March 27, 1951 F. K. SCHEFE 2,546,476

DIFFERENTIAL CONVEYER

Filed Sept. 17, 1946 5 Sheets-Sheet 1

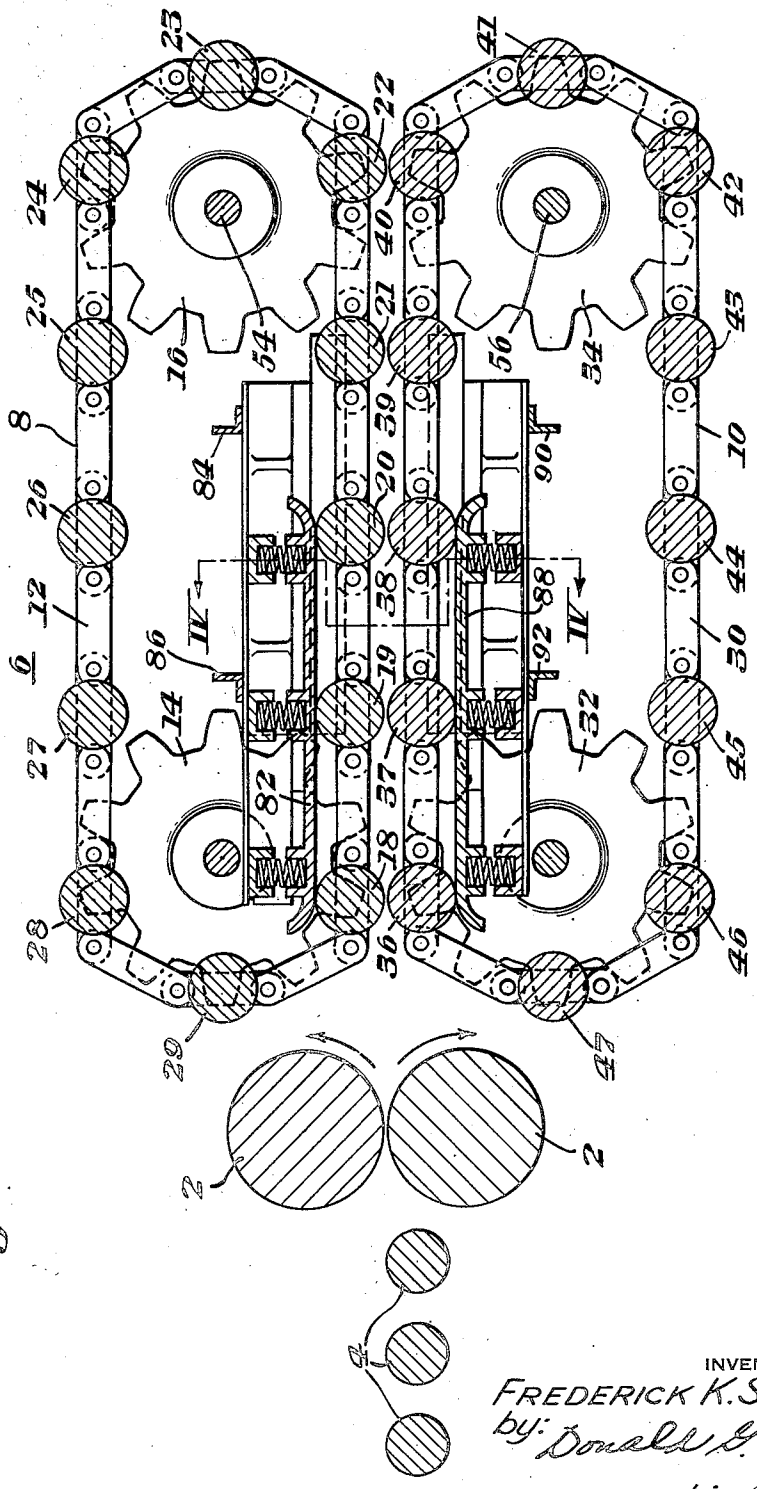

Fig. 1.

