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Ternes

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[54] **RETRACTABLE WHEEL FOR PAPER GUIDING CYLINDER**

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[52] **U.S. Cl.** **226/191,** 226/194, 226/199, 101/226

[51] **Int. Cl.** **B65h 17/20**

[58] **Field of Search** 226/194, 191, 196, 226/199, 190; 101/126, 127

[56] **References Cited**

UNITED STATES PATENTS

2,701,717	2/1955	Morrill	226/191 X
2,804,300	8/1957	Bilane	226/191

Primary Examiner—Allen N. Knowles

Attorney—Ralph F. Merchant et al.

[57] **ABSTRACT**

The disclosure is directed to a printed paper guiding reel or cylinder having a plurality of small wheel members defining the cylindrical paper engaging surface of the reel. Each of the wheel members is radially retractable to a position of non-engagement to permit selective positioning thereof relative to printed matter which is not yet dried. Retraction of the wheel member is effected by manual movement of the wheel relative to a supporting hub which is retainably disposed in a radial slot in the wheel. The opposite ends of the slot define positions of symmetric and eccentric rotation of the wheel. The slot is narrowed intermediate its ends to force the hub into one stable position or the other, and yielding openings are formed to permit flexure of the wheel in the area of the slot as it is moved between positions.

11 Claims, 6 Drawing Figures

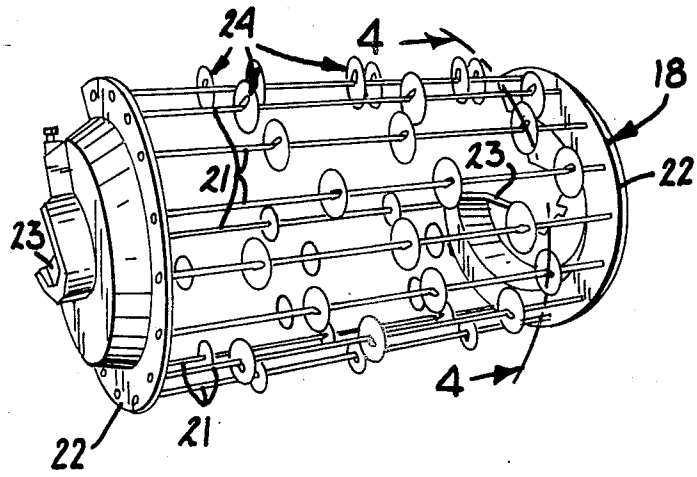
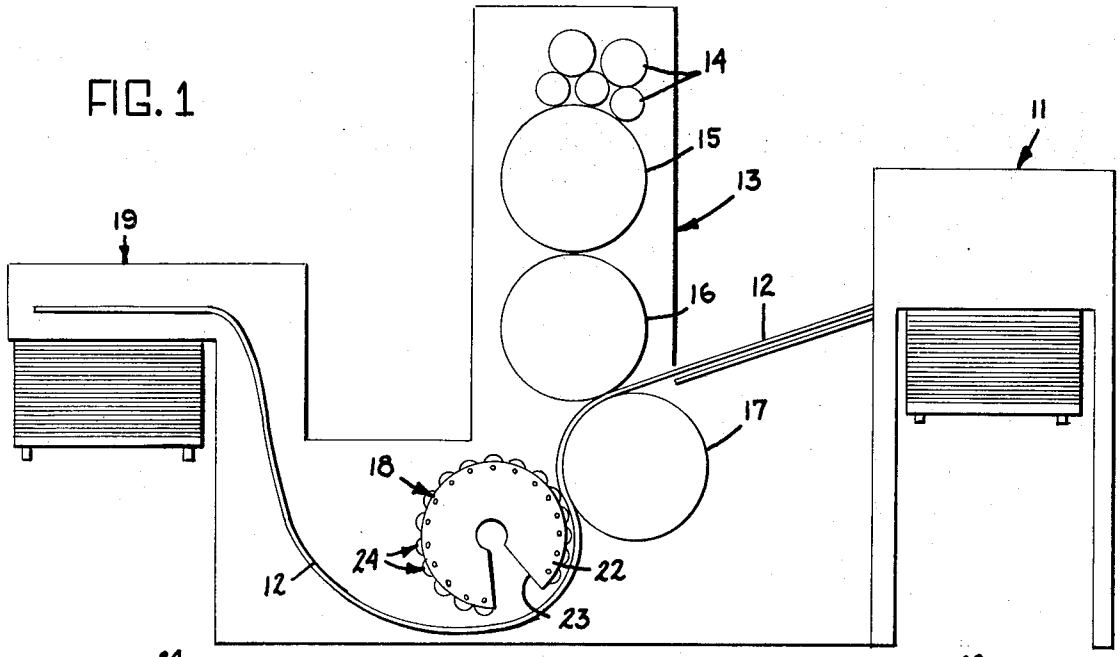


