United States Patent

[11] 3,576,242

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[21] Appl. No. **789,769**
[22] Filed **Jan. 8, 1969**
[45] Patented **Apr. 27, 1971**
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[54] **BRAKING ROLLER**
11 Claims, 5 Drawing Figs.

[52] **U.S. Cl.** **193/35,** 188/185
[51] **Int. Cl.** **B65g 13/075,** B60t 8/04
[50] **Field of Search** ..... 188/184, 185; 193/35 (A)

[56] **References Cited**

UNITED STATES PATENTS

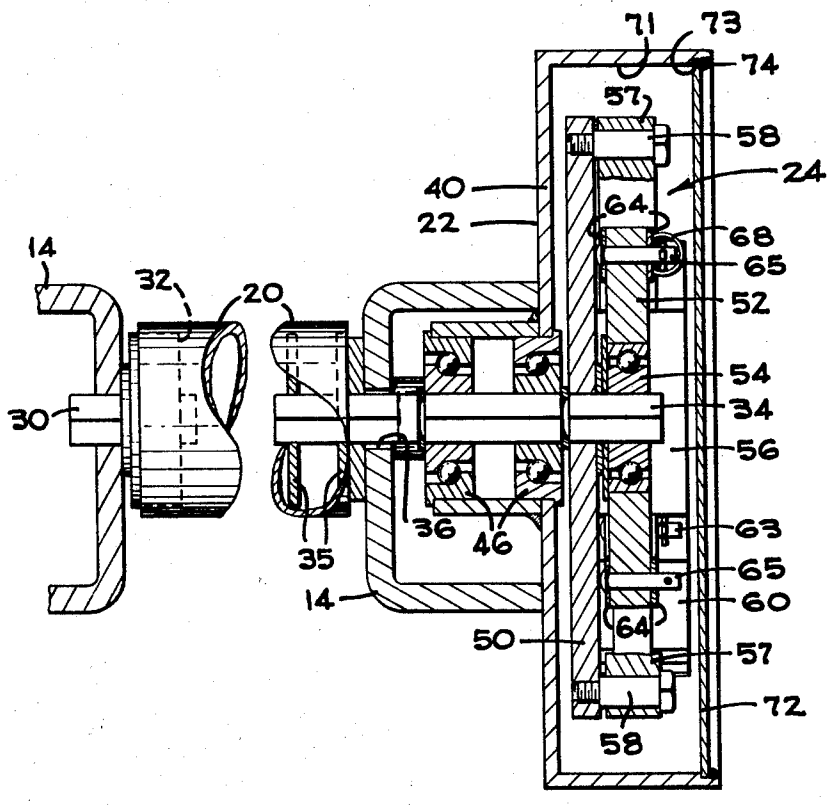
3,312,320	4/1967	Froio	193/35 (A)

FOREIGN PATENTS

61,811	12/1939	Norway	188/185
71,099	12/1915	Switzerland	188/184

Primary Examiner—Duane A. Reger
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ABSTRACT: A gravity roller conveyor includes at spaced intervals special braking rollers which have stationary brake drum attachments adjacent to one of their ends. A pair of brake shoes, located within each of the brake drums, is pivotally mounted to and rotatable with each braking roller. Each pair of shoes is interconnected by springs urging the shoes away from the cylindrical braking surface of the drum. As the speed of the conveyor rollers increases under a moving load, the centrifugal force acting upon the brake shoes propels them outwardly against the urging of their springs and into engagement with the braking surface of the drum in order to retard the speed of the associated braking roller and, therefore, the load upon the conveyor.

