts **3, 4** respectively comprise substantially cylindrical hubs **3***a*, **4***a* and preferably ring-shaped flanges or extensions **3***c*, **4***c* which extend radially outwardly beyond the respective hubs. Each hub has at least one radially outwardly extending projection in the form of an axially parallel rib **3***b*, **4***b* whose width and or height decreases in a direction away from the respective flange. The flanges may but need not extend circumferentially all the way around the respective shafts.

FIG. **1** further shows a tubular body **1** in the form of a cylindrical core consisting of cardboard or the like and supporting a supply or roll of convoluted strip material **2**. The internal diameter of the core **1** is slightly greater than the diameters of the hubs **3***a*, **4***a*. The arrangement is such that, when the hubs **3***a*, **4***a* are inserted into the core **1** from the opposite ends thereof, the ribs **3***b*, **4***b* bear against the internal surface of the core and hold the inserts **3, 4** against axial movement. When the hubs **3***a*, **4***a* are properly inserted into the core **1**, the flanges **3***c*, **4***c* abut against the respective ends of the core and against the adjacent ends of innermost convolutions of the roll of strip material **2**. The length of the core **1** is such that, when the hubs **3***a*, **4***a* are fully inserted and the shafts **5, 6** are inserted into the chamber **11**A end-to-end, the inserts **3, 4** respectively abut against the outer stops **7, 10** and are thereby centered in the bearing **11**. The latter is further provided with supporting surfaces **11***c*, **11***d* on which the flanges **3***c*, **4***c* rest when the centering device is fully assembled in a manner as shown in FIG. **1**. The distance between the supporting surface **11***c* and the right-hand end of the roll of convoluted strip material **2** is then identical with that between the left-hand end of the supporting surface **11***d* and the adjacent end of the roll. The material **2** is assumed to be a web of paper one side of which is coated with a photosensitive layer to be exposed to light in the photographic copying machine.

If the core **1** of FIG. **1** is replaced with a shorter core **1′** (FIG. **2**) for a shorter roll of convoluted strip material **2′**, the hubs **3***a*, **4***a* are introduced into the opposite ends of the core **1′** so that the flanges **3***c*, **4***c* reach and abut against the respective ends of the roll **2′**. When the shafts **5, 6** are thereupon inserted into the chamber **11**A of the bearing **11**, the inserts **3, 4** respectively abut against the corresponding inner stops **8, 9** so that the roll **2′** is centered exactly midway between the supporting surfaces **11***c*, **11***d* for the flanges **3***c*, **4***c*. The attendant who replaces the core **1** of FIG. **1** with the core **1′** of FIG. **2** need not be concerned with the axial positions of inserts **3, 4** on the respective shafts **5, 6**; all the attendant has to do is to make sure that the flanges **3***c*, **4***c* abut against the respective ends of the core **1′**. Once the shafts **5, 6** are thereupon inserted into the chamber **11**A, the inserts **3, 4** automatically assume the positions shown in FIG. **2** in which their hubs **3***a*, **4***a* respectively abut against the inner stops **8** and **9**. The same holds true if the core **1′** of FIG. **2** is to be replaced with the longer core **1** of FIG. **1**. Thus, the centering device can be rapidly and conveniently converted for proper centering of longer cores **1** or shorter cores **1′** without requiring much attention on the part of the attendant. As mentioned above, the attendant is merely required to fully insert the hubs **3***a*, **4***a* into the respective ends of the core **1** or **1′**; the centering action is carried out in automatic response to insertion of shafts **5, 6** into the chamber **11**A because the inner ends of the shafts then abut against each other and the stops **7, 10** or **8, 9** move into abutment with the adjacent outer or inner ends of the corresponding inserts **3, 4**. The roll **2′** of FIG. **2** will be installed in the photographic copying machine when the machine is to make relatively small prints from a series of originals, such as the frames of an exposed photographic roll film or the frames of a series of roll films which are spliced to each other end-to-end.

If the material of the core **1** or **1′** is relatively soft, it will undergo some deformation when its ends receive the hubs **3***a*, **4***a* because the ribs **3***b*, **4***b* either deform or even penetrate into the core. During unwinding of strip material **2** or **2′**, the inserts **3, 4** may rotate relative to the shafts **5, 6**, the shafts and the inserts may rotate with the core **1** or **1′**, or the core **1** or **1′** rotates relative to the inserts and shafts. The same applies when the core **1** or **1′** is used to collect strip material in a photographic copying machine or the like.

The axial bores **3***d*, **4***d* of the inserts **3, 4** receive the respective shafts **5, 6** with sufficient clearance to allow the inserts to move axially of the shafts or vice versa. It is clear, however, that the inserts **3, 4** can be mounted in such a way that they are free to move axially between the respective stops **7, 8** and **9, 10** but cannot rotate on the associated shafts.