FIG. 1



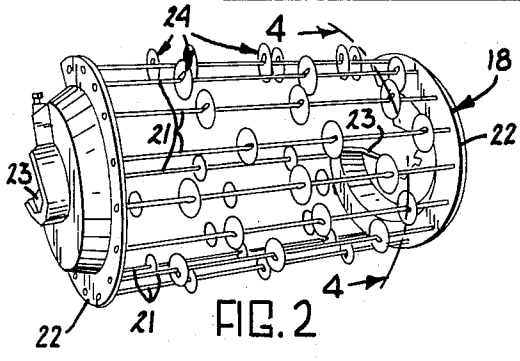


FIG. 2

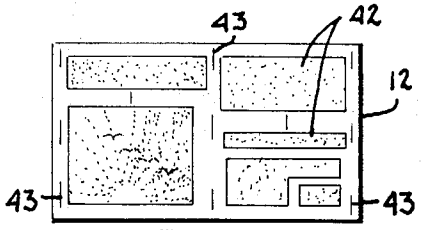


FIG. 5

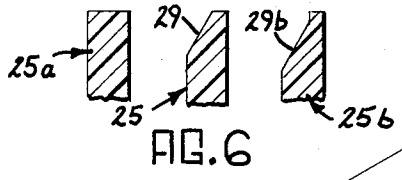
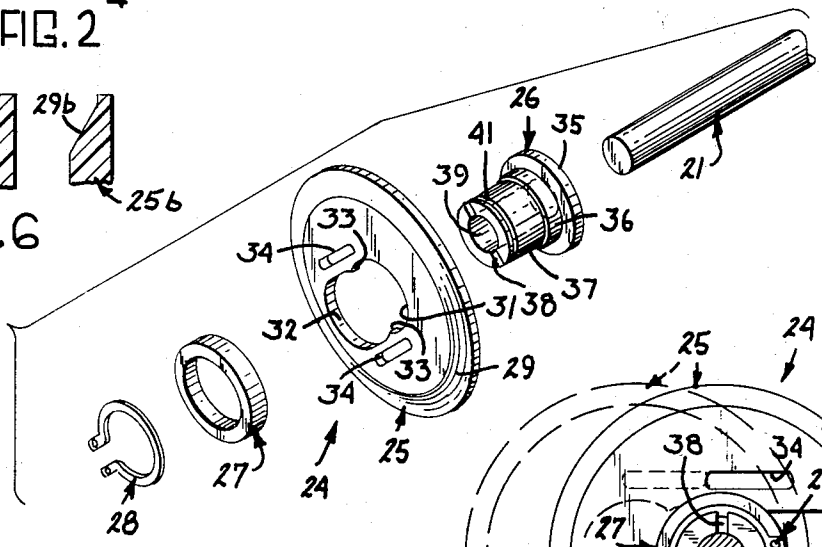


