Nov. 28, 1961 A. M. PASINSKI 3,010,565

PRESSURE ROLL EQUALIZING MECHANISM

Filed Sept. 16, 1959 2 Sheets-Sheet 1

Fig. 1.

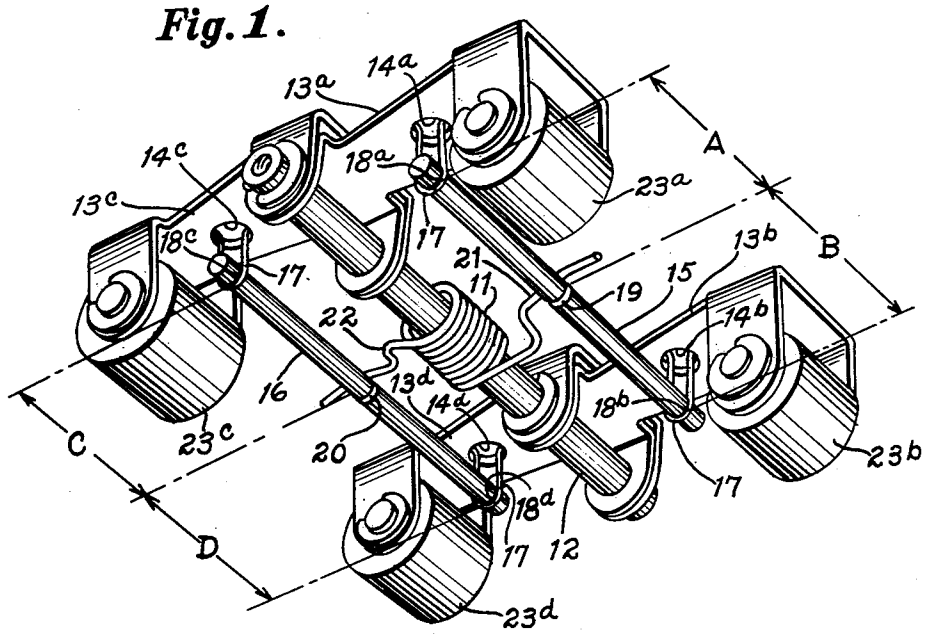


Fig. 2.

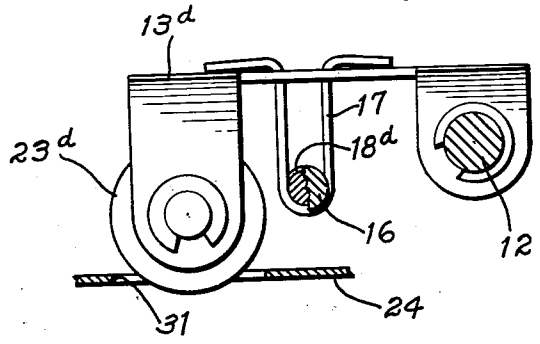
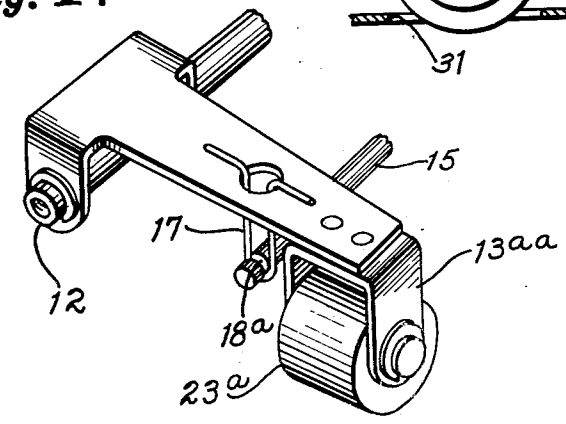


Fig. 4.