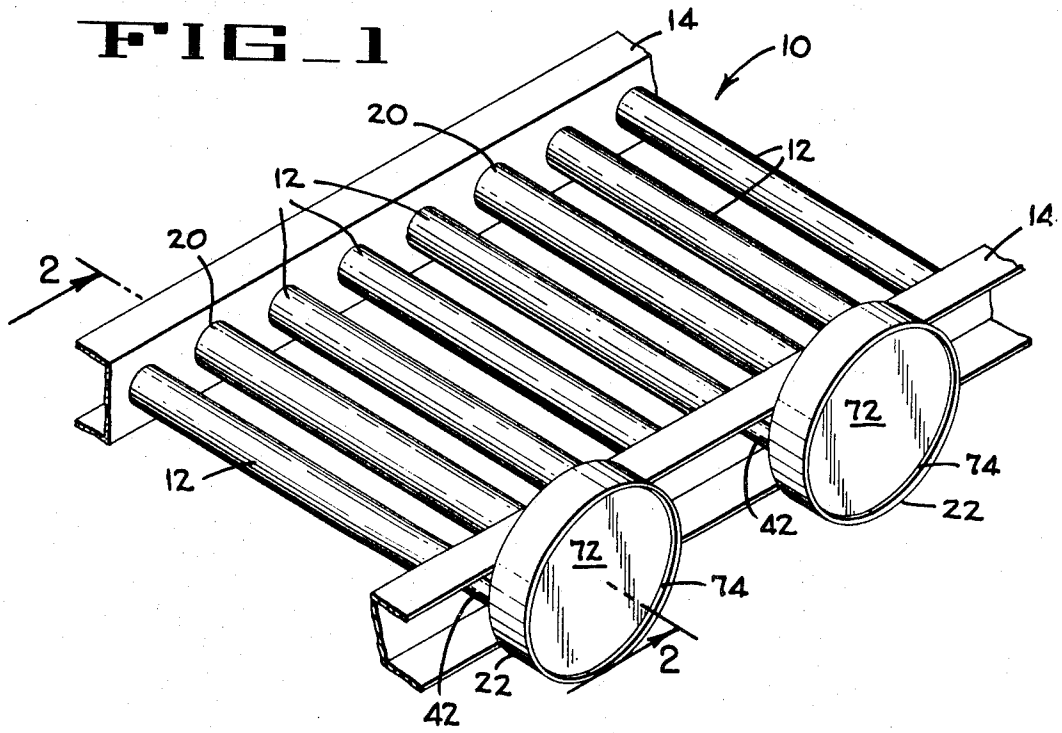


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SHEET 1 OF 3

FIG_1



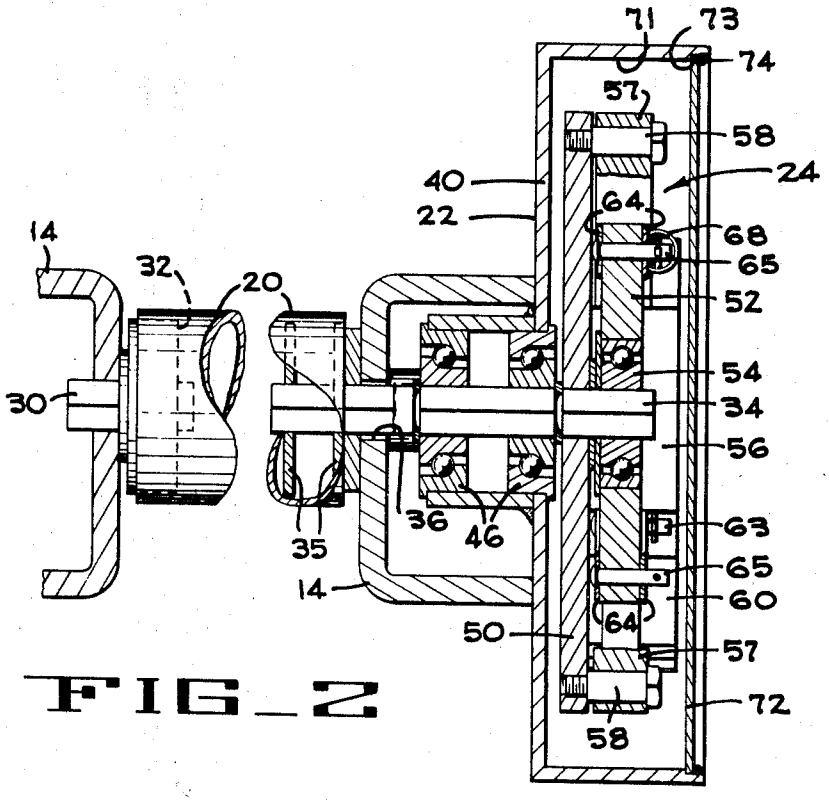