FIG. 6

FIG. 3



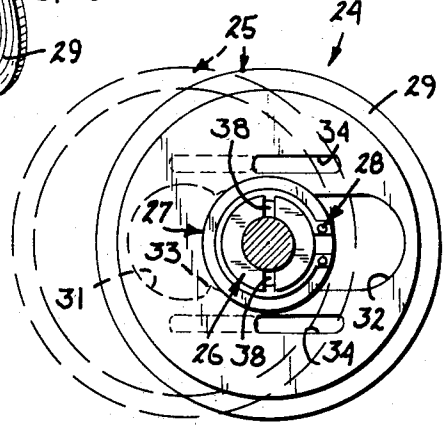


FIG. 4

RETRACTABLE WHEEL FOR PAPER GUIDING CYLINDER

The invention is directed to a retractable wheel used in the printing industry in connection with a drive reel or cylinder which guides and moves continuously supplied paper after it has been printed.

In the continuous printing of paper rolls or similar printing material, handling of the paper immediately after the printing step is often accomplished by a drive reel or cylinder. In the past, such drive cylinders have been constructed with a plurality of parallel rods supported by opposite end members to define a cylinder, each rod having a plurality of small wheel members disposed thereon which would engage the paper for guiding and driving purposes. A guiding cylinder constructed in this manner confines the engagement of recently printed paper to a limited number of points, thereby reducing the chance of smearing ink which is not yet dried. However, one problem which has persisted with such guiding cylinders is the creation of small crease marks in the paper, since engagement takes place at specific points and at relatively high speeds.

An important advance in this field has been the development of a guiding cylinder having small wheel members which are longitudinally slideable on the rods to selective positions which avoid the printed matter and which are radially retractable to preclude engagement with the paper where such longitudinal movement did not solve the problem. The radial retraction is effected by providing the combination of a wheel having radial slots and a hub which is retainably disposed in the slot. One end of the slot defines a position of symmetrical rotation of the wheel member, and the other end defines a position of eccentric rotation, at which point the wheel member cannot engage the moving paper. This radial slot is narrowed at an intermediate point to resist unwanted movement of the wheel member from one stable position to another.

In order to operate optimally, the individual wheel members must freely and independently rotate as they are engaged by the continuously moving paper. This has not always been the case, however, due to the fact that repeated movement of the wheel member from position to position has resulted in its seizure in the extended or symmetrical rotational position. Such seizure is caused primarily by inflexibility of the wheel member, which is in turn due to the requirement that it be made strong structurally. The problem is compounded by the inability to control proper tolerances between the hub and wheel member, which must be essentially low cost items due to the number used, and by thermal expansion of the members due to changes in the ambient temperature. If the wheel member seizes in its position of symmetrical rotation, it is unable to freely rotate when engaged by the continuously moving printed paper, and the paper is thus creased.

My invention resides in the unique construction of a retractable wheel member used in paper guiding cylinders of this type which is of inherently greater strength than prior art wheels and yet is always freely rotatable notwithstanding the number of times it has been extended and retracted. Specifically, I provide an essentially solid wheel member having a first circular opening defining the axis of symmetrical rotation and a second circular opening defining the axis of eccentric rotation. These two circular openings are joined by a restricted passage, thus defining the elongated slot in which a hub member is retainably slideable. Disposed on each side of the restricted passage is an elongated relief opening of significantly less size than the slot but which is in essential alignment therewith. These parallel elongated relief openings are disposed sufficiently close to the hub slot as to permit the material lying therebetween to flex a predetermined amount as the hub is moved from one position to the other. Consequently, the wheel gives somewhat as it is moved radiallly inward and outward, and this flexing feature entirely precludes the wheel member from seizing and becoming locked to the hub in the position of symmetric rotation.

This feature is particularly important because the outer position of the radial slot (i.e., the position of eccentric rotation) must be of slightly smaller size to frictionally preclude rotation of the wheel member relative to the hub in the retracted position. If the wheel member were able to rotate in its eccentric position, it would, of course, move to a position of engagement with the printed paper, which is opposite to the effect desired. The inclusion of elongated openings on opposite sides of the restricted passage enables the circular openings to be of different size and to maintain such size difference over extended periods of operation.