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PRESSURE ROLL EQUALIZING MECHANISM

Filed Sept. 16, 1959 2 Sheets-Sheet 2

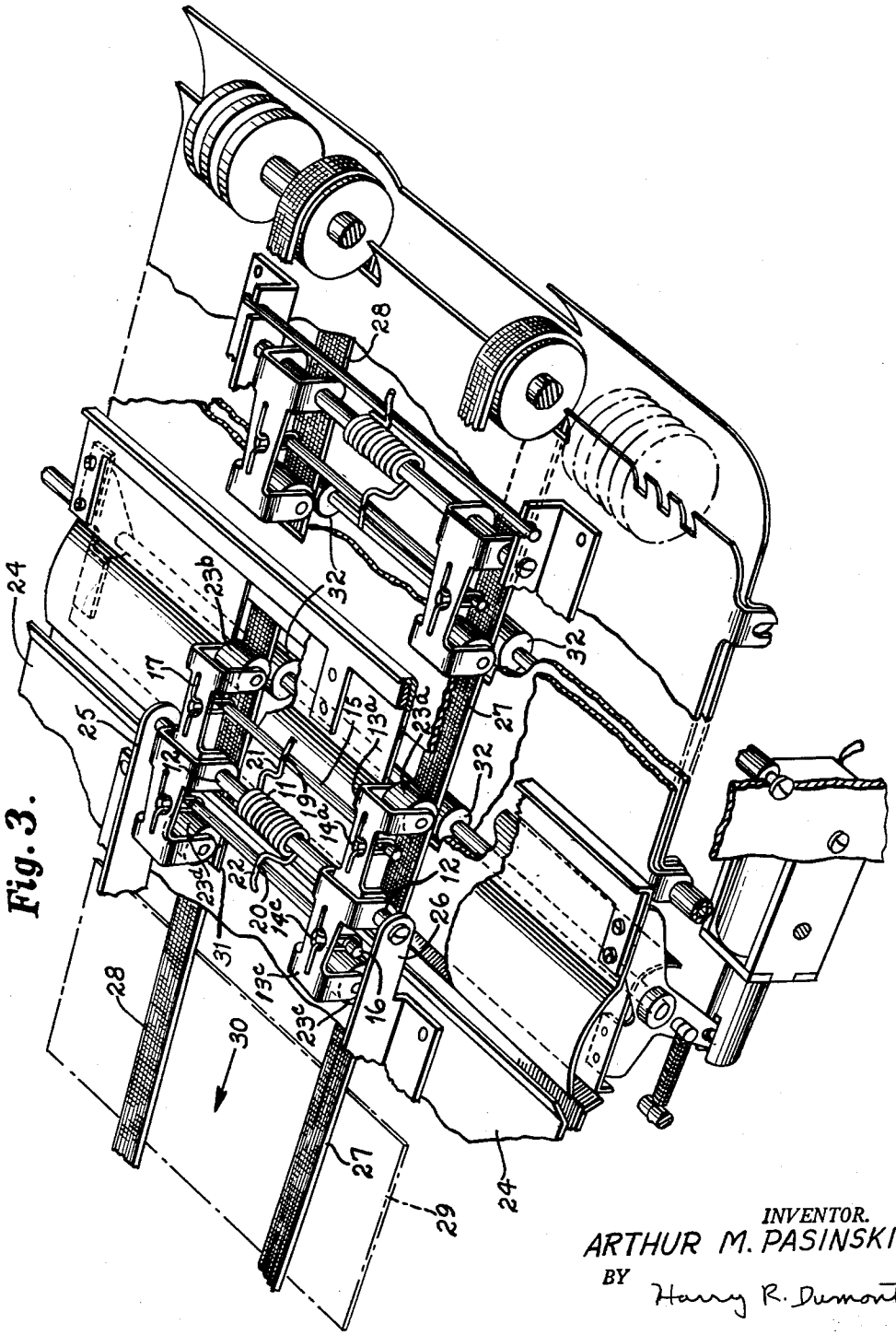


Fig. 3.

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United States Patent Office 3,010,565
Patented Nov. 28, 1961

3,010,565

PRESSURE ROLL EQUALIZING MECHANISM

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Filed Sept. 16, 1959, Ser. No. 840,438
15 Claims. (Cl. 198—167)

This invention relates generally to sheet feeding devices for business machines and more particularly to an improved pressure roll mechanism for sheet feeding.

One of the problems encountered in modern business machines is that of conveying the information presented on receipts, checks, letters, punch cards and the like at a relatively high speed through reading, encoding or sorting station. Due to the influence of unequal pressures the transported documents sometimes become skewed and jam during their passage along conveyors between guide plates with pressure rolls and belts provided for their guidance.

