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[54] **ADJUSTABLE CUP SUPPORT FOR USE IN CONTINUOUS PRINTING ON CONICAL CUPS**

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[30] **Foreign Application Priority Data**

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[51] **Int. Cl.** **B41f 17/28**

[58] **Field of Search** 269/48.1; 93/39.3; 101/38–40

[56] **References Cited**

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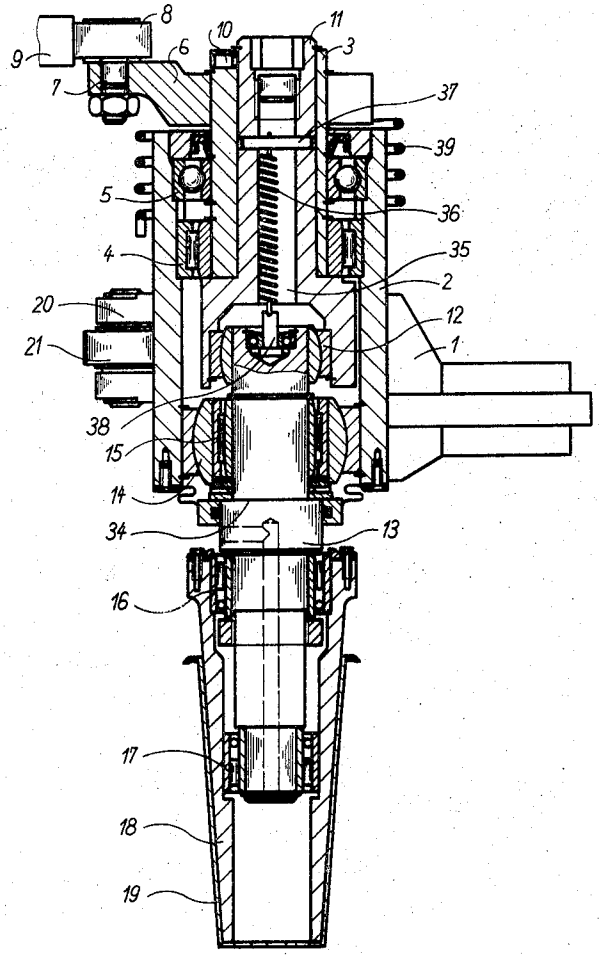
[57] **ABSTRACT**

To assure constant line contact between a conical cup and a printing cylinder during continuous printing operations, a cup carrier is provided which can position the conical cups in continuous tangential contact with the printing cylinder. The cup carrier is mounted on a shaft which extends axially from a bearing head, a plurality of the bearing heads are mounted in angularly spaced relationship with the axis of the printing cylinder. An eccentric bush and an eccentric bolt are rotatably supported within each bearing head and, in turn, support the shaft which mounts the cup carrier. By adjusting the eccentric bush and bolt, the axis of the shaft can be angularly displaced relative to the axis of the bearing head so that a cup positioned on the cup carrier can be placed in proper contact with the printing cylinder. A cam and spring mechanism are operatively associated with the bearing head to assure constant contact between a cup on the cup carrier and the printing cylinder during the printing operation.