The elongated relief openings also enable the inventive wheel member to be produced with greater thickness, which is impossible with prior art devices due to the lateral inflexibility of thicker materials. Making the wheel member thicker increases its structural strength and enables it to operate without break-down over longer periods of time. Further, the greater thickness offers a larger bearing surface between the wheel member and the supporting rod, which is also advantageous from the standpoint of extended operational periods.

An additional feature of my inventive retractable wheel resides in the hub. To prevent rotation of the wheel member in its retracted (eccentric) position, it is necessary for the hub to be secure on its mounting rod. On the other hand, the wheel member must be longitudinally slideable over the rod to permit its selective movement to a position where it is out of contact with the printed matter. Consequently, the frictional cooperation between hub and rod must be controlled to permit both functions. This has been extremely difficult in the past due to the fact that the elongated rods are steel, and the diameter variances ordinarily occur from rod to rod. I have solved this problem, however, by providing a tapered hub which encompasses the range of diameter variances and which is split axially over a portion of its length. This enables the hub to compensate for such variances and thereby give rise to the desired frictional control.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic representation of a system for continuously printing rolls of paper which includes a guiding cylinder having retractable wheel members embodying the inventive principle;

FIG. 2 is a perspective view of the paper guiding cylinder;

FIG. 3 is an exploded perspective view of the inventive retractable wheel member;

FIG. 4 is an enlarged sectional view as seen generally from a line 4—4 of FIG. 2;

FIG. 5 is a view in top plan of material printed with a system utilizing the inventive wheel member; and

FIG. 6 is an enlarged sectional view of three different peripheral edge embodiments for the inventive wheel member.

DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. 1 is a schematic representation of a system for printing continuously supplied paper or other printing material. This system comprises a source 11 for providing a continuous supply of paper 12 to printing apparatus shown generally at 13. Source 11 may comprise apparatus for receiving a roll of printing paper and means for rotating the roll in a controlled manner.

Printing apparatus 13 includes a plurality of ink rollers 14 for distributing printing ink evenly over a plate cylinder 15. Plate cylinder 15 in turn transfers the ink to a blanket cylinder 16 which defines the printing characters. Paper 12 passes from source 11 between blanket cylinder 16 and an impression cylinder 17 which are cooperably driven to effect the transfer of printed matter onto paper 12 as it passes continuously therebetween.

After having been printed, the continuous movement of paper 12 must be guided and controlled; and, to this end, the printing system includes a paper guiding cylinder or reel 18 which engages the paper 12 as it leaves impression cylinder 17 and guidably directs paper movement to a take-up area 19, which involves cutting and stacking the printed paper 12. It will be appreciated that paper guiding cylinder 18 must be rotated at a speed essentially the same as the advancing speed of the paper 12 as it leaves impression cylinder 17 to preclude relative movement therebetween, which would result in smearing of the ink.

FIG. 2 is a perspective view of the paper guiding cylinder 18, which comprises a plurality of elongated rods 21 which are mounted in parallel relation between a pair of end supports 22 to define a cylindrical skelton frame work. Each of the end supports 22 has a segment thereof removed to define an open radial slot 23 (see also FIG. 1), which permits the paper guiding cylinder 18 to be mounted on a rotatable shaft.

Disposed on each of the elongated rods 21 are a plurality of wheels 24 the position of which is variable by longitudinal sliding over the elongated rods 21.

FIGS. 3 and 4 are enlarged representations of a wheel 24, which is shown to comprise a wheel member 25, a hub 26, a spacer 27 and a snap ring 28. Components 25–27 are preferably injection molded from a strong synthetic material having a low friction characteristic, an example of which is the combination of Delrin and Teflon. Snap ring 28 is preferably metallic.

Wheel member 25 is essentially disc-shaped having a beveled or chamfered peripheral face portion 29 (see also FIG. 6) to present a peripheral edge of minimum engagement area to the paper 12. The thickness of wheel member 25 is chosen to give it sufficient strength for maintenance free usage over extended periods of time, but without being unduly heavy.