An object of this invention is to provide a pressure roll equalizer of improved design which will maintain sheets in transport by a conveyor in properly aligned position even when they are transported at a high rate of speed, and which will provide equal pressure at all points to transported sheets.

An additional object is to provide an improved spring suspension mechanism which will permit independent displacement of one of a number of spring biased and suspended members without altering the forces exerted by the other members.

With these objects in view, the invention as applied to a pressure roll assembly comprises a spring suspension mechanism which includes a resilient torsion device mounted on a central shaft. The resilient torsion device has a pair of substantially rigid arm portions extending laterally therefrom. Two pairs of similar and opposed frames are journalled on the central shaft near its ends and a pair of bars of substantial equal length are pivotally mounted at each end thereof to one of the frames. The arm portions of the resilient torsion device bear against the midpoints of the bars. Each of the frames carries a pressure member which will bear against an opposing surface.

The invention resides in the combinations and arrangements of elements as set forth in the following specification and as indicated with particularity in the appended claims. The invention itself, both as to its organization and method of operation, as well as additional objects and advantages thereof, will best be understood from the following description when read in connection with the accompanying drawings in which:

FIG. 1 is a bottom perspective view of the pressure roll assembly;

FIG. 2 is an elevation of one of the rolls with its frame showing the manner in which it is mounted in the assembly;

FIG. 3 is a perspective view, partially in section, showing the incorporation of the pressure roll assembly in a document conveyor system, and

FIG. 4 is a fragmentary perspective view of a modification of the assembly.

Referring to the drawings, FIG. 1 shows the pressure roll assembly with a resilient torsion device having a pair of substantially rigid arm portions extending therefrom here shown as torsion spring **11** supported on central shaft **12**, with end portions **21** and **22** laterally extended from torsion spring **11**. Journalled on central shaft **12** in opposing pairs are frames **13***a*, **13***b*, **13***c*, and **13***d* in which are similarly located apertures **14***a*, **14***b*, **14***c*, and **14***d*. Two parallel spaced bars **15** and **16** of substantially equal length are retained in position by four wire hangers **17** extending through the apertures **14***a*, **14***b*, **14***c*, and **14***d*. The wire hangers **17** are seated in circumferential grooves **18***a*, **18***b*, **18***c*, and **18***d*, each of which is near the end and is substantially equidistant from the midpoint of its respective bar **15** or **16**. Bearing in compression against grooves **19** and **20** of bars **15** and **16** are extended end portions **21** and **22** of torsion spring **11**. It should be noted that grooves **19** and **20** are located substantially at the midpoints of their respective bars **15** and **16**. The distance A, measured on bar **15** from circumferential groove **18***a* to groove **19**, is therefore equal to distance B, measured from circumferential groove **18***b* to groove **19**. Distances C and D measured in a similar manner on bar **16** are likewise equal. Mounted in frames **13***a*, **13***b*, **13***c*, and **13***d* are a plurality of pressure members herein shown as rotatable members and hereinafter referred to as rolls **23***a*, **23***b*, **23***c*, and **23***d*.

FIG. 2 shows an elevation of one of the four frames—**13***d* with hanger **17** engaging bar **16** about its groove **18***d*. The frame is journalled on central shaft **12** and carries roll **23***d*. Also shown is a portion of guide plate **24** with one of four apertures **31** illustrated.

FIG. 3 shows the incorporation of the pressure roll assembly in a document conveyor as shown in FIG. 96 of Fettig et al., application Serial No. 705,443, filed December 26, 1957 and being of common ownership herewith. Guide plate **24** has upstanding parallel support members **25** and **26** between which is rigidly mounted central shaft **12**. The forces contributed by torsion spring **11** through its extended end portions **21** and **22** against bars **15** and **16** at grooves **19** and **20** result in bringing pressure to bear upon conveyor belts **27** and **28** through frames **13***a*, **13***b*, **13***c*, and **13***d* and through their four associated rolls **23***a*, **23***b*, **23***c*, and **23***d*. Thus record indicia bearing documents or sheets **29** passing in the direction indicated by arrow **30**, which may be toward a reading or encoding station, pass between lower rolls **32** which are rigidly supported below and adjacent to the belts **27** and **28**. Provision of the four apertures **31** in the guide plate **24** permits curved surfaces of rolls **23** to protrude through guide plate **24** into contact with conveyor belts **27** and **28**. If the pressures exerted by the four rolls **23** against belts **27** and **28** are not equal, the rolls **23** will rotate at different rates of speed. This will result in portions of the sheet **29** being advanced at different rates of speed and will cause the sheet passing between conveyor belts **27**, **28** and rolls **23** to become skewed and diverted out of its proper path so that jamming occurs.