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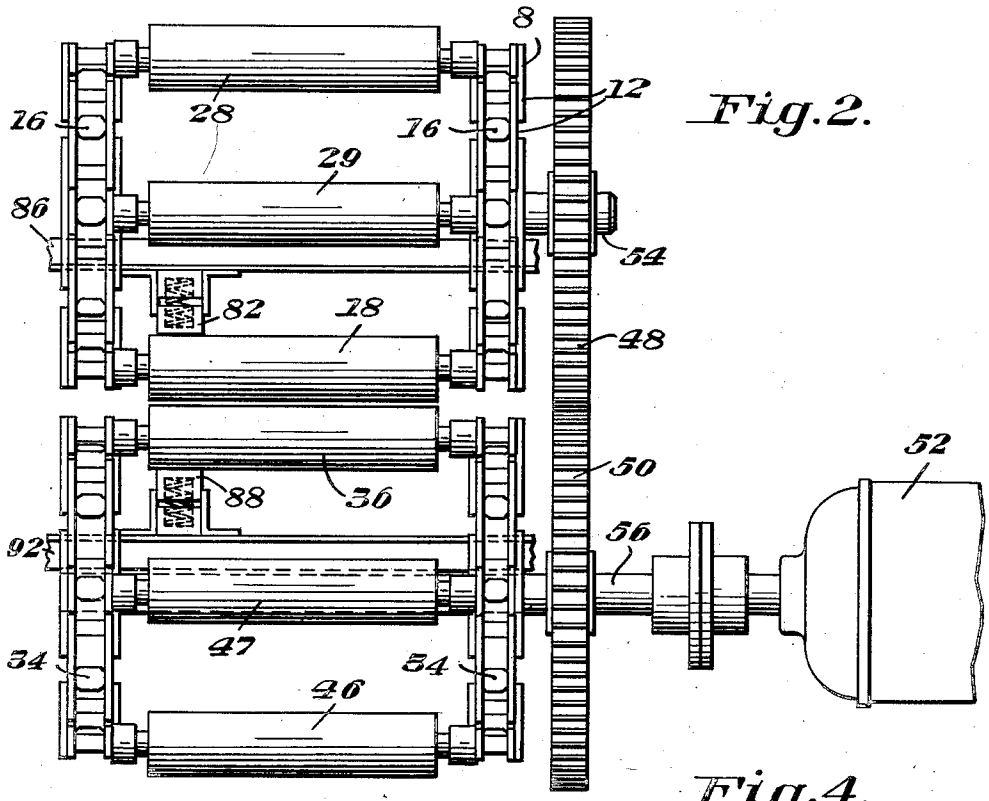

Fig. 2.

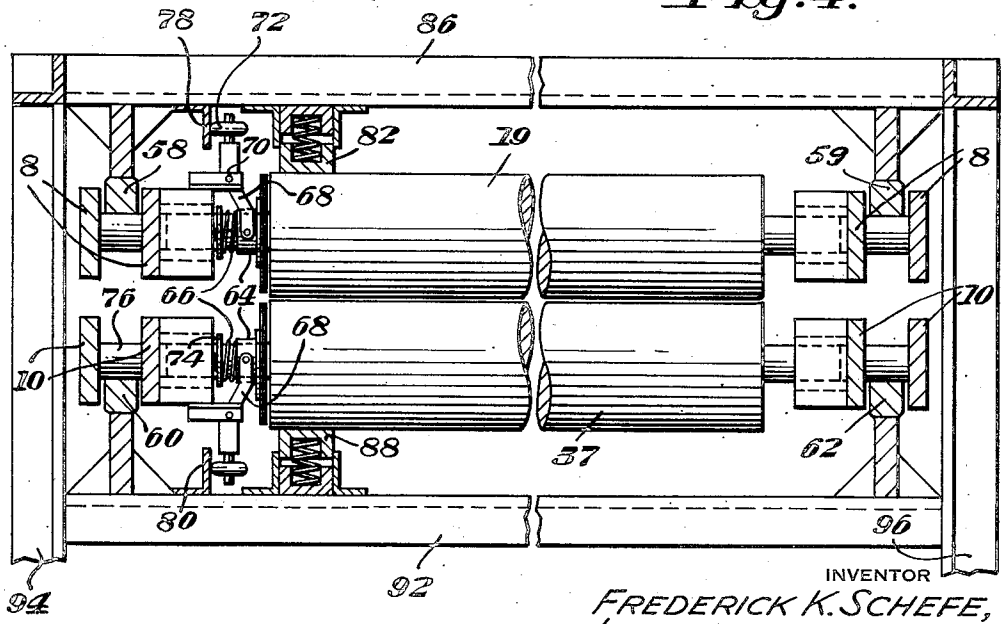

Fig. 4.