FIG_2

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FIG_4

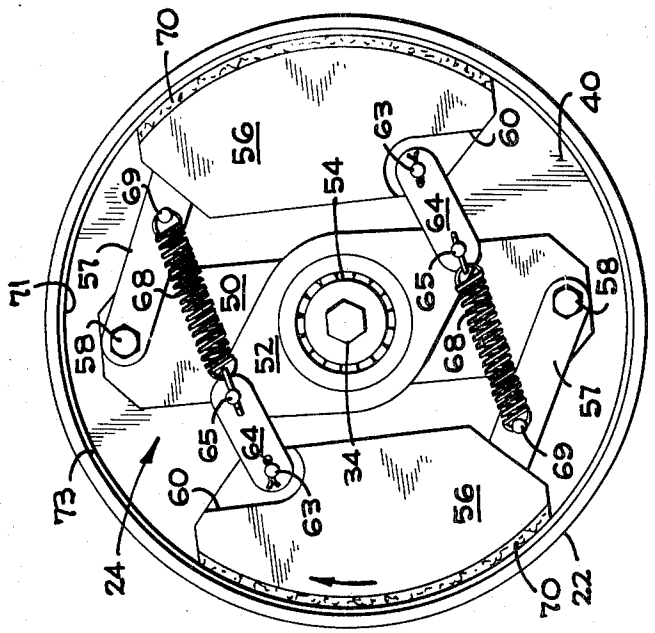
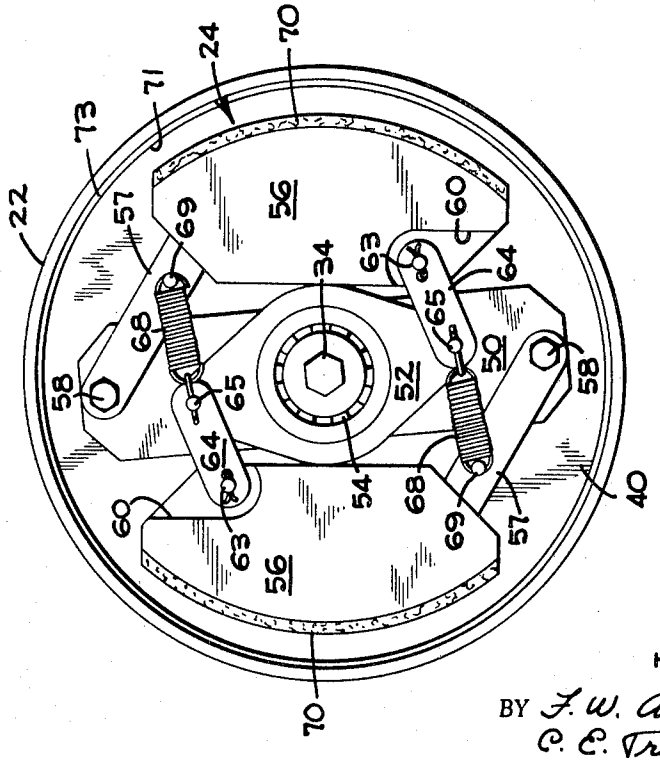