FIG. **3** illustrates the shaft **6** and the associated insert or plug **4**. The periphery of the shaft **6** between the stops **9** and **10** is provided with at least one notch or recess **6***a* which can receive a ball **12** mounted in a radial bore **4***e* of the flange **4***c* and being biased radially inwardly by a helical spring **13** which reacts against a screw **14**. The latter meshes with the flange **4***c* and is received in the outermost end of the bore **4***e*. When the insert **4** assumes the illustrated intermediate position (spaced apart from the stops **9** and **10**), the ball **12** snaps into the recess **6***a* and thereby releasably holds the insert against axial movement relative to the shaft **6** or vice versa. A similar detent structure can be provided on the shaft **5** and insert **3**. The purpose of such detent structures is to enable the centering device to properly center tubular bodies whose axial length exceeds that of the core **1′** but is less than the axial length of the core **1**. In assembling the inserts **3, 4** and shafts **5, 6** with a tubular body of intermediate length, the attendant inserts the hubs **3***a*, **4***a* in the same way as shown in FIGS. **1** or **2** and thereupon moves the shafts **5, 6** axially so that the balls **12** snap into the respective recesses whereby the tubular body of intermediate length is automatically centered when the shafts **5, 6** are inserted into the chamber **11**A. It is clear that each shaft may be provided with two or more suitably distributed recesses as well as that the recesses can be provided in the internal surfaces of the inserts **3, 4**; in the latter instance, each shaft has a radial bore for a spring-biased ball which can snap into a selected recess of the associated insert.

It is further clear that the detent structure shown in FIG. **3** constitutes but one form of means for yieldably holding the inserts **3, 4**, in one or more intermediate

positions. For example, each insert can carry in its interior a leaf spring (not shown) and the shafts **5, 6** may be provided with circumferential grooves alternating with ribs which cooperate with the respective leaf springs to hold the inserts in selected intermediate positions.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can, by applying current knowledge, readily adapt it for various applications without omitting features which fairly constitute essential characteristics of the generic and specific aspects of my contribution to the art and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the claims.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended claims.

1. A device for centering tubular bodies of different axial lengths, particularly for centering rolls of convoluted strip material in photographic copying machines or the like, comprising a bearing having a chamber of predetermined length; a pair of discrete shafts each having spaced-apart inner and outer stops, the combined length of said shafts being substantially equal to said predetermined length so that said shafts are insertable into said chamber when placed end-to-end; and an annular insert axially movably mounted on each of said shafts between the respective stops, said inserts having hubs insertable into a tubular body from opposite ends thereof and flanges which abut against the respective ends of the tubular body in inserted positions of said hubs, said inserts abutting against the corresponding inner stops when said hubs are inserted into a tubular body of a first length and against the corresponding outer stops when said hubs are inserted into a tubular body of a greater second length and while said shafts are located end-to-end in said chamber.

2. A device as defined in claim **1,** wherein the length of each of said shafts is one-half said predetermined length, said stops on one of said shafts being mirror symmetrical to said stops on the other of said shafts with reference to a plane normal to the axes of and extending between said shafts when said shafts are located in said chamber end-to-end.

3. A device as defined in claim **1,** wherein said bearing has an open side through which said shafts are insertable into and removable from said chamber.

4. A device as defined in claim **3,** wherein said bearing has mutually inclined surfaces flanking said open side and converging toward said chamber to guide the outer ends of said shafts during insertion into said chamber.

5. A device as defined in claim **3,** wherein said open side is located at a level above said chamber.

6. A device as defined in claim **1** for centering tubular bodies having axial holes of a predetermined diameter, wherein the outer diameter of each of said hubs is less than said predetermined diameter.

7. A device as defined in claim **6,** wherein each of said hubs comprises at least one radially outwardly extending projection arranged to engage the internal surface of a tubular body which receives said hubs.

8. A device as defined in claim **7,** wherein each of said projections is an axially parallel rib whose width, as considered in the radial direction of the respective hub, diminishes in a direction away from the respective flange.

9. A device as defined in claim **1,** wherein said bearing comprises supporting surfaces for the flanges of said inserts.

10. A device as defined in claim **1,** further comprising detent means provided on said shafts and said inserts for releasably holding each of said inserts in at least one intermediate position between the respective stops.

11. A device as defined in claim **10,** wherein each of said detent means comprises at least one recess provided in the periphery of the corresponding shaft between the respective stops and a spring-biased member radially movably received in the corresponding insert and arranged to snap into said recess in said intermediate position of said corresponding insert.

* * * * *