The inventive mechanism shown is so designed to overcome this problem. Provision of one central torsion spring **11** with end portion **21** seated in groove **19** of bar **15** results in a constant force being applied to bar **15** and acting through equal lever arm distances A and B as measured on bar **15** (FIG. 1) so that the forces impelling frames **13***a* and **13***b* with their associated rolls toward their respective opposed belts **27** and **28** are equal. Similarly, the constant force exerted by torsion spring **11** through its extended end portion **22** against bar **16** through equal lever arm distances C and D causes equal forces to impel frames **13***c* and **13***d* with their associated rolls toward their respective opposed belts **27** and **28**. Since bars **15** and **16** are of equal length and lever arm distances A, B, C and D are equal, it is readily apparent that the forces urged against each of the frames **13***a*, **13***b*, **13***c*, and **13***d* are equal, and that rolls **23***a*, **23***b*, **23***c*, and **23***d* bear against belts **27** and **28** with equal force to prevent skewing of the transported sheet **29**.

In FIG. 4 is shown a modification of the assembly with

central shaft **12**, bar **15**, wire hanger **17**, roll **23***a*, and modified frame **13***aa*. In this modification, the frame **13***aa* and the remaining three frames are so designed to carry the rolls **23***a, b, c* and *d* with their axes at right angles to the central shaft **12**.

The floating type mounting afforded by wire hangers **17** at either end of bars **15** and **16** allows free pivotal movement of these bars about hangers **17** in the circumferential grooves **18**. This permits the mechanism to have the attributes of a spring suspension permitting movement of any one of the frames **13** away from its opposing belt **27** or **28** without altering the equal forces with which the remaining frames **13** with their rolls **23** bear against the opposing belts **27** or **28**.

The manner in which this independent suspension is accomplished is best studied in terms of the movement of one of the bars **15**. With reference to FIG. 1, when one of the rotatable members such as **23***b* is moved from its normal position, its associated frame **13***b* pivots in an arcuate path about central shaft **12**. In so moving the bar **15** is carried upwardly with frame **23***b* at one end and pivots about the circumferential grooved portion **18***a* suspended from wire hanger **17** at its other end. A second yielding pivot point is provided at groove **19** in bar **15** where the extended portion **21** of torsion spring **11** abuts. The extended portion **21**, while it moves upwardly in an arcuate path similar to that traveled by frame **13***b*, permits bar **15** to pivot around extended end portion **21** where it is seated in groove **19**. Extended portion **21** maintains its position relative to the midpoint of bar **15** and therefore the lever arm distance measured perpendicularly from groove **19** to the line of displacement of frame **23***b* remains substantially equal to A. As a result the forces exerted by the three remaining rotating members **23***a, c,* and *d* against a plane surface such as presented by belt conveyor **27** and **28** remain constant whenever one of the four members is displaced from its normal position.

What is claimed is:

1. A spring suspension mechanism comprising a central shaft, a torsion spring mounted centrally on said shaft and having end portions extending laterally therefrom, two pairs of similar opposed frames journalled on said central shaft, each of said pairs being located proximate a different end thereof, a pair of bars of substantially equal length, each of said bars having one end thereof pivotally mounted to one of said frames of one of said pairs of frames and the other end pivotally mounted to another of said frames of the other of said pairs of frames, said end portions of said torsion spring bearing against the midpoints of said bars, and a plurality of rotatable members mounted in said frames.

2. A spring suspension mechanism comprising a central shaft, a torsion spring mounted centrally on said shaft and having end portions extending laterally therefrom, two pairs of similar opposed frames journalled on said central shaft, each of said pairs being located proximate a different end thereof, a pair of spaced bars of substantially equal length parallel to said central shaft, means pivotally securing one end of each of said bars to one of said frames of one of said pairs of frames and pivotally securing the other end to another of said frames of the other of said pairs of frames, said end portions of said torsion spring bearing against said bars proximate the midpoints thereof, and a plurality of rotatable members mounted in said frames.