FIG_3

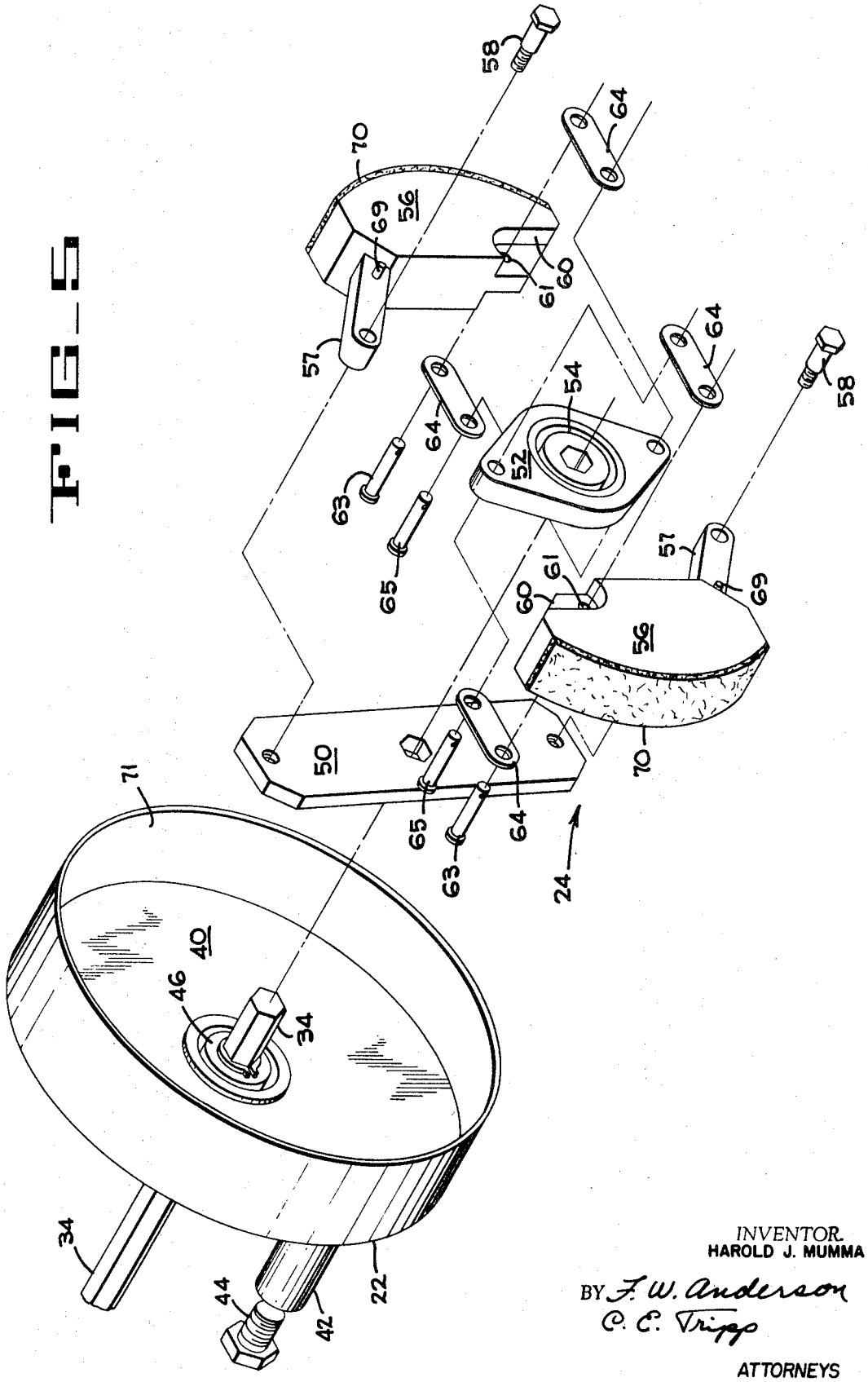


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FIG_5



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BRAKING ROLLER

BACKGROUND OF THE INVENTION

1. Field of the Invention

In general, this invention pertains to that field of art concerned with conveyors, and more particularly, it pertains to braking rollers for use in a gravity roller conveyor for retarding the speed of the articles travelling thereon.

2. Description of the Prior Art

In gravity roller conveyor systems, where the rollers are individually mounted for free rotation, a persistent problem has been the provision of means and methods for exercising some control over the movement of the articles upon the conveyor and, particularly, controlling their maximum permissible speed. Obviously, if the articles are allowed to build up high speeds while they move over the freely rotating rollers, they will be subject to damage or they will damage the conveyor structure when they accumulate upon the conveyor or are otherwise brought to a stop. One basic way of solving the problem of runaway loads upon a gravity roller conveyor is to place braking rollers at spaced intervals along the conveyor among the freely rotatable rollers to retard the speed of the packages or other articles as they move thereover. A braking roller generally operates automatically so that it is freely rotating with little friction at low speeds but is retarded or braked to an increasing degree as the speed of the roller increases. Since the articles travelling upon the conveyor are in contact with the braking roller, their forward movement will be retarded as the angular movement of the braking roller is retarded.

While many different means, from rotating eccentric weights to intricate hydraulic systems, have been devised for providing the increased resistance to movement necessary in a braking roller, it has been discovered that one of the simplest and most effective ways of retarding a braking roller is through the use of a friction brake system. For example, the U.S. Pat. No. 3,312,320 to Froio discloses several embodiments of a braking roller wherein a set of brake shoes that are positioned within the roller are permitted to be forced radially outward under the centrifugal forces generated by the rotating roller and against the urging of return springs into friction-braking engagement with the inner cylindrical surface of the roller. A special planetary gearing arrangement is provided in order to rotate the brake shoes at a much higher angular speed than that of the roller so as to accomplish the friction-braking effect between the shoes and the roller. The devices shown in the patent to Froio are relatively complex and costly to manufacture since an intricate planetary gearing arrangement is necessitated; hence, they have not achieved a wide acceptance in the materials-handling field where equipment cost is so often a prime factor.