Wheel member 25 has a first circular opening 31 formed therethrough which is concentric with its center, and a second circular opening 32 which is eccentrically disposed relative to the center. Because the injection molding process is generally unreliable insofar that close tolerances are concerned, the circular openings 31 and 32 are preferably formed by machining after the member 25 has been molded and reached an essentially stable state. For a purpose described in detail below, the circular opening 31 is slightly greater in size than that of the opening 32. The openings 31 and 32 are interconnected by a restricted passage defined by opposed side projections 33 lying therebetween. As described, it will be appreciated that the first and second openings 31, 32 and the restricted passage together define a radial slot which permits radial movement of the wheel member 25 relative to the hub 26, as will be discussed in greater detail below.

Adjacent the restricted passage on opposite sides thereof are elongated slots 34 which are in essential alignment with the radial slot defined by circular openings 31 and 32, and parallel with each other. These elongated slots 34 thus define a strip 35 of material which is capable of flexing laterally as the hub 26 moves relative to the restricted passage. It will be appreciated that the nature of the material from which wheel member 25 is made plays a role in the size and position of elongated slots 34, the objective being to create strips 35 capable of lateral flexure but strong enough to perform satisfactorily over extended periods of time. It will also be appreciated that, although elongated slots are formed in the preferred embodiment, other types of structural formations would be suitable to effect the desired degree of lateral flexure in the area of the restricted passage.

Hub 26 comprises a circular flange 35 of greater circumference than either of the circular openings 31, 32, and first and second cylindrical stepped portion 36, 37, respectively. The axial length of stepped portion 36 conforms to the thickness of wheel member 25 and is adapted to be received by either of the circular openings 31, 32. As such, the circumferential size of stepped portion 36 is slightly less than that of opening 31 to permit free rotational movement of the wheel member 25 relative to the hub 26. As pointed out above, circular opening 32 is slightly smaller than openings 31, and this size difference is sufficient to preclude rotation of the wheel member 25 relative to the hub 26 when the stepped portion 36 is disposed in circular opening 32. Stepped portion 37 has a lesser diameter than stepped portion 36 and a greater axial length. The stepped portion 37 is split into radially expandable, semicircular segments by a diametrical slot 38 which extends axially over its length.

Hub 26 also has an axial bore 39 formed therethrough which is tapered slightly with the larger end opening at the flange 35. The segmented slot 38 and tapered bore 39 together cooperate to adapt the hub 26 to rods 21 which vary in circumferential size. Accordingly, notwithstanding size of the rod 21, the hub 26 is capable of sliding axially thereover, and yet is frictionally secured thereto a sufficient amount to preclude rotation.

Spacer 27 is ring-shaped and has a axial dimension somewhat less than the stepped portion 37 of hub 26. With the hub 26 inserted through the radial slot of wheel member 25, spacer 27 fits over the stepped portion 37 and is held in place by snap ring 28 which is sprung into a peripheral groove 41 formed at the extreme end of stepped portion 37.

As described, and as particularly shown in FIG. 4, with hub 26 mounted on a rod 21, wheel member 25 is capable of occupying a position of free, symmetric

rotation relative to the hub **26** (solid lines), and is also capable of being shifted to the circular openings **32** where it is eccentric relative to the hub **26** and incapable of rotation relative thereto (broken lines). As pointed out above, as wheel member **25** moves from position to position, the stepped portion **36** of hub **26** passes through the restricted passage defined by projections **33** and causes the strips **35** to flex laterally to continuously maintain the proper tolerance between relatively movable components.