3. A spring suspension mechanism comprising a central shaft, a torsion spring mounted centrally on said central shaft, end portions of said torsion spring extending laterally therefrom, two pairs of similar opposed frames journalled on said central shaft, each of said pairs being located proximate a different end thereof, a pair of spaced bars of substantially equal length parallel to said central shaft, means pivotally securing one end of each of said bars to one of said frames of one of said pairs of frames and pivotally securing the other end to other of said frames of the other of said pairs of frames, said end portions of said torsion spring bearing against said bars proximate the midpoints thereof, and a plurality of rotatable members mounted in said frames, said rotatable members having their axes parallel to said central shaft.

4. The combination as recited in claim 3 wherein said rotatable members mounted in said frames have their axes substantially at right angles to said central shaft.

5. In a sheet feeding mechanism having a belt conveyor, a guide plate proximate one surface of said belt conveyor having a plurality of apertures therein, a pair of parallel spaced support members mounted on said guide plate, and a pressure roll equalizing mechanism mounted between said support members, said pressure roll equalizing mechanism comprising a central shaft mounted between said support members transversely to the direction of movement of said belt conveyor, a torsion spring centrally mounted on said central shaft having end portions laterally extending therefrom, two pairs of oppositely disposed frames journalled on said central shaft, each of said pairs being located proximate a different end thereof, a pair of spaced bars of substantially equal length parallel to said central shaft, means pivotally securing one end of each of said bars to one of said frames of one of said pairs of frames and pivotally securing the other end to another of said frames of the other of said pairs of frames, said end portions of said torsion spring bearing against said bars proximate the midpoints thereof, and a plurality of rolls having their axes parallel to said central shaft and mounted in said frames, said rolls bearing against said belt conveyor through said plurality of apertures in said guide plate.

6. The combination as recited in claim 5 wherein said plurality of rolls have their axes substantially at right angles to said central shaft and wherein said central shaft is mounted between said support members substantially parallel to the direction of movement of said belt conveyor.

7. In a sheet feeding mechanism having a belt conveyor, a guide plate proximate the upper surface of said belt conveyor and having a plurality of apertures therein, a pair of parallel spaced support members mounted on said guide plate, and a pressure roll equalizing mechanism mounted between said support members, said pressure roll equalizing mechanism comprising a central shaft mounted between said support members transversely to the direction of movement of said belt conveyor, a torsion spring journalled centrally on said central shaft, end portions of said torsion spring laterally extending therefrom, two pairs of oppositely disposed frames journalled on said central shaft and each of said pairs being located proximate a different end thereof, each of said frames having an aperture therein, a pair of spaced bars of substantially equal length substantially parallel to said central shaft, each of said bars having a circumferential grooved portion near each end thereof, a plurality of wire hangers, each of said hangers extending through a different one of said apertures in said frames and engaging said bars about one of said circumferential grooved portions, said end portions of said torsion spring engaging said bars proximate the midpoints thereof, and a plurality of rolls mounted in said frames with their axes substantially parallel to said central shaft, said rolls engaging said belt conveyor through said apertures in said guide plate.

8. The combination as recited in claim 7 wherein said plurality of rolls have their axes substantially at right angles to said central shaft and wherein said central shaft is mounted between said support members substantially parallel to the direction of movement of said belt conveyor.

9. In a sheet feeding mechanism having a belt conveyor, a guide plate proximate one surface of said belt

conveyor and having a plurality of apertures therein, a pair of spaced support members mounted on said guide plate, and a pressure roll equalizing mechanism mounted between said support members, said pressure roll equalizing mechanism comprising a central shaft mounted between said support members transversely to the direction of movement of said belt conveyor, a torsion spring journaled centrally on said central shaft, end portions of said torsion spring laterally extending therefrom, two pairs of oppositely disposed frames journalled on said central shaft each of said pairs being located proximate a different end thereof, each of said frames having an aperture therein, a pair of bars of substantially equal length, each of said bars having a circumferential grooved portion near each end thereof, a plurality of wire hangers, each of said hangers extending through a different one of said apertures in said frames and engaging a different one of said bars about one of said circumferential grooved portions, said end portions of said torsion spring engaging said bars proximate the midpoints thereof, and a plurality of rolls mounted in said frames with their axes substantially parallel to said central shaft, said rolls engaging said belt conveyor through said apertures in said guide plate.