SUMMARY OF THE INVENTION

The apparatus of the present invention comprises a braking roller for use with a gravity roller conveyor system wherein the braking roller is provided with centrifugally actuated brake shoes which are adapted to be thrown into contact with a stationary brake drum surface under increased roller speeds. The cylindrical brake drum is fixed to the side frame of the conveyor adjacent to one end of the braking roller and the brake shoes are pivotally mounted for rotation with the roller shaft in such a way as to make a smooth braking engagement with the brake drum surface and to provide a force directly acting upon the roller shaft so as to retard its angular velocity.

The mounting for the brake shoes comprises an important feature of the present invention since it permits the arcuately shaped shoes to move into uniform engagement with the inner cylindrical surface of the brake drum to evenly distribute the frictional restraining force over the entire frictional contact area of the shoe. This force is then applied directly as a torque upon the rotating roller shaft; consequently, a maximum braking effect is obtained from the available centrifugal forces generated by the roller. Each brake shoe is pivotally mounted

both to a first supporting plate which is fixed to the roller shaft and to a second supporting plate which is mounted for rotation upon the roller shaft. As the relatively heavy brake shoe is forced radially outward by centrifugal force, the second supporting plate permits the outer surface of the shoe to move generally radially of the roller shaft to assure the uniform and complete engagement of the brake shoe surface with the brake drum surface which uniform engagement will be maintained even though the lining of the brake shoe may wear or be replaced. Therefore, once the brake shoes are installed, they will operate satisfactorily throughout their useful life even though they may be subject to considerable wear.

Another important aspect of the present invention is the fact that the brake shoes require no costly or complex mechanisms in order to achieve their desired effect. They can therefore be produced at a low cost and thus be made available to many segments of the material-handling industry which would not otherwise be able to use an efficient braking device upon their gravity roller conveyors.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an isometric view of a portion of a gravity roller conveyor structure which includes a pair of the braking rollers of the present invention.

FIG. 2 is an enlarged section taken generally along the line 2–2 of FIG. 1 with the midportion of the braking roller being broken away.

FIG. 3 is a reduced end elevation of the braking roller shown in FIG. 2 with the cover plate of the brake drum being removed and with the brake shoes being shown in their retracted positions.

FIG. 4 is an end elevation of the braking roller similar to FIG. 3 but showing the brake shoes in their expanded position in contact with the surface of the brake drum.

FIG. 5 is an exploded isometric view of the braking mechanism of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In the embodiment of the invention disclosed in the drawings, a short portion of a gravity roller conveyor **10** (FIG. 1) is shown which is generally comprised of a plurality of rollers **12** each of which are mounted for free rotation between a pair of channel-shaped side frame members **14**. At uniformly spaced intervals along the length of the conveyor there are provided special braking rollers **20**, which rollers comprise the subject matter of the present invention. At one end of each of the braking rollers there is provided a stationary brake drum **22** which is designed to react with the rotating elements of a brake mechanism **24** attached to a lateral extension of the roller so as to retard the angular speed of the roller and thereby retard the speed of the packages or other articles travelling upon the roller conveyor surface.

As shown in FIG. 2, each braking roller **20** has one of its ends rotatably mounted by means of a hexagonal shaft **30** which is secured within the adjacent side frame member **14**. The hex shaft is mounted for rotation within the end of the cylindrical roller body structure by means of a bearing **32**. At the other end of the braking roller a second hexagonal shaft **34**, of considerably longer length than the hex shaft **30**, is provided which shaft extends along the axis of the roller and is rigidly secured within the roller by means of a pair of plates **35** so as to be rotatable with the body of the roller. Hex shaft **34** passes through an aperture **36** in the adjacent conveyor side frame member and serves to mount the braking mechanism structure **24** within the body of the cylindrical brake drum **22**.

The brake drum **22** includes a flat inner wall **40** of circular shape which is provided with a pair of internally threaded tubular extensions **42** (one only being shown in FIG. **5**) which serve to secure the brake drum upon the adjacent conveyor side frame member **14** by means of bolts **44** (FIG. **5**) which are threaded into the tubular extensions. The elongated roller

shaft 34 passes through the center of the drum wall 40 and is mounted for free rotation therein by means of a split roller bearing structure 46 (FIG. 2).