7 Claims, 3 Drawing Figures



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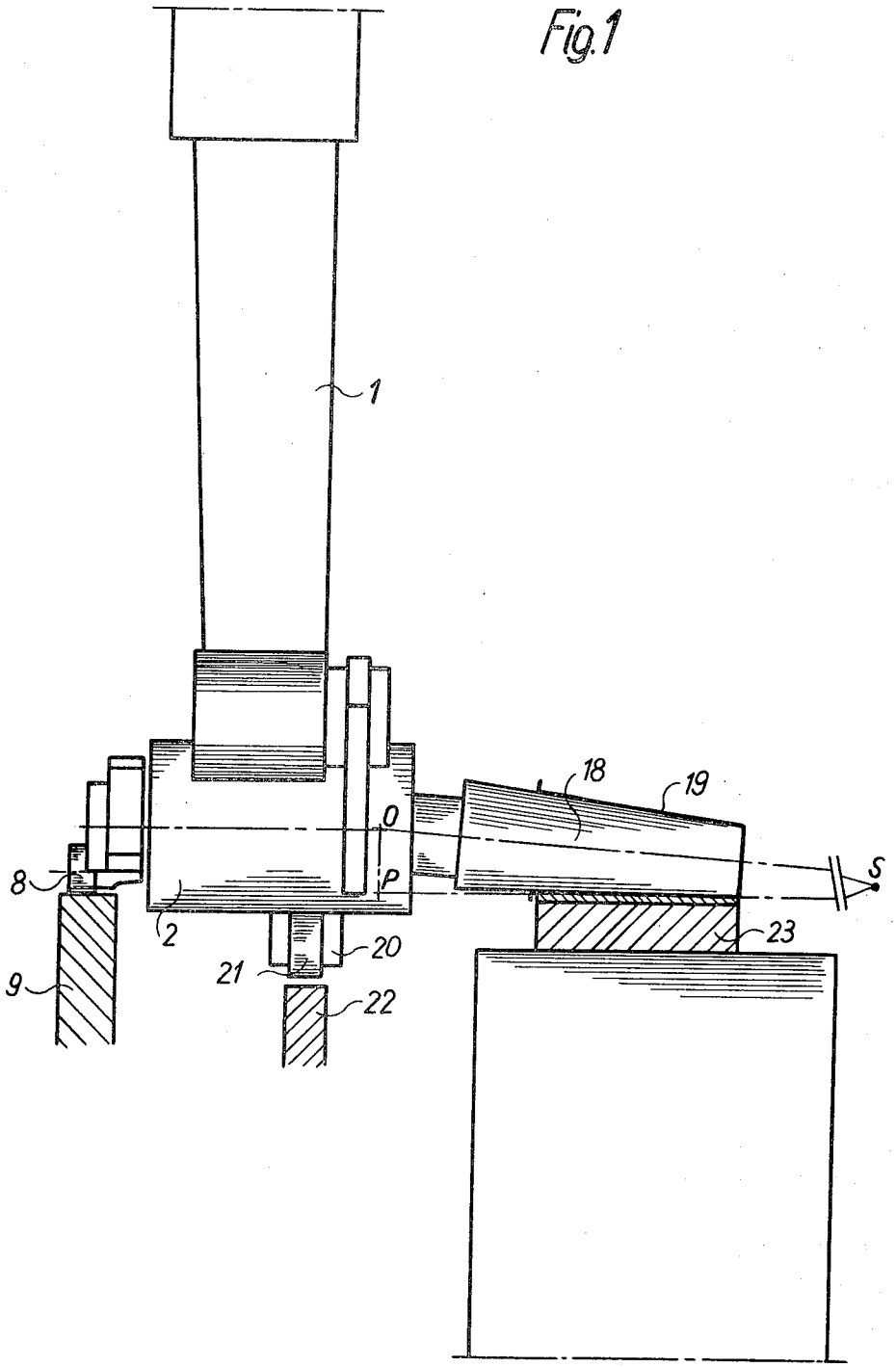
SHEET 1 OF 3