10. A spring suspension mechanism comprising a central shaft, a resilient torsion device mounted centrally on said central shaft, a pair of substantially rigid arm portions extending laterally therefrom, two pairs of similar opposed frames journalled on said central shaft, each of said pairs of frames being located proximate a different end thereof, a pair of bars of substantially equal length, each of said bars having one end thereof pivotally mounted to one of said frames of one of said pairs of frames and having the other end pivotally mounted to another of said frames of the other of said pairs of frames, said arm portions of said resilient torsion device bearing against the midpoints of said bars, and a plurality of rotatable members mounted in said frames.

11. A spring suspension mechanism comprising a central shaft, a resilient torsion device mounted centrally on said central shaft, a pair of substantially rigid arm portions extending laterally therefrom, two pairs of similar opposed frames journalled on said central shaft, each of said pairs being located proximate a different end thereof, a pair of bars of substantially equal length, each of said bars having one end thereof pivotally mounted to one of said frames of one of said pairs of frames and having the other end pivotally mounted to another of said frames of the other of said pairs of frames, said arm portions of said resilient torsion device bearing against the midpoints of said bars, and a plurality of pressure members mounted in said frames.

12. In a sheet feeding mechanism having a belt conveyor, a guide plate proximate one surface of said belt conveyor and having a plurality of apertures in said guide plate, a pair of spaced support members mounted on said guide plate, and a pressure roll equalizing mechanism mounted between said support members, said pressure roll equalizing mechanism comprising a central shaft mounted between said support members transversely to the direction of movement of said belt conveyor, a resilient torsion device centrally mounted on said central shaft, a pair of substantially rigid arm portions extending laterally therefrom, two pairs of oppositely disposed frames journalled on said central shaft each of said pairs being located proximate a different end thereof, each of said frames having an aperture therein, a pair of bars of substantially equal length, each of said bars having a circumferential grooved portion near each end thereof, a plurality of wire hangers, each of said hangers extending through a different one of said apertures in said frames and engaging a different one of said bars about one of said circumferential grooved portions, said arm portions of said resilient device engaging said bars proximate the midpoints thereof, and a plurality of rolls mounted in said frames with their axes substantially parallel to said central shaft, said rolls engaging said belt conveyor through said apertures in said guide plate.

13. The combination as recited in claim 12 wherein said central shaft is mounted between said support members substantially parallel to the direction of movement of said belt conveyor and said plurality of rolls are mounted in said frames with their axes substantially at right angles to said central shaft.

14. In a sheet feeding mechanism having a belt conveyor and a pressure roll equalizing mechanism mounted adjacent one surface of said belt conveyor, said pressure roll equalizing mechanism comprising a central shaft, a torsion spring mounted centrally on said central shaft and having end portions extending laterally therefrom, two pairs of oppositely extending frames journalled on said central shaft, each of said pairs being located proximate a different end of said central shaft, a pair of spaced bars of substantially equal length parallel to said central shaft, means pivotally securing one end of each of said bars to one of said frames of one of said pairs of frames, means pivotally securing the other end of each of said bars to one of said frames of the other of said pairs of frames, said end portions of said torsion spring bearing against said bars proximate the midpoints thereof, and a plurality of rotatable members mounted in said frames and bearing against said belt conveyor.

15. In a sheet feeding mechanism having a belt conveyor, a guide plate proximate one surface of said belt conveyor and having a plurality of apertures therein, a pair of parallel spaced support members mounted on said guide plate, and a pressure roll equalizing mechanism mounted between said support members, said pressure roll equalizing mechanism comprising a central shaft mounted between said support members, a torsion spring centrally mounted on said central shaft and having end portions laterally extending therefrom, a pair of frames journalled on said central shaft and similarly extending therefrom, each of said frames being located near one end of said central shaft, a pair of bars substantially parallel to said central shaft, the first of said pair of bars being rigidly mounted between said support members, the second of said pair of bars being pivotally secured proximate each end to one of said frames, each of said end portions of said torsion spring engaging a different one of said pair of bars proximate the midpoint thereof, and a plurality of rolls mounted in said frames, said rolls bearing against said conveyor belt through said apertures in said guide plate.

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