The braking mechanism 24 of the present invention is best shown in FIGS. 3 and 4 and the exploded view of FIG. 5. A brake shoe supporting plate 50 is affixed to the outer end of the roller shaft 34 so as to be rotatable with the shaft. Outwardly of said supporting plate 50 a rotatable support member 52 is mounted upon the shaft by means of an antifriction bearing structure 54 permitting the support member 52 to rotate with respect to the shaft. A pair of brake shoes 56 are mounted between the supporting plate 50 and the supporting member 52 in positions where they may move outwardly into engagement with the brake drum under the centrifugal forces generating by the rotating body of the braking roller. Each brake shoe includes a rigid support arm 57 at one side thereof which is pivotally mounted upon a socket head shoulder screw 58, the threaded end of which is tapped into and thereby secured to one of the radially projecting ends of the supporting plate 50. The opposite side of the brake shoe includes a recessed portion 60 which is apertured at 61. A pivot pin 63 is loosely mounted within the aperture 61 and pivotally mounts one end of a pair of parallel links 64 to the brake shoe. The other end of the links are pivotally mounted by means of a second pivot pin 65 to one of the projecting ends of the diamond-shaped supporting member 52. Pivot pin 65 also serves to mount one end of a tension spring 68, the other end of which is hooked about an extension 69 that projects laterally from the brake shoe support arm 57 of the brake shoe opposite to that to which the adjacent parallel links 64 are attached.

The outer arcuate faces of the brake shoes 56 are provided with a brake lining 70 which may be of any suitable frictional material, such as cork for example. The braking surface is provided by the inner cylindrical surface 71 of the brake drum and the brake shoes are arcuately shaped so as to exactly fit this surface. The entire brake mechanism structure is covered during use by means of a cover plate 72 (FIG. 6) which is mounted within a small recessed portion 73 at the outer end of the brake drum and is retained therein by means of a retaining ring 74.

The operation of the braking roller will be evident from the opposed views of FIG. 3 and FIG. 4. When the braking roller is at rest, or moving at a very slow speed, the tension springs 68 act between the brake shoes so as to bring them inwardly toward each other to move the brake lining 70 away from the braking surface 71. As the speed of the roller increases in the clockwise direction as indicated by the arrow in FIG. 4, the centrifugal forces acting upon the brake shoes cause them to move outwardly as they pivot upon the shoulder screws 58. This movement is restrained by the tension springs, and as the springs are elongated the supporting member 52 will rotate slightly counterclockwise (as viewed in FIG. 4) with respect to the supporting plate 50 that is fixed to the rotating roller shaft 34. As the angular speed of the roller increases to some predetermined amount which will be the maximum desired, the brake shoes will be thrown into engagement with the braking surface 70 and will thereby create a frictional force which is directed generally along the brake shoe mounting arms 57 to the supporting plate 50 to provide a reaction torque upon the roller shaft and thereby slow the roller. Obviously, any articles which are traveling upon the roller will also be retarded by this braking action.

It should further be pointed out that the braking rollers 20 may be made slightly larger in diameter than the regular rollers 12 in the roller conveyor structure. For example, if the standard roller 12 is 1.9 inches in diameter, the braking roller 20 should be about 2.0 inches in diameter. By this means, a good gripping engagement between the braking roller and the article traveling upon the conveyor is assured so that the retardation of the braking rollers will have maximum braking effect.

It can be seen that the braking roller of the present invention is provided with a simple brake mechanism structure which includes relatively few moving parts and is therefore economical to manufacture. The special pivotal mounting of the brake shoes, wherein one brake shoe supporting member is permitted to rotate with respect to the other brake shoe supporting member, allows the brake shoes to be moved directly and uniformly into engagement with the cylindrical brake drum surface. Consequently, even though the brake shoe lining may wear under the constant braking action, the friction-braking effect will still be maintained over the entire brake shoe surface; thus, the maximum braking effect is provided by the generated centrifugal forces.

Although the best mode contemplated for carrying out the present invention has been herein shown and described, it will be apparent that modification and variation may be made without departing from what is regarded to be the subject matter of the invention as set forth in the appended claims.