Fig.1



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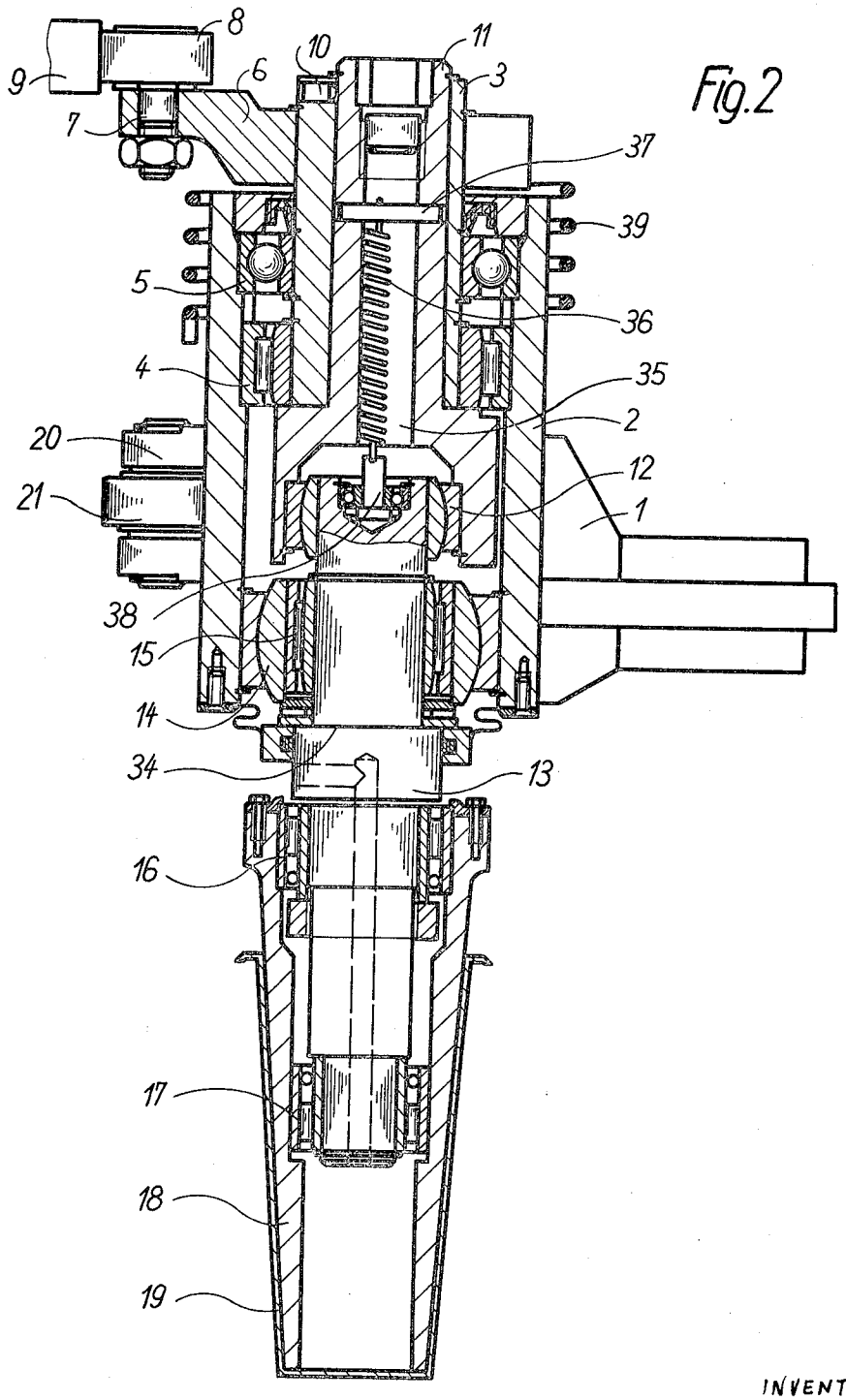

Fig.2

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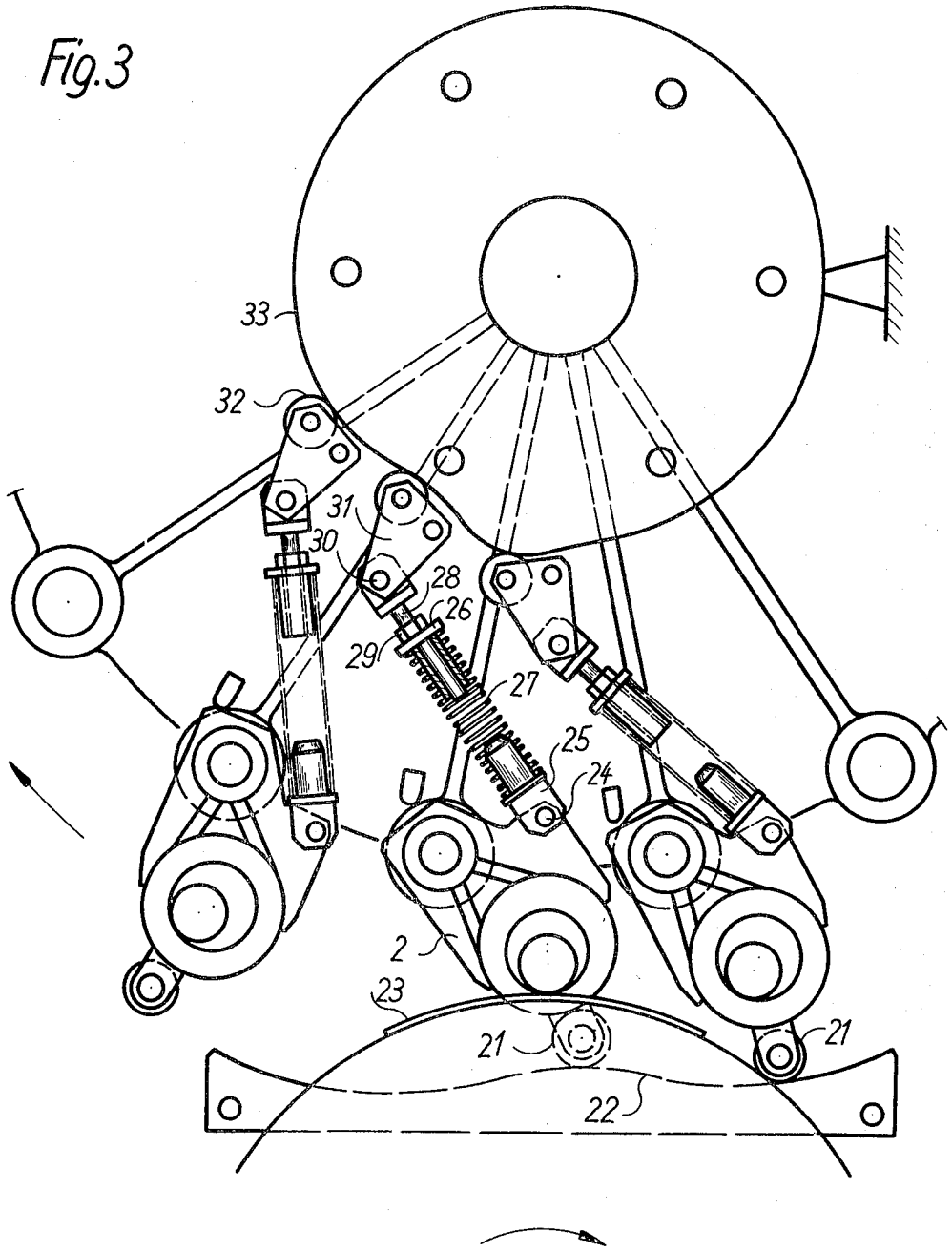
Fig.3



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ADJUSTABLE CUP SUPPORT FOR USE IN CONTINUOUS PRINTING ON CONICAL CUPS

SUMMARY OF THE INVENTION

The present invention is directed to apparatus for continuously printing on conical cups and, more particularly, it concerns an adjustable device for placing the conical cups in tangential contact with a printing cylinder.

To provide constant line contact between conically shaped cups mounted on cup carriers and a printing cylinder, it is necessary that the cup carrier be adjustably positionable so that a triangle formed by a first leg which extends along the axis of the cup carrier and a second leg which extends tangentially to the surface of the printing cylinder and in parallel relationship with its axis lies in a plane which passes through the axis of the printing cylinder. The cup carrier is held in an axially extending support whose axis is maintained in parallel relationship with the axis of the printing cylinder. Accordingly, the support is adjusted so that while it rotates about its axis parallel to the axis of the printing cylinder, it rotates the triangle containing the axis of the cup carrier and the line of contact with the printing cylinder to maintain constant line contact. The support for the cup carrier is rotated by means of a cam roller associated with the support and contacting a cam positioned adjacent the path of movement of the support.

