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Zebny

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[54] **CORE AXLE WITH ADJUSTABLE RETAINER**

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[52] **U.S. Cl.** **242/72**

[51] **Int. Cl.** **B65h 75/24**

[58] **Field of Search** 242/72.1, 72, 46.2, 46.3, 242/46.4; 279/2

[56] **References Cited**

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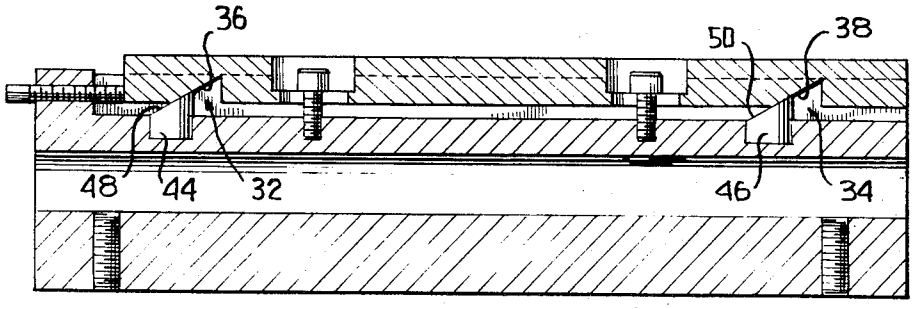
[57] **ABSTRACT**

An axle for the core of a paper roll is provided with a radially displaceable gripper bar operating in a longitudinal channel in the outer cylindrical surface of the axle body. Cam surfaces are notched into the gripper bar and beveled, self-aligning pins cooperate with the cam surfaces to displace the gripper bar radially in response to axial shifting thereof. A threaded actuating screw projects into one end of the axle body to effect the axial shifting and retainer screws are provided to hold the assembly together.

