Sept. 8, 1964 R. E. MARTIN 3,147,969

COLLATING MACHINE

Filed July 17, 1962 4 Sheets-Sheet 1

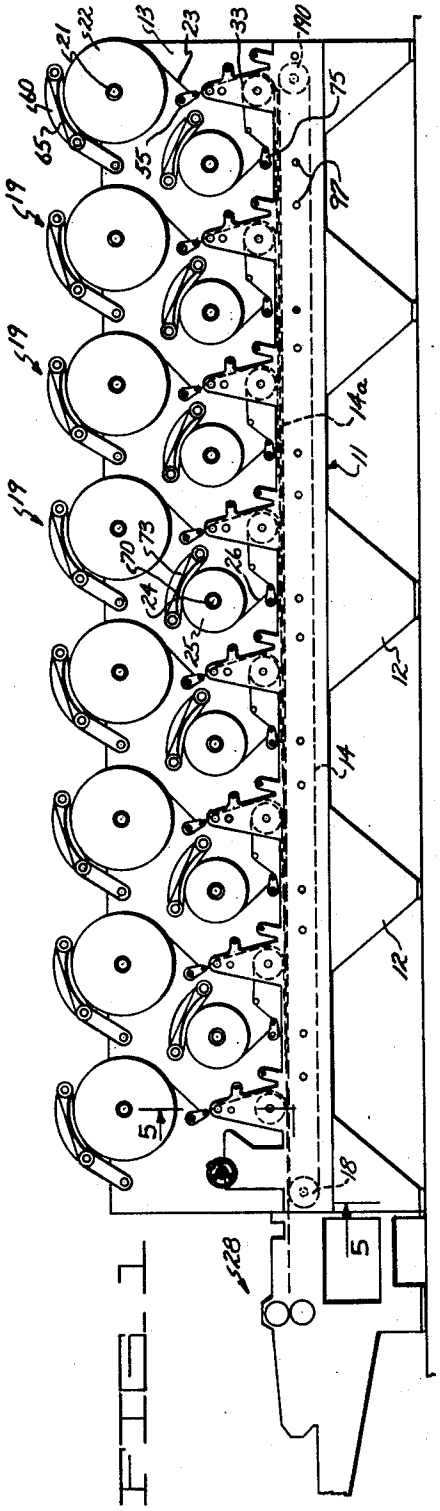


FIG. 1

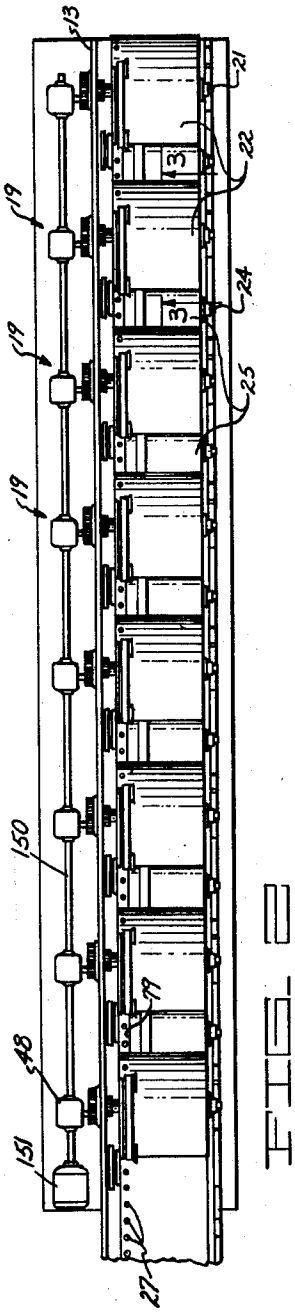


FIG. 2

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