The support for the cup carrier is mounted on a turntable and, as mentioned above, has its axis in parallel relationship with the axis of the printing cylinder. When the printing apparatus is not in use, the cup carrier mounted in the support can be adjusted by means of an eccentric bush and an eccentric bolt located within the support to assure that the surface of a cup positioned on the cup carrier will have its line of contact parallel with and tangential to the printing cylinder, though the axis of the cup carrier is disposed angularly to the axis of its support.

Therefore, in accordance with the present invention, a plurality of angularly spaced supports or bearing heads are rotatably mounted in a turntable with an eccentric bush rotatably mounted within each bearing head and an eccentric bolt positioned within and rigidly connected to the eccentric bush. At one end of the eccentric bush, a lever is connected to the bush and extends outwardly into contact with a cam through a roller member secured to the lever for effecting the desired rotation of the eccentric bush. Within the bearing head a shaft is mounted within a rocker bearing secured within the end of the eccentric bolt and spaced axially from the end of the eccentric bolt the shaft is supported within another rocker bearing secured within the bearing head. When the apparatus is not in use, the eccentric bush and the eccentric bolt can be adjusted to afford the desired parallel relationship between the printing cylinder and its line of contact with a cup positioned on the cup carrier. The cup carrier is mounted on the shaft which extends outwardly from the bearing head by means of combined needle and inclined ball bearings.

The various features of novelty which characterize the invention are pointed out with particularity in the claims annexed to and forming a part of this disclosure. For a better understanding of the invention, its operating advantages and specific objects attained by its use, reference should be had to the accompanying drawings and descriptive matter in which there is illustrated and described a preferred embodiment of the invention.

BRIEF DESCRIPTION OF THE DRAWING

In the drawing:

FIG. 1 is a somewhat schematic view of a support for a cup carrier formed in accordance with the present invention;

FIG. 2 is a longitudinal sectional view of the support for the cup carrier as indicated in FIG. 1; and

FIG. 3 is a view taken transversely of that in FIG. 2 and illustrating an arrangement for effecting uniform contacting pressure of the cup carrier against the printing cylinder.

DETAILED DESCRIPTION OF THE INVENTION

In FIG. 1 an apparatus is shown for supporting a cup carrier which positions conically shaped cups against a printing cylinder during a continuous printing operation. A turntable 1 supports a plurality of bearing heads 2 disposed in angularly spaced relationship, note FIG. 3, and a cup carrier 18 with a conically shaped cup mounted on it extends downwardly from the support or bearing head 2 so that the cup is positioned in line contact with the printing cylinder 23 during the continuous printing operation.

As shown in FIG. 2, the bearing head has an axially extending annular shape and an eccentric bush 3 is rotatably mounted within the bearing head by means of a needle bearing 4 and a ball bearing 5, spaced from one another in the axial direction. One end of the eccentric bush 3 extends outwardly from the bearing head 2 and a lever 6 is clamped to this outwardly extending end. A bolt 7 secures a roller 8 to the lever, and the roller 8 is in operative engagement with a cam 9 spaced above and outwardly from the bearing head, note FIG. 1. Rigidly connected to the eccentric bush 3 by screws 10 is an eccentric bolt 11 which extends downwardly through the eccentric bush with its lower end terminating within the bearing head 2. A rocker bearing 12 is positioned within the lower end of the eccentric bolt 11.

One end of an axially extending shaft 13 is secured within the rocker bearing 12 and the shaft extends outwardly from the bearing head. However, spaced below the end of the eccentric bolt 11, a rocker bearing 14 is secured within the bearing head and in turn supports a needle bearing 15 in which the shaft is supported. Mounted on the shaft 13, exteriorly of the bearing head 2, are needle and angular contact bearings 16 and 17 on which the cup carrier 18 is positioned. As indicated above, the cup carrier 18 supports a cup 19 as it is printed by the printing cylinder 23, note FIGS. 1 and 3. When the device is shut down, the cup carrier can be positioned so that the cups it supports can be positioned in continuous line contact with the printing cylinder. In the positioning operation the eccentric bush and eccentric bolt are rotated within the bearing head so that the axis of the shaft 13 and of the cup carrier 18 are disposed angularly to the axis of the bearing head 2 while the surface of the cup 19 on the cup carrier is in parallel relationship with the printing cylinder along its line of contact.

In FIG. 1 a triangle OPS is shown by which the desired contact between the conical cups and the printing cylinder is achieved. The leg OS of the triangle represents the axis of the shaft 13 and of the cup carrier 18. The line PS represents the line of contact between the printing cylinder and the conical cup and intersects the line OS at a point spaced below, the cup carrier, note FIG. 1. The third leg of the triangle is represented by a line passing through the pivot point of the shaft 13 within the head and extending perpendicularly to the axis of the bearing head and intersecting the line PS at the point P. By rotating the triangle OPS about the axis of the support or bearing head 2 by means of the cam roller 8 in operative engagement with the cam 9, the constant line of contact between the cup and the printing cylinder is maintained.

Secured to the outer side of the bearing head 2 is a lever 20 in which a roller is mounted for operative engagement with a cam 22, note FIGS. 1 and 3, so that the support is guided in such a manner that the cup on the cup support is directed tangentially toward the printing cylinder. By this arrangement, it is possible to avoid the possibility of the cup 19 and cup carrier 18 striking against the printing cylinder during the printing operation. During the printing operation itself, the roller 21 remains inactive.

To assure a constant line contact between the conically shaped cup 19 and the printing cylinder 23 during the printing operation, a spring and cam mechanism, as shown in FIG. 3, is provided. The spring and cam mechanism consists of a supporting member 25 articulated to a flange portion of the bearing head 2 by means of a bolt 24 and extending in an inward direction toward the axis of the turntable generally perpendicularly to the axis of the bearing head. Aligned with and spaced inwardly from the supporting member 25 is an adjusting shaft 26, both of the supporting member 25 and adjusting shaft 26 have facing shoulders between which a compression spring 27 extends. At its inner end, the adjusting shaft has a threaded bolt 28 screwed into it and a nut 29 is positioned on the threaded bolt for regulating the biasing action of the spring and cam mechanism. At its end spaced from the adjusting shaft 26, the threaded bolt 28 is articulated by a pin 30 to a lever 31 on which a rotatable roller 32 is mounted. A cam 33 is mounted on the axis of the turntable and the roller 32 passes along the outer surface of the cam 33 as the bearing head 2 moves the cup carrier 18 and its conically shaped cup 19 past the printing cylinder 23. Due to the configuration of the cam 33, the spring and cam mechanism assures a constant line contact between the cup 19 and the printing cylinder 23 during the printing operation.

While in FIG. 2 the cup carrier 18 and the shaft 13 are in alignment with the axis of the bearing head 2, it will be noted in FIG. 1, that during operation of the device the axis of the shaft and the cup carrier are disposed angularly to the axis of the bearing head 2. To eliminate any play between the collar 34 on the shaft 13 and the surface of the rocker bearing 14 in the bearing head against which it abuts, a tension spring 36 is secured at one end to a bolt 38 within the end of the shaft 13 in the rocker bearing 12 and the spring is secured at its other end to a clamp pin 37 secured within the eccentric bolt 11.

After the bearing head has moved the cup carrier and its associated cup past the printing cylinder, the roller 8 is returned into its starting position by means of a torsion spring 39 (also called a wound bending spring) which is secured at one end to the outer surface of the bearing head and at its other end to the roller lever 6.

While the invention has been described and illustrated as a support for a member positioning conically shaped cups against a printing cylinder, it will be appreciated that it can be used for printing other types of hollow conically shaped bodies.

What is claimed is:

1. A device for supporting a conical cup and the like and maintaining the cup in contact with a printing cylinder during a continuous printing operation, comprising a turntable, a plurality of axially extending annular shaped bearing heads mounted in spaced relationship on said turntable, bearing means positioned within each said bearing head, an eccentric bush rotatably mounted within said bearing means in each said bearing head, an eccentric bolt positioned within and rigidly connected to said eccentric bush, said eccentric bolt having one end located within said bearing head, a first rocker bearing mounted in the end of said eccentric bolt located within said bearing head, a second rocker bearing secured within said bearing head and spaced axially from the end of said eccentric bolt containing said first rocker bearing, an axially extending shaft fitted at one end within said first rocker bearing in said eccentric bolt and extending therefrom outwardly from said bearing head, a needle bearing mounted within said second rocker bearing and said shaft positioned within said needle bearing in said rocker bearing, bearing means positioned on said shaft outwardly from said bearing head, and a cup carrier having a conically shaped exterior for supporting conically shaped cups, said cup carrier mounted on said bearing means on said shaft, whereby said eccentric bush and eccentric shaft in each said bearing head can be adjusted for positioning said shaft so that its axis is angularly disposed relative to the axis of said bearing head for positioning said cup carrier so that it guides cups into tangential line contact with the printing cylinder.

2. A device, as set forth in claim 1, wherein said bearing means positioned within each said bearing head comprises a needle bearing and a roller bearing spaced apart in the axial direction of said bearing head.

3. A device, as set forth in claim 1, wherein a first cam is spaced outwardly from said turntable, a roller lever clamped to the end of said eccentric bolt at the opposite end thereof from which said shaft extends, and a roller mounted on said roller lever and arranged to contact said cam for maintaining the cup on said cup carrier in constant line contact with the printing cylinder.

4. A device, as set forth in claim 1, wherein a second cam is spaced outwardly from said turntable and is spaced in the axial direction of said bearing head from said first cam, a lever secured to the exterior of said bearing head, a roller mounted on said lever and arranged to contact said cam as said bearing head rotates past the printing cylinder for guiding said cup carrier tangentially toward the printing cylinder and prevent-

ing any striking contact between the cup on said cup carrier and the printing cylinder and said roller being inactive as the cup on said cup carrier is being printed.

5. A device, as set forth in claim 1, wherein a support member is articulated to each said bearing head and a section thereof extends transversely of the axis of said bearing head and inwardly toward the axis of said turntable, an adjusting shaft spaced inwardly from and in general alignment with said section of said support member, a compression spring bearing against and extending between each of said section of said support member and said adjusting shaft, a threaded bolt having one end screwed into said adjusting shaft, a nut positioned on said threaded bolt for regulating the biasing action of said compression spring, a lever positioned adjacent the end of said threaded bolt which is spaced from said adjusting shaft, a pin for articulating said threaded bolt to said lever, a third cam mounted on said turntable, and said roller on said lever being disposed in operative engagement with said third cam whereby the combination of said third cam and said adjusting shaft and compression spring biases said bearing head and said cup carrier which it supports toward the printing cylinder for effecting a constant line of contact between the cup positioned on said cup carrier and the printing cylinder during the printing operation.

6. A device, as set forth in claim 1, wherein a tension spring is positioned within said bearing head and is connected at one end to said eccentric bolt and at its other end to the end of said shaft within said first rocker bearing for eliminating play between said shaft and said second rocker bearing.

7. A device, as set forth in claim 1, wherein a torsion spring is positioned about the exterior surface of said bearing head and is secured at one end to said bearing head and at its opposite end to said roller lever for returning said roller mounted on said roller lever to its starting position.

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