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DIFFERENTIAL CONVEYER

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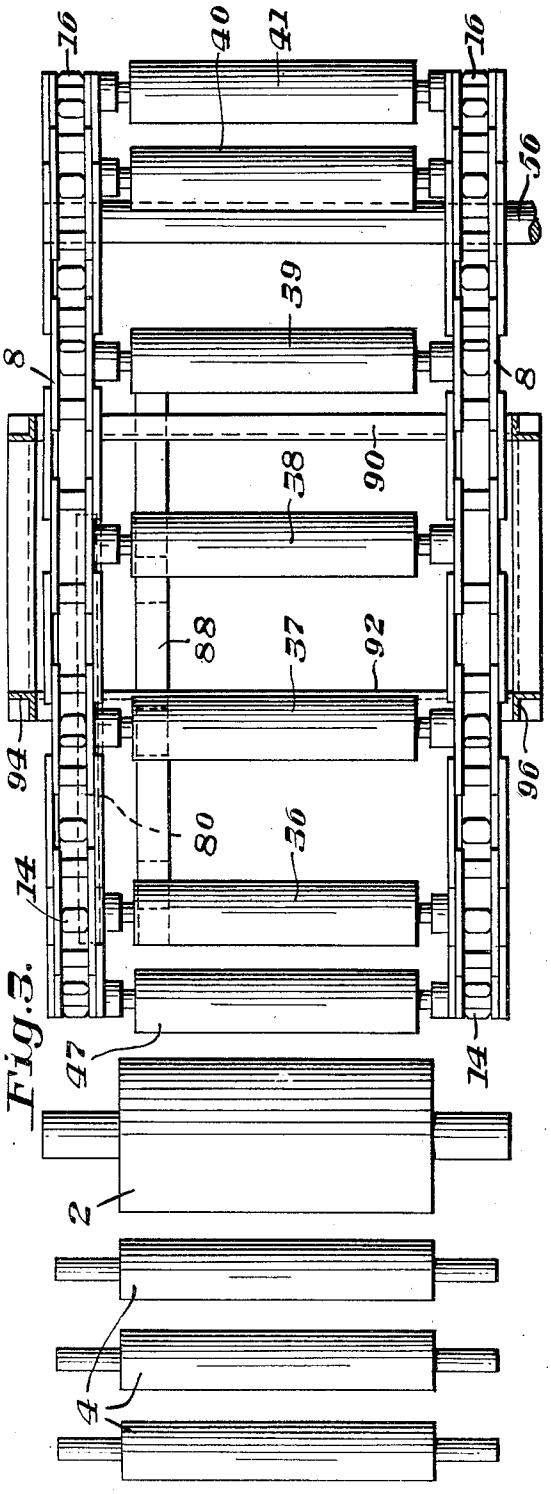

Fig. 2.

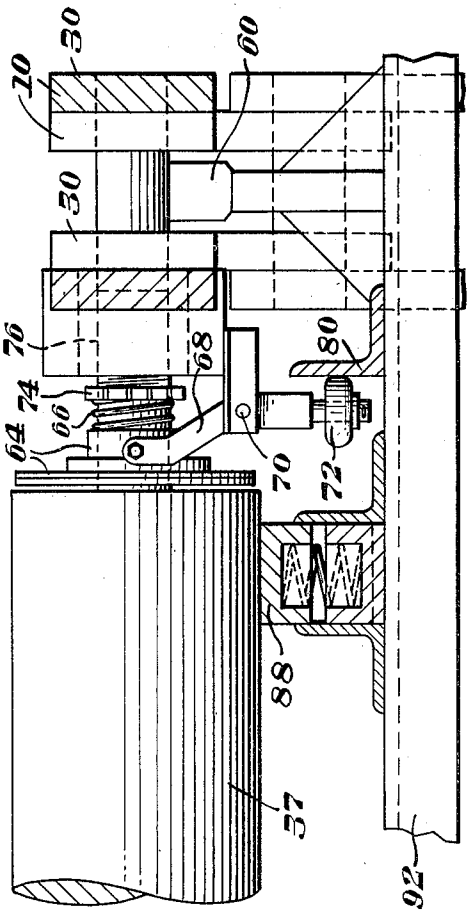

Fig. 5.

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Fig. 6.