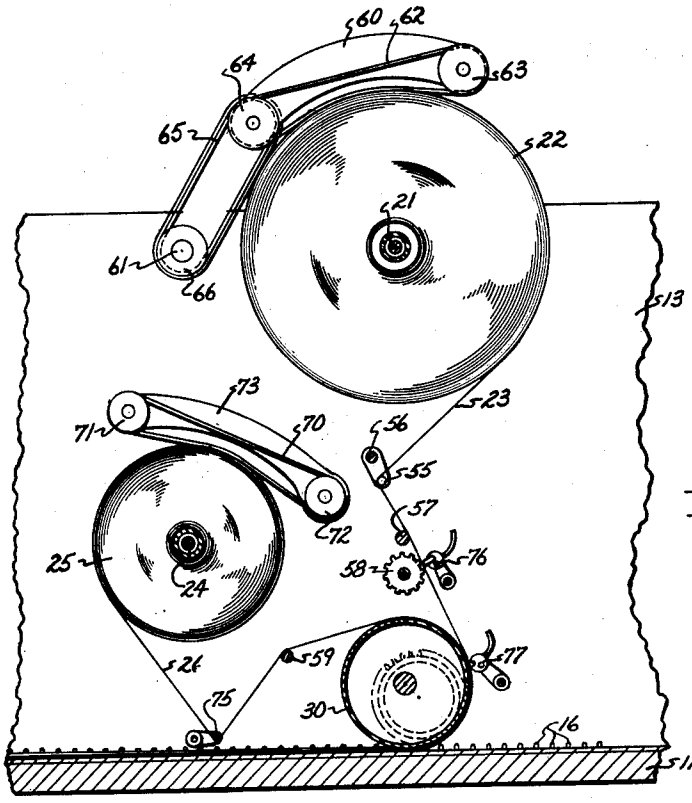


FIG. 3

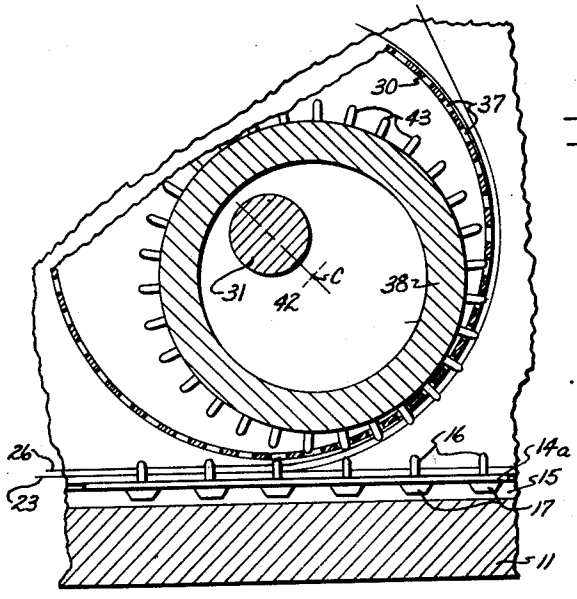


FIG. 4

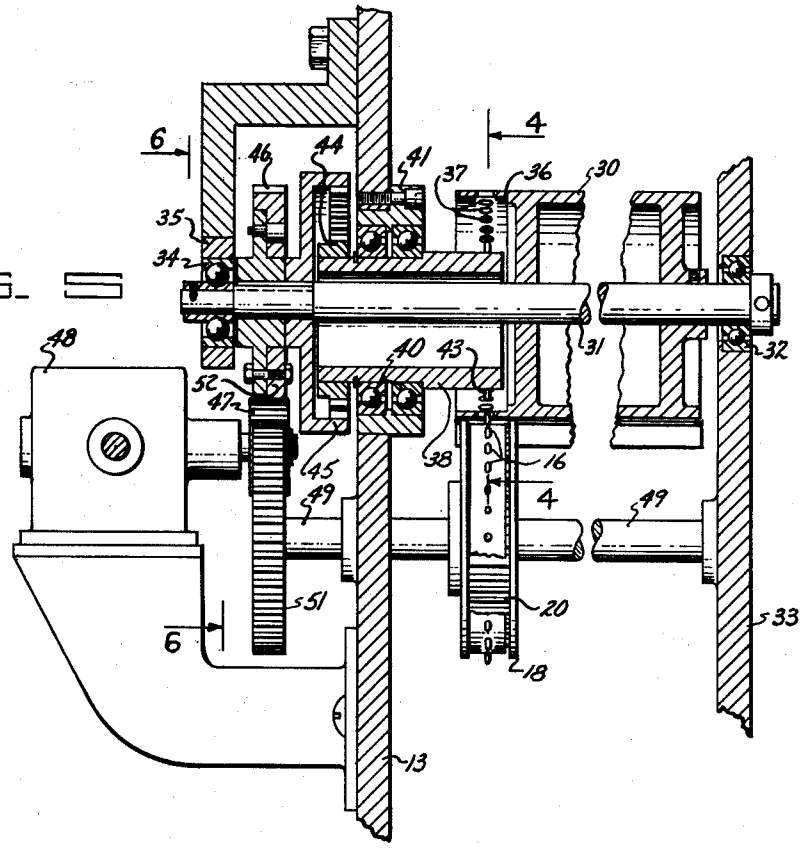
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COLLATING MACHINE