I claim:

1. A braking roller for use in a gravity roller conveyor to retard the speed of articles traveling thereon wherein said conveyor comprises a plurality of parallel cylindrical rollers mounted for free rotation between a pair of side frame members and wherein a braking roller is provided at spaced locations among said parallel rollers, said braking roller having a shaft axially affixed thereto for rotation therewith, said shaft extending through and being rotatably mounted within one of said side frame members, means rotatably mounting the other end of said braking roller to the other of said side frame members, a brake shoe pivotally connected to the end of said shaft which projects outwardly of said one side frame member, a brake drum fixed to said one side frame member and extending outwardly thereof about said brake shoe, and spring means for continuously urging said brake shoe radially inwardly, said brake shoe being pivotable outwardly under centrifugal force against the continual restraining force of said spring means when said roller is rotated and into engagement with said brake drum when said braking roller reaches a predetermined velocity to provide a retarding torque upon said shaft to thereby slow said roller, said spring means providing a continuously increasing restraining force upon said brake shoe as said brake shoe is moved radially outwardly reaching a maximum when said brake shoe engages said brake drum whereby said brake shoe will be caused to move out of engagement with said brake drum as the speed of said roller decreases from said predetermined velocity.

2. A braking roller as set forth in claim 1 including a second brake shoe pivotally connected to said shaft and mounted radially opposite to said first-mentioned brake shoe, said spring means being connected between each of said brake shoes in order to urge them radially inwardly.

3. A braking roller as set forth in claim 2 wherein said brake drum includes an inner cylindrical braking surface and wherein said brake shoes are provided with arcuate outer surfaces for engagement with said braking surface, said brake shoes being pivotable outwardly so that they engage said braking surface over their entire arcuate surfaces even though said arcuate surfaces may be subject to uniform radial wear.

4. A braking roller for use in a gravity roller conveyor to retard the speed of articles traveling thereon wherein said conveyor comprises a plurality of parallel cylindrical rollers mounted for free rotation between a pair of side frame members and wherein a braking roller is provided at spaced locations among said parallel rollers, said braking roller having a shaft axially affixed thereto for rotation therewith, said shaft extending through and being rotatably mounted within one of said side frame members, means rotatably mounting the other end of said braking roller to the other of said side frame members, a brake shoe pivotally connected to said shaft, a brake drum fixed to said one side frame member about said brake shoe, a first support member fixed to said shaft and extending radially therefrom, said brake shoe being

provided with a support arm extending from one end thereof, means for pivotally mounting said support arm at the outer end of said support member, a second support member rotatably mounted upon said shaft, and means for pivotally mounting said second support member to the other end of said brake shoe, said brake shoe being pivotable radially outward under centrifugal force when said roller is rotated to engage said brake drum and provide a retarding torque upon said shaft to thereby slow said roller.

5. A braking roller as set forth in claim **4** wherein said means for pivotally mounting said second support member to said brake shoe comprises a link pivotally connected at its opposite ends to said second support member and to said brake shoe.

6. A braking roller as set forth in claim **5** including a tension spring connected between said support arm on said brake shoe and said second support member to bias said brake shoe radially inwardly.

7. A braking roller for use in a gravity roller conveyor to retard the speed of articles traveling thereon, said roller including a shaft projecting from one end of the body of the roller and being axially affixed to said roller body, a first support member fixed to said shaft, a second support member rotatably mounted upon said shaft, a brake shoe pivotally mounted upon said first support member, means pivotally connecting said brake shoe and said second support member, and a brake drum stationarily mounted upon the conveyor frame structure and being adapted to frictionally engage said

brake shoe when the latter is urged radially outward under the centrifugal forces generated by the rotating roller body in order to provide a restraining force upon said shaft to retard the angular speed of said roller.

8. A braking roller as set forth in claim **7** including a second brake shoe pivotally mounted upon said support member radially opposite of said first-mentioned brake shoe, and means pivotally connecting said second brake shoe with said second support member.

9. A braking roller as set forth in claim **8** wherein said first support member comprises an elongated member fixed at its midportion to said shaft, each of said brake shoes being provided with a support arm at one side thereof which is pivotally mounted at one of the outer ends of said first support member.

10. A braking roller as set forth in claim **9** wherein said second support member is rotatably mounted at its midportion to said shaft and includes a pair of oppositely directed radial extensions, a link pivotally connected to each of said radial extensions, the other end of each link being pivotally connected to one of said brake shoes at the side opposite to that on which said support arm is provided.

11. A braking roller as set forth in claim **10** including a tension spring attached at one end thereof to each radial extension of said second support member, the other end of each spring being connected to the brake shoe opposite of that to which the associated radial extension is pivotally attached.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,576,242 Dated October 18, 1971

Inventor(s) HAROLD J MUMMA

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 3, line 39 change "(Fig. 6)" to --(Fig. 2)--.

Signed and sealed this 18th day of January 1972.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Acting Commissioner of Patents