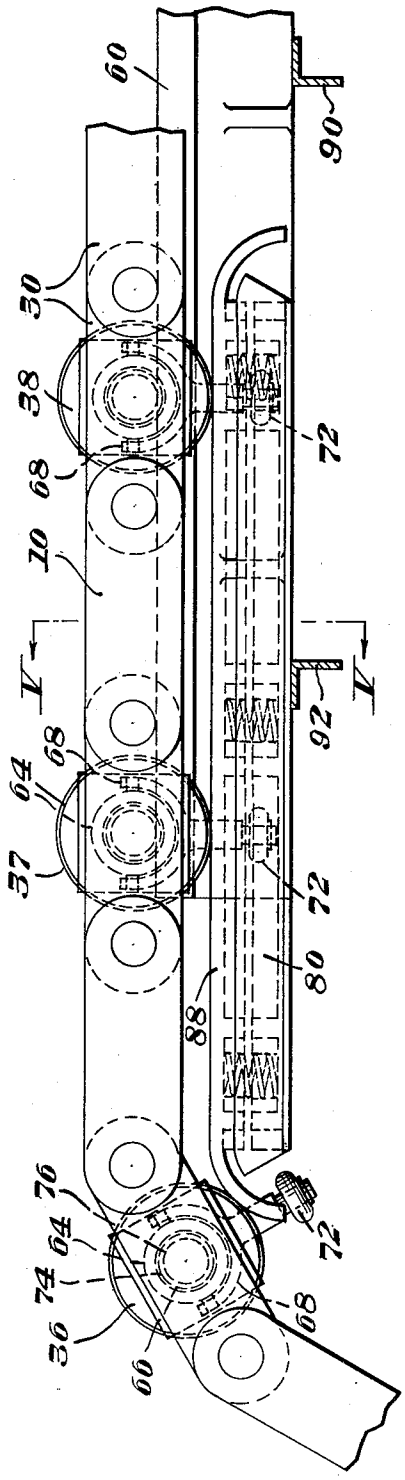
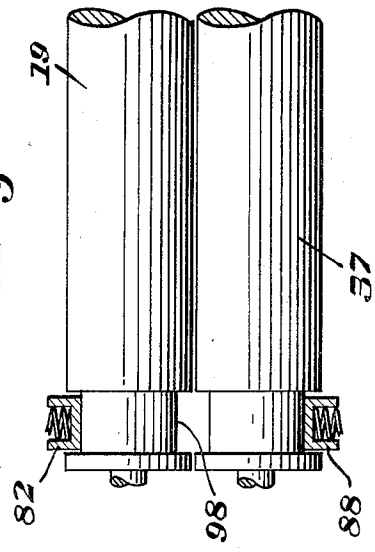


Fig. 7.



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DIFFERENTIAL CONVEYER

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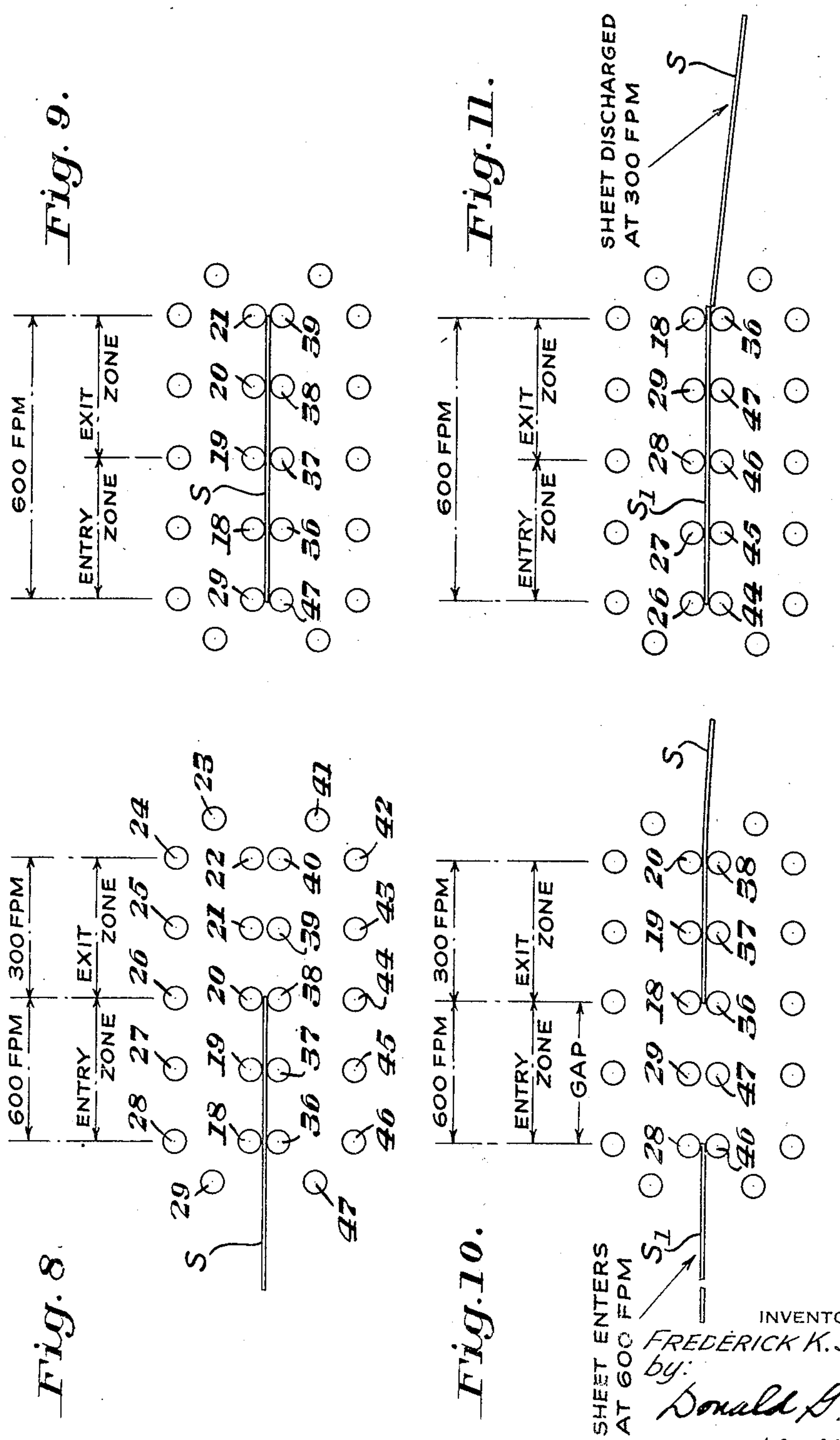

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Patented Mar. 27, 1951 2,546,476

UNITED STATES PATENT OFFICE

2,546,476

DIFFERENTIAL CONVEYER

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Application September 17, 1946, Serial No. 697,537

6 Claims. (Cl. 198—34)

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This invention relates to a differential conveyor and more particularly to such a conveyor for decelerating steel sheets prior to piling them. Such a device is particularly useful in connection with shearing, conveying, processing and piling sheets at extremely rapid rates. Those devices now in general use in piling operations usually include a conveyor operated considerably slower than the shear in order to lap the sheets and thus materially slow down the forward speed of travel to prevent damage during piling. The sheets become lapped and develop a tendency to abrade each other when discharged from the lapping conveyor and do not pile effectively. Other devices have also been suggested but they too have not proved to be commercially successful for various reasons.

It is an object of my invention to provide a differential conveyor which can slow down sheets automatically at their forward speed of travel.

Another object is to provide a differential conveyor which can be used to deliver sheets at sharply accelerated speeds.

These and other objects will be more apparent after referring to the following specifications and attached drawings, in which:

Figure 1 is a side view partly in section of the differential conveyor and associated mechanism;

Figure 2 is an end view of Figure 1 looking from the right;

Figure 3 is a bottom view of Figure 1;

Figure 4 is a sectional view taken on the line IV—IV of Figure 1;

Figure 5 is an enlarged view showing the braking mechanism;

Figure 6 is an enlarged view of a portion of the entry and of the conveyor;

Figure 7 is an enlarged view showing a modification; and

Figures 8 to 11 inclusive show diagrammatically various positions of the sheets during their travel through the pass line of the conveyor.