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FIG. 5



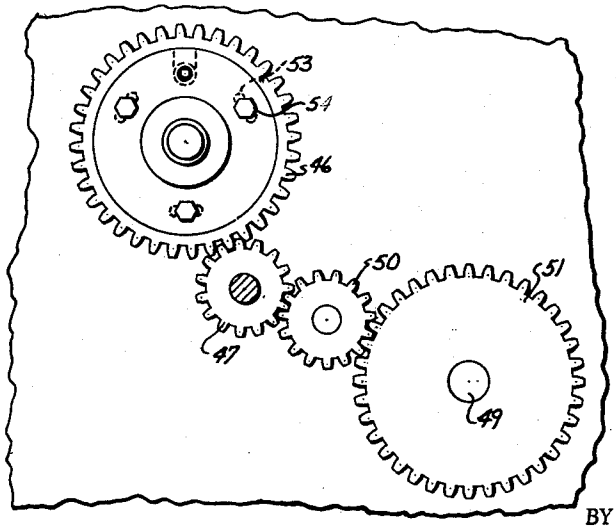


FIG. 6

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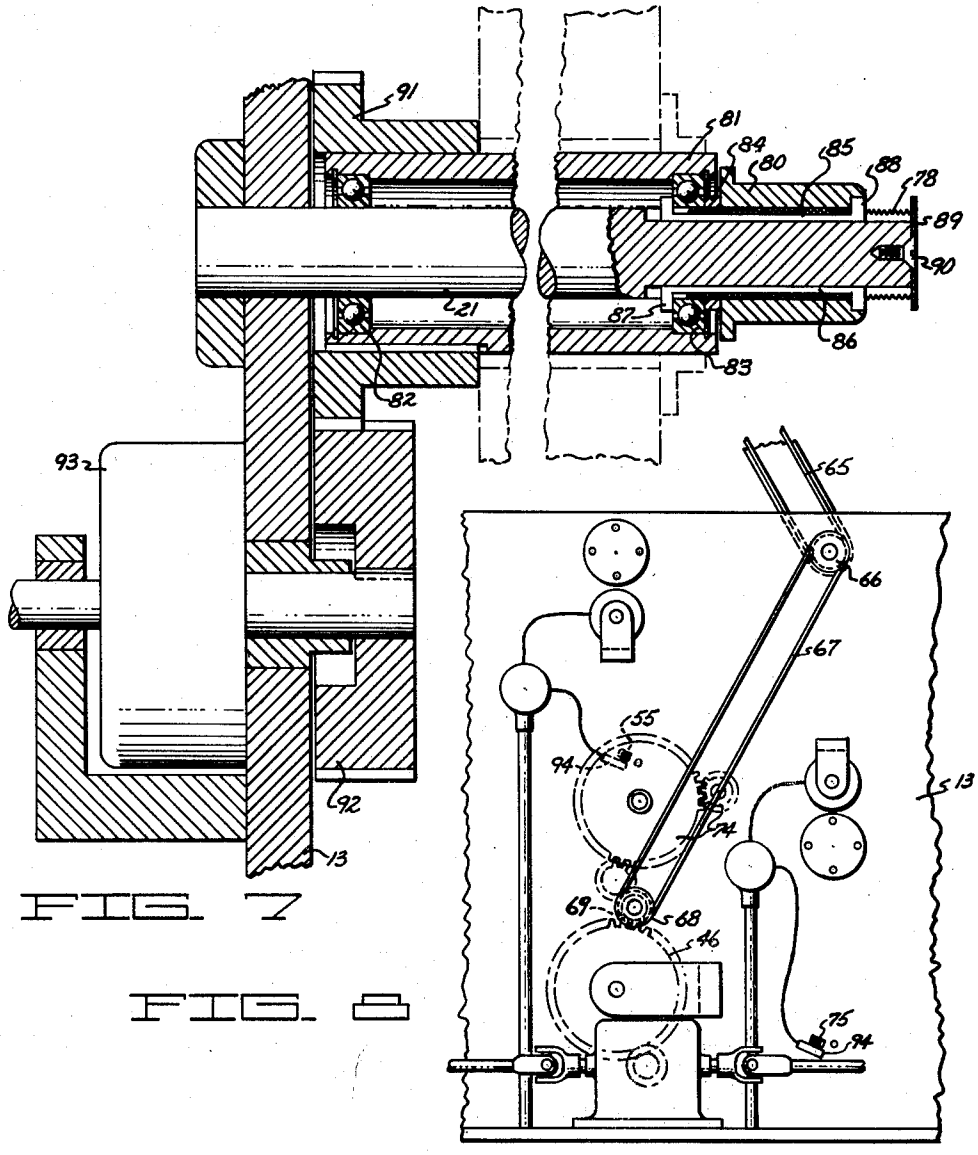