10 Claims, 4 Drawing Figures



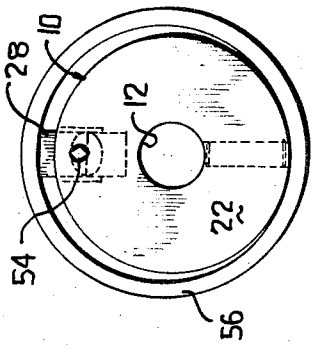


FIG.4

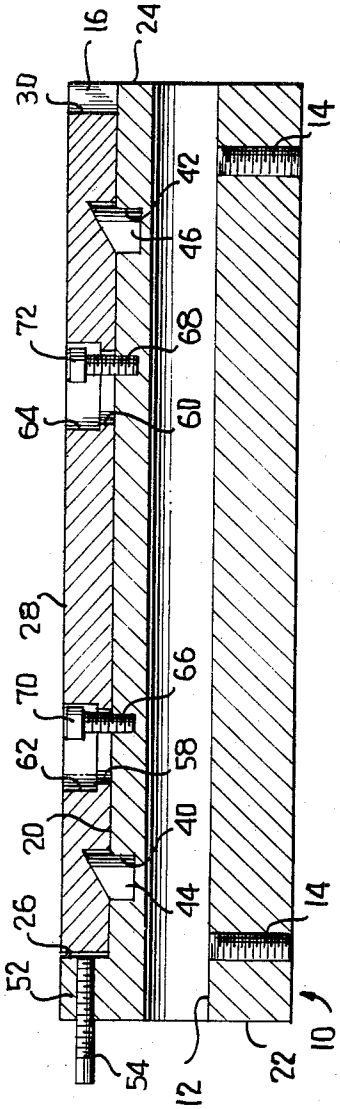


FIG.1

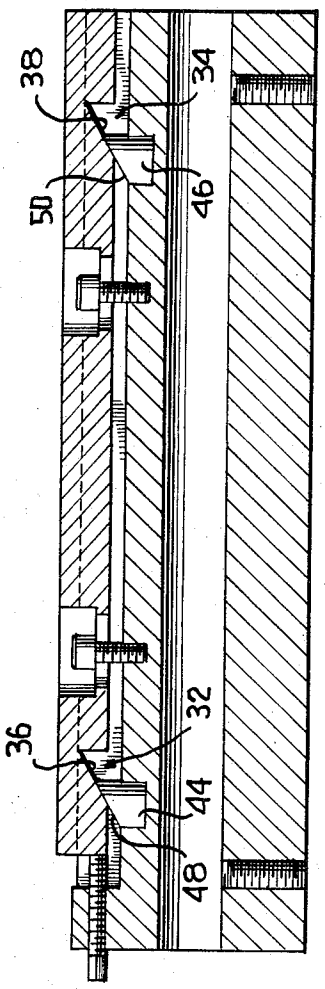


FIG.2

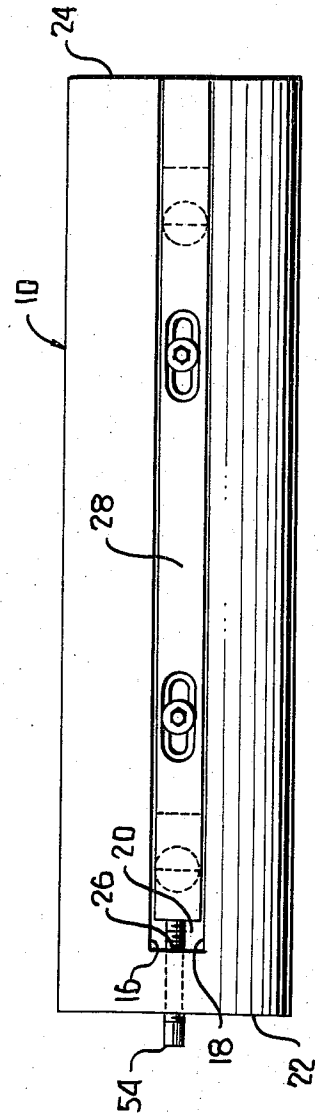


FIG.3

CORE AXLE WITH ADJUSTABLE RETAINER

BACKGROUND OF THE INVENTION

Numerous types of radially expanding devices have been proposed or utilized for the purpose of securely engaging within the core of a roll of sheet material such as paper in order to support such roll of material as in a winding or unwinding operation. In many instances these mechanisms are complex and indeed the tendency contemporarily appears to be in the direction of more and more costly devices even though there is a definite need and market for an inexpensive device of this nature.

In particular, prior devices which operate on a wedging principle in order to achieve the requisite radial expansion have tended to become more complex and costly even though a wedging or inclined cam surface action offers a basically simple and yet fully effective solution.

BRIEF SUMMARY OF THE INVENTION

The present invention is directed to the provision of an inexpensive and yet wholly effective core axle assembly which employs at least one radially shiftable gripper bar whose radial movement is effected by an inclined cam surface action in response to axial force directed against the gripper bar or bars. The arrangement is such that only relatively few and simple machining operations are required to make the component parts. The camming surfaces are formed as notches in the gripper bar and the members against which they react are in the form of beveled cylindrical pins located within the channel of the axle body which receives the gripper bar. A threaded actuator member projects into one end of the channel and bears against an end of the gripper bar. The cylindrical pins are self-aligning in the channel and avoid the necessity for special machining techniques or complex arrangements otherwise necessary to provide the required reaction surfaces. A simple retaining arrangement assures that the entire assemblage is held together while allowing for the full range of adjustment of the gripper bar.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a longitudinal section taken through an illustrative embodiment of the invention;

FIG. 2 is a view similar to FIG. 1 but showing the gripper bar fully extended radially;

FIG. 3 is a plan view of the assembly; and

FIG. 4 is an end view showing the device in operative association with the core of a paper roll.

DETAILED DESCRIPTION OF THE INVENTION

FIG. 1 illustrates a preferred form of expandable mandrel which is to operate as the axle assembly for a paper roll core so as to allow the roll to be supported for winding and unwinding operations. For example, a paper roll may be mounted for feeding to a printing press having a shaft (not shown) for controlling the feed and to which the axle device shown is to be affixed. For this purpose, the body **10** is provided with an axial bore **12** for receiving such a shaft and to which the body is fixed as by means of set screws **14** as shown.

A longitudinally extending channel is formed in the outer cylindrical surface of the body so as to define a pair of parallel opposite side walls **16** and **18** and a flat bottom wall **20**, as may be seen in FIG. **3**. The channel extends from a point adjacent the end face **22** of the body **10** and extends through the opposite end face **24** such that the channel defines an inner end wall **26** as shown.

The gripper bar **28** seats snugly but slidably in the channel and, in the normal position as shown in FIG. **1**, is shifted inwardly toward the end wall **26** and lies closely adjacent thereto with its opposite end **30** somewhat inset from the corresponding end face **24** of the body. In this position of the gripper bar, its inner surface seats upon the bottom wall **20** of the channel and with its outer surface substantially flush with the outer opening of the channel. The gripper bar is provided with a pair of notches **32** and **34** as shown best in FIG. **2**, which present the inclined, transverse cam surfaces **36** and **38** which, in the normal position of FIG. **1**, are in registry with a pair of blind bores **40** and **42** which project radially inwardly from the bottom wall of the channel.

These blind bores receive the cylindrical pin members **44** and **46** in snug fashion but not so tightly as to preclude rotation of the pins therein. The outer ends of the pins are beveled to present the flat, oval faces **48** and **50** having the same slope as the cam surfaces **36** and **38** against which they respectively engage in face-to-face contact.

The section **52** between the end wall **26** of the channel and the end face **22** of the body **10** is provided with a threaded bore in alignment with the channel and receives a threaded actuating member **54** which projects through this section and bears against the inner end of the gripper bar. The actuating member projects beyond the body and, being radially offset therein, is readily accessible for manipulation when the entire assemblage is operatively associated with the machine with which it is to be used.

The actuating member may be manipulated to shift the gripper bar axially and effect, correspondingly, radial action and shifting of the bar due to the cooperative engagement of the surfaces **36, 48** and **38, 50** as is illustrated in FIG. **2**. The gripper bar may thus be operated to effect internal gripping of the paper roll core **56** as shown in FIG. **4**.

To complete the assembly, the gripper bar is provided with a pair of elongate slots **58** and **60** surmounted by the enlarged resecces **62** and **64**, the former providing clearance for the threaded shanks **66** and **68** of retaining fasteners and the latter providing clearance for the enlarged heads **70** and **72** of these fasteners. As shown in FIGS. **1** and **2**, these retainers protrude at most insubstantially above the gripper bar when it is fully retracted and yet limit its radial outward disposition so as to hold the parts in place. It will be appreciated, of course, that a plurality of gripper bar arrangements may be provided in circumferentially spaced relation around the body **10**.

Of particular importance to the arrangement of this invention is the fact that the machining operations are simple, straightforword and inexpensive. The channel may be formed in a simple milling operation and the blind bores **40** and **42** likewise are easily located and formed to the proper diameter and depth by simple end milling operations. The pins **44** and **46** are easily formed preferably from standard rod stock and their ability to self-align when engaged by the cam surfaces

of the gripper bar substantially relaxes the machining requirements.

Various modifications may be made to the specific structure described above. However, it should be apparent that this invention involves an arrangement wherein one or more gripper bars are provided around the circumference of the mandrel body. The mandrel body itself is so dimensioned as to be received easily within the cylindrical bore of the member which is to be gripped and thereby supported for rotation about the rotational axis of the mandrel. The gripper bar is of lesser length than the channel which receives it so as to be shiftable within such channel from the normal, bottomed position to a maximum shifted position without projecting beyond or appreciably beyond the other end of the mandrel. The actuating means may take many forms such that it bears against one end of the gripper bar to shift it axially of the channel while allowing the bar to ride outwardly of the channel due to the reaction of the cam surfaces of the bar against the sloping end faces of the pins. At the same time, the actuating means should be of such form that it is radially offset from the rotation axis and includes a member projecting into the channel so as to bear against the gripper bar. Preferably, this actuating means does not extend appreciably if at all outwardly of the rotational axis beyond the confines of the mandrel body itself. If more than one bar-channel arrangement is used, the actuating means may take the form of individual actuator means for each such gripper bar whereby each is independently operable, or a common actuator means may be employed simultaneously to actuate all gripper bars.

What Is claimed Is:

1. An expandable mandrel for internally gripping a hollow member having a cylindrical bore and for supporting such member for rotation about a selected axis, comprising, in combination:

an elongate body presenting an outer surface dimensioned to be loosely received in the cylindrical bore of said hollow member and having opposite end faces, said body having an outwardly facing channel extending longitudinally at least through a major portion of the length of said body to present parallel side walls and a bottom wall, said body having a pair of longitudinally spaced blind bores extending inwardly from said bottom wall of the channel parallel to said side walls, each of said blind bores being of predetermined depth;

an elongate gripper bar slidably fitted between said side walls within said channel, said bar being of a length less than that of said channel and adapted normally to reside in bottomed relation in said channel with the opposite ends of the bar spaced inwardly with respect to the corresponding opposite end faces of the body, said bar having a pair of notches therein facing said bottom wall of the channel and defining cam surfaces sloping upwardly from said bottom wall of the channel in directions away from one end face of the body and registered respectively with said blind bores when said bar is in such normal position, said bar being of a height to allow said mandrel to be received in said bore of the hollow member when the bar is in said normal position thereof;

a pair of cylindrical pins rotatably seated in said blind bores, each pin having a bevelled end portion projecting outwardly from the bottom wall of the channel and presenting sloping end faces in face-to-face contact with respective ones of said cam surfaces on the bar; and

actuating means at said one end face of the body in radially offset position with respect to said selected axis for axially shifting said bar within said channel while allowing the bar to ride outwardly into engagement with the hollow member due to reaction of said cam surfaces against said end faces of the pins.

2. An expandable mandrel as defined in claim 1 including means for limiting the radial displacement of said gripper bar.

3. An expandable mandrel as defined in claim 1 including means for limiting the radial displacement of said bar, said means comprising a retaining member having a shank engaging in the bottom wall of said channel and an enlarged head spaced above said bottom wall but within the confines of said channel, said bar having an elongate slot receiving said shank and an enlarged recess surmounting said slot receiving said enlarged head.

4. An expandable mandrel as defined in claim 3 wherein said channel terminates short of said one end face of the body to define a portion presenting an end wall for the channel, said portion having a threaded bore, and said actuating means comprising a threaded member engaged in said threaded bore to bear against said bar.

5. An expandable mandrel as defined in claim 1 wherein each blind bore is of a diameter at least equal to the width of said channel whereby each pin presents an end face extending at least the full width of the channel.

6. An expandable mandrel as defined in claim 2 wherein the sloping end face of each pin lies in full outwardly from the bottom wall of the channel so that each pin fully fills its associated blind bore.

7. An expandable mandrel as defined in claim 1 wherein said channel terminates short of said one end face of the body to define a portion presenting an end wall for the channel, said portion having a threaded bore, and said actuating means comprising a threaded member engaged in said threaded bore to bear against said bar.

8. An expandable mandrel for internally gripping a hollow member having a cylindrical bore and for supporting such member for rotation about a selected axis, comprising, in combination:

an elongate body presenting a cylindrical outer surface and opposite end faces and having a radially outwardly facing channel extending longitudinally from a point adjacent one end face through the opposite end face of the body to present parallel side walls, a bottom wall and an end wall, said body having a radially offset threaded bore extending longitudinally of said body in alignment with said channel through said one end face and said end wall of the channel and having a pair of longitudinally spaced blind bores extending radially inwardly from said bottom wall of the channel, each of said blind bores being of predetermined depth;

an elongate, rectangular gripper bar slidably fitted within said channel, said bar being of a length less than that of said channel and adapted normally to reside in seated relation in said channel with one end of the bar in close proximity to said end wall

of the channel, said bar having a pair of notches therein defining cam surfaces sloping upwardly from said bottom wall of the channel in directions away from said end wall thereof and registered respectively with said blind bores when said bar is in such normal position, said bar being of a height substantially the same as the depth of said channel;

a pair of cylindrical pins rotatably seated in said blind bores, each pin having a bevelled end portion projecting outwardly from the bottom wall of the channel and presenting sloping end faces in face-to-face contact with respective ones of said cam surfaces on the bar;

a threaded adjusting member engaged in said threaded bore and bearing against said one end of the bar whereby axially to shift said bar within said channel to allow corresponding radial outward displacement thereof due to reaction of said cam surfaces against said end faces of the pins; and

means for limiting the radial displacement of said bar, said means comprising a retaining member having a shank engaging in the bottom wall of said channel and an enlarged head spaced above said bottom wall but within the confines of said channel, said bar having an elongate slot receiving said shanks and an enlarged recess surmounting said slot receiving said enlarged head.

9. An expandable mandrel as defined in claim **8** wherein each blind bore is of a diameter at least equal to the width of said channel whereby each pin presents an end face extending at least the full width of the channel.

10. An expandable mandrel as defined in claim **9** wherein the sloping end face of each pin lies in full outwardly from the bottom wall of the channel so that each pin fully fills its associated blind bore.

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