With reference to FIGS. **2** and **5**, operation of the guiding cylinder **28** initially involves proper axial placement of the several wheels **24** to avoid printed matter represented by numeral **42** on paper **12.** Thus, with each of the wheels **24** freely rotatable (i.e., hub **26** projecting through circular opening **31** of wheel member **25**) and placed in a proper axial position on its associated rod **21,** the cylinder **18** is capable of engaging paper **12** and properly guiding it to the take-up area **19** without damage to the printed matter **42.** The points of engagement of the wheels **24** on paper **12** are represented by short lines **43** in FIG. **5.**

In the event that a specific wheel **24** cannot be axially positioned to avoid printed matter **42,** it is simply retracted; i.e., wheel member **25** is moved relative to hub **26** so that the stepped portion **36** occupies circular opening **32.** As pointed out above, the relationship between components in this position is frictional, so that wheel member **25** is unable to rotate relative to hub **26.** Accordingly, in this retracted position, wheel member **25** cannot engage paper **12** and printed matter **42** is thereby protected.

FIG. **6** is an enlarged sectional representation of the extreme peripheral edge of wheel member **25** and alternative embodiments **25***a* and **25***b*. As pointed out above, wheel member **25** has a bevel or chamfer **29** to substantially reduce its paper engaging surface. Wheel member **25***a* has an unmodified blunt edge, whereas wheel member **25***b* has a beveled portion **29***b* which is spaced from the extreme peripheral edge to define a projecting paper engaging surface **30***b*.

I claim:

1. Retractable wheel apparatus comprising:

a. a substantially solid wheel member of predetermined thickness;

b. first and second essentially circular openings formed through said predetermined thickness and respectively defining a first axis of symmetrical rotation and a second axis of eccentric rotation of the wheel member, said first and second openings being interconnected by a passage of reduced size;

c. hub means generally conforming in size to the first and second circular openings, the hub means being selectively and resistably movable therebetween through said passage of reduced size;

d. the wheel member having relief opening means disposed on each side of the restricted passage, the relief openings being constructed and arranged to permit that portion of the wheel member adjacent the restricted passage to flex laterally as the hub means is moved therethrough.

2. The apparatus defined by claim **1,** wherein the first circular opening is sized to permit the wheel member to freely rotate relative to the hub means when it is positioned therein, and the second circular opening is sized to frictionally preclude rotation of the wheel member relative to the hub means when it is positioned therein.

3. The apparatus defined by claim **1,** wherein the relief opening means each comprises an elongated opening formed entirely through the predetermined thickness of the wheel member, the elongated relief opening being essentially aligned with each other and with the restricted passage.

4. The apparatus defined by claim **1,** wherein the hub means comprises:

a. a hub member having a flanged base and an axially extending portion sized for cooperation with the first and second circular openings, the flanged base being greater in size than said circular openings;

b. a spacer constructed to fit over the axially extending portion of the hub member, whereby the wheel member is retained between the spacer and flanged base;

c. and means for holding the spacer on the axially extending portion of the hub member.

5. The apparatus defined by claim **4,** wherein the axially extending portion of the hub member has a peripheral groove formed in its extreme end, and the spacer holding means comprises a snap ring removably disposed in the peripheral groove.

6. The apparatus defined by claim **4,** wherein the axially extending portion of the hub means has a first cylindrical stepped portion sized to cooperate with the first and second openings, and a second cylindrical stepped portion sized to cooperate with the spacer.

7. The apparatus defined by claim **1,** wherein the hub means comprises:

a. a hub member having an axially extending portion cooperable with the first and second circular openings;

b. and means for retaining the wheel member on the hub member;

c. the hub member having an axially bore formed therethrough to receive a mounting rod.

8. The apparatus defined by claim **7,** wherein the axial bore is tapered from one end to the other, and the axially extending portion is slotted axially at the smaller bore end to define radially expandable segments.

9. The apparatus defined by claim **8,** wherein the axial slot is diametrical to define semicircular segments.

10. The apparatus defined by claim **7,** wherein the hub member and wheel member are formed from synthetic material having a low coefficient of friction.

11. The apparatus defined by claim **1,** wherein the peripheral face of the wheel member is beveled to reduce the size of its peripheral edge.

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