FIG. 7

FIG. 8

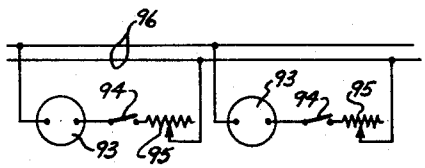


FIG. 9

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United States Patent Office 3,147,969 Patented Sept. 8, 1964

3,147,969

COLLATING MACHINE

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Filed July 17, 1962, Ser. No. 210,490
10 Claims. (Cl. 270—52)

This invention relates to collating machines and has particular reference to machines for collating continuous strips of manifold business forms or the like.

Collating machines of the above type have been constructed heretofore employing an endless band having regularly spaced pins therealong. The band is moved along a strip support table to accumulate and transport continuous perforated strips of preprinted manifold paper in superimposed relation toward a finishing station where the forms are severed and stacked or folded in fan fold manner ready for use. The pins of the pin band maintain the forms in proper registration during the collating process.

The strips are fed from separately spaced supply rolls onto the pin band where they are attached together as by applying adhesive along one edge.

Although such machines of the above type are generally satisfactory, trouble is often encountered in properly feeding the strips onto the pin band at high speeds. This may be due to a number of factors, such as lateral weaving of a strip due to irregularities in the material or possibly due to mis-alignment of the guide means for the strip material.

A principal object of the present invention is to overcome the above difficulties.

Another object is to insure accurate registration of various superimposed manifold form strips relative to each other particularly when collated at high speeds.

Another object is to materially increase the speed of collating continuous manifold strip material.

Another object is to enable proper collating of extremely thin paper strips such as carbon transfer strips in proper registration.

A still further object is to facilitate lateral adjustment of rolls of strip material during operation of a collating machine.

The manner in which the above and other objects of the invention are accomplished will be readily understood on reference to the following specification when read in conjunction with the accompanying drawings, wherein:

FIG. 1 is a front elevation view of a collating machine embodying a preferred form of the present invention.

FIG. 2 is a plan view of the machine.

FIG. 3 is an enlarged sectional view through one of the collating stations and is taken substantially along the line 3—3 of FIG. 2.

FIG. 4 is an enlarged sectional view through the strip drive unit and associated part of the table at one of the collating stations and is taken substantially along line 4—4 of FIG. 5.

FIG. 5 is a transverse sectional view through one of the strip drive units and is taken substantially along the line 5—5 of FIG. 1.

FIG. 6 is a rear view illustrating part of the drive train for the pin band and one of the strip drive units and is taken along line 6—6 of FIG. 5.

FIG. 7 is a transverse sectional view through one of the strip roll support units.

FIG. 8 is a rear view of one of the collating stations.

FIG. 9 is a schematic diagram illustrating the brake controls for the strip rolls.

Referring to FIGS. 1 and 2 in particular, the collating machine comprises, in general, an elongated table 11 having legs 12 for supporting the same at a convenient

height above a floor. A vertical wall 13 extends upwardly from the rear of the table to support the various rolls of paper and carbon strips, as will appear later. A flexible endless metal pin band or belt 14 is mounted with its upper strand 14a located in a guide slot 15 (FIG. 4), such upper strand being substantially flush with the top of the table 11.