Referring more particularly to the drawings the reference numeral 2 indicates a pair of pinch rolls which are operated in conjunction with conveyor rolls 4 for feeding sheets S in spaced apart relationship to the conveyor 6 of my invention. The conveyor 6 has a pair of spaced apart top chains 8 and a similar pair of spaced apart bottom chains 10. Each chain 8 is made up of a plurality of links 12 pinned together. The endless chains 8 are mounted on sprockets 14 and 16. A plurality of rolls 18 to 29, inclusive, extend between the chains 8 and are rotatably supported

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thereby in any suitable manner. Each of the endless chains 10 is made up of a plurality of links 30 pinned together and is mounted on sprockets 32 and 34. A plurality of rolls 36 to 47, inclusive, extend between the chains 10 and are rotatably supported thereby. The rolls of each conveyor chain are arranged so that the distance between the centers of the rolls is equal to the circumference of the rolls. The top and bottom sprockets and chains are driven at equal speeds by gears 48 and 50 from a variable speed driving means such as an electric motor 52. The sprockets 16 and gear 48 are mounted on a common shaft 54 and the sprockets 34 and gear 50 are mounted on a shaft 56 which is driven by the motor 52.

As shown in Figure 4, the chains 8 are guided by rails 58 and 59 and chains 10 are supported on and guided by rails 60 and 62, thus establishing a separation of the rolls of the conveyor to suit the thickness of the sheets being conveyed.

As shown in Figures 4, 5 and 6, each roll of the conveyor is provided with an automatically applied brake 64. A spring 66 normally presses the brake 64 against the end of the roll. An operating arm 68, pivotally mounted at 70, has one end connected to the brake 64 while the other end supports a roller 72. The degree of braking action may be regulated to suit operating conditions by changing the position of nut 74 on the roll shaft 76, thus changing the force exerted by spring 66. In some cases it may be necessary to apply the brakes in a manner to stop rotation of the rolls gradually, but in the present description, it is preferred to use a brake adjustment that will stop the rotation of rolls almost instantly. Tracks 78 and 80 for rollers 72 extend along the entry zone of the conveyor for a purpose which will appear later. The peripheries of rolls 18, 19 and 20 in the position shown in Figure 1 are in contact with a resiliently mounted bar 82 which is supported on cross members 84 and 86. The peripheries of rolls 36, 37 and 38 in the position shown in Figure 1 are in contact with a resiliently mounted bar 88 which is supported on cross members 90 and 92. Cross members 84, 86, 90 and 92 are supported by the uprights 94 and 96.

As shown in Figure 7, the rolls may be provided with a reduced portion 98 at the point of contact with the resilient bars 82 and 88. The purpose of this construction will be explained below.

The operation of the device is as follows:

As the motor 52 moves the conveyor chains 8 and 10 around their path of movement, the con-

veyor rolls with their brakes applied will move at a speed equal to the speed of the conveyor chains. As the rolls approach the entry zone of the conveyor, the brake operating rollers 72 contact the tracks 78 and 80 and force the brakes 64 against the springs 66 to release them. With the brakes released, the rolls are rotated by contact with the resilient bars 82 and 88. This increases the circumferential speed of the rolls at this point to a value twice that of the linear speed. If it is desired to increase the circumferential speed to more than twice the linear speed, the diameter of the rolls is decreased at the point of contact 98 with the bars 82 and 88 as shown in Figure 7. As the rolls leave the resiliently mounted bars 82 and 88, the brake operating rollers 72 also leave the tracks 78 and 80, thus applying the brakes.

As the sheet S enters the entry zone, as shown in Figure 8, the rotating rolls 18, 19, 20, 36, 37 and 38 grip it and feed it forward at the peripheral speed of the rolls which speed may be assumed to be 600 feet per minute.

In Figure 9, sheet S has traveled a distance equal to two circumferences of the rolls and the forward end of the sheet is shifted to a point matching the center line of rolls 21 and 39. However, the rollers 21 and 39 have only moved a distance equal to one circumference of the rolls. Although the brakes have been applied to rolls 20, 21, 38 and 39 in the exit zone, the degree of braking action is such that the sheet S will rotate the rolls at the higher speed of the sheet.

In Figure 10 the sheet S is shown discharged from the entry zone to the exit zone and the brakes of rolls 19, 20, 37 and 38 will function to stop their rotation with the sheet S assuming the same speed as the chain or 300 feet per minute. A second sheet S_1 is about to enter the entry zone of the conveyor. It will be seen that the sheet S_1 is spaced a distance of two roll circumferences from sheet S. This distance is necessary to prevent the front end of the second sheet from overtaking the rear end of the first sheet as they progress through the conveyor. The speed of the rolls 2 and conveyor 4 is adjusted to provide this gap.

In Figure 11 sheet S_1 has moved forward at 600 feet per minute a distance equivalent to four roll circumferences at which time the sheet S, whose speed has been lowered to 300 feet per minute, has moved forward only two circumferences, and as a result the gap between sheets S and S_1 has practically disappeared, but since sheet S has been discharged from the conveyor it immediately gravitates to a lower level onto a pile of sheets or another conveyor. Therefore, it will be seen that no interference between the successively delivered and conveyed sheets is possible. If desired, the direction of travel of the differential conveyor may be reversed and sheets delivered to the right hand end of the conveyor as shown in Figure 1 and delivered from the left hand end at accelerated speeds.

While two embodiments of my invention have been shown and described, it will be apparent that other adaptations and modifications may be made without departing from the scope of the following claims.

I claim:

1. A differential conveyor for sheets or the like comprising an endless chain of rolls, means for moving said chain around a given path of travel, said rolls conveying said sheets through a part of travel, means for rotating the rolls at one end of the path of strip travel, means for normally holding the rolls from rotating at the other end of the path of strip travel, said sheets overcoming the braking action on the normally non-rotating rolls and rotating them at the same speed as the rotating rolls when a sheet is in contact with rolls at both ends of the path of strip travel.

2. A differential conveyor for sheets or the like comprising two endless chains of rolls, means for moving said chains around a given path of travel, said chains forming a pass therebetween for conveying said sheets through a part of the path of travel, means for rotating the rolls at one end of the path of strip travel, means for normally holding the rolls from rotating at the other end of the path of strip travel, said sheets overcoming the braking action on the normally non-rotating rolls and rotating them at the same speed as the rotating rolls when a sheet is in contact with rolls at both ends of the path of strip travel.

3. A differential conveyor for sheets or the like comprising an endless chain of rolls, means for moving said chain around a given path of travel, said rolls conveying said sheets through a part of the path of travel, means for normally holding the rolls from rotating, means at one end of the path of strip travel against which the rolls bear, means for releasing the holding means when the rolls are in contact with the roll bearing means so as to permit rotation of the rolls, said sheets overcoming the braking action on the normally non-rotating rolls in contact with a sheet and rotating them at the same speed as the rotating rolls when the sheet is in contact with rolls at both ends of the path of strip travel.

4. A differential conveyor for sheets or the like comprising two endless chains of rolls, means for moving said chains around a given path of travel, said chains forming a pass therebetween through which said sheets are conveyed through a part of the path of travel, means for normally holding the rolls from rotating, means at one end of the path of strip travel against which the rolls bear, means for releasing the holding means when the rolls are in contact with the roll bearing means so as to permit rotation of the rolls, said sheets overcoming the braking action on the normally non-rotating rolls in contact with a sheet and rotating them at the same speed as the rolls in contact with the roll bearing means when the sheet is in contact with rolls at both ends of the path of strip travel.

5. A differential conveyor for sheets or the like comprising two endless chains of rolls, means for moving said chains around a given path of travel, said chains forming a pass therebetween through which said sheets are conveyed through a part of the path of travel, a brake for each roll, each of said brakes normally holding its roll from rotating, an operating arm for each brake, bars at the entrance of said conveyor against which the rolls bear, a track for each chain at the entry side of the conveyor, said operating arms bearing against said tracks to release said brakes as the corresponding roll bears against the bar adjacent thereto, said rolls rotating on said bars when their brakes are released, said brakes being applied when their rolls leave their bars, said sheets overcoming the braking action on the normally non-rotating rolls in contact with a sheet and rotating them at the same speed as the rotating rolls when the sheet is in contact with rolls at both ends of the path of strip travel.

6. A differential conveyor for sheets or the like

comprising two endless chains of rolls, the distance between the axis of said rolls of each chain being equal to the circumference thereof, means for moving said chains around an endless path, said chains forming a pass therebetween through which said sheets are conveyed through a part of the endless path, a brake for each roll, each of said brakes normally holding its roll from rotating, an operating arm for each brake, a roller at the end of each operating arm, bars at the entrance of said conveyor against which the rolls bear, a track for each chain at the entry side of the conveyor, said rollers bearing against said tracks to release said brakes as the corresponding roll bears against the bar adjacent thereto, said rolls rotating on said bars when their brakes are released, said brakes being applied when their rolls leave their bars, said sheets overcoming the braking action on the

normally non-rotating rolls in contact with a sheet and rotating them at the same speed as the rotating rolls when the sheet is in contact with rolls at both ends of the path of strip travel.

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