The pin band is provided with regularly spaced outwardly projecting pins 16, the pins being attached to the pin band and to buttons 17 extending inwardly of the band. The band is supported at its opposite ends for endwise movement by sprockets 18 and 190. The sprockets have teeth 20 (FIG. 5) thereon to engage the buttons 17 and thereby form a driving connection with the band.

A plurality of collating stations 19 are provided along the length of the machine, each including a support shaft 21 for a roll 22 of paper strip 23 and a support shaft 24 for a roll 25 of carbon transfer strip 26.

In most cases, the various paper strips have regularly spaced business forms or the like pre-printed thereon and are perforated along one edge thereof as at 27 (FIG. 2) to fit over the pins of the pin band and thus insure accurate registration of the forms in the resulting manifolded assembly.

During the collating process the various paper strips and their interleaved carbon strips are suitably glued together along the edges thereof adjacent the perforations 27 as will be described presently and are carried by the pin band to a final station 28 where they are trimmed and either cut into individual form pads and stacked or are folded in a fan fold manner. This final station 28 may be of any conventional construction well known in the art and since it forms no part of the present invention it is not described in detail herein.

In accordance with the present invention, each perforated paper strip 23 is continually and positively guided onto the pin band 14 in proper registration with the pins 16 and in superposition with the other strips previously fed onto the pin band at preceding collating stations so that the collator may be operated at very high speeds without damage due to mis-registration. As seen particularly in FIGS. 3, 4 and 5, each collating station 19 includes a smooth cylindrical paper guide drum 30 located directly above the pin band. The drum is secured to a shaft 31 rotatably mounted at its forward end in a ball-bearing 32 supported by a bracket 33 extending upwardly from the front of the table. The rear end of the shaft is rotatably mounted in a bearing 34 carried by a bracket 35 suitably supported by the rear wall 13.

The drum 30 is hollowed at 36 to form a thin cylindrical flange having spaced openings 37 therein which are arranged to register with the pins 16 on the pin band directly therebelow. A hollow feed wheel or sleeve 38 surrounds the shaft 31 and is rotatably mounted in ball-bearings 40 carried by a bearing retainer 41 suitably secured to the wall 13. The sleeve is located eccentrically of the drum 30 with its center C located on a line 42 extending through the center of the shaft 31 at an angle of approximately 45 degrees to the horizon.

The sleeve 38 extends within the hollowed portion of the drum 30 and is provided with pins 43 which, at the under side of the sleeve, extend through the openings 37 of the drum and project therebeyond to form a drive for the paper strip as it passes over the drum. An external gear 44 is attached to the sleeve and meshes with an internal gear 45 keyed to the shaft 31. The latter gear is adjustably secured to a gear 46 which meshes with a drive gear 47 driven through a suitable gear transmission unit 48. As shown in FIG. 2, a similar gear unit is provided for each collator station 19. Such gear units are coupled together by shaft sections 150 and are driven

by a motor **151**. Thus, the motor **151** drives the various gears **47** through respective transmission units **48** and each gear **47**, in turn, drives the associated drum **30** through gear **46** and shaft **31**.

It will be noted that the pitch diameter of the internal gear **45** is equal to the outer diameter of the drum **30** and the pitch diameter of the external gear **44** is equal to the diameter of a circle concentric with the sleeve **38** and extending tangent to the outer periphery of the drum **30** so that the pins **43** will move at the same velocity as the drum so as to advance the strip with a minimum amount of slippage over the drum.

It will be noted that the openings **37** are larger than the pins **43** and **16**. Also, it will be noted in FIGS. 5 and 6 that the gear **47** at the leftmost collator station is entrained with the pin band sprocket **18** through gears **50** and **51** to drive the same. The gear **51** is attached to a shaft **49** carrying the sprocket **18**. The size of gear **51** is such that the velocity of the pin band will be equal to the peripheral velocity of the drum. Thus, the pins **16** and **43** will enter into and withdraw from the openings **37** without engaging the sides thereof.

The gear **46** has a flange **52** in which are formed arcuate slots **53** (FIG. 6) to receive bolts **54** threaded into the gear **46**. By loosening such bolts, the drum may be angularly adjusted relative to the rest of the machine so as to obtain proper angular relationship between the pins of the sleeve **38** and the pins of the pin band whereby the associated paper strip **23** will be properly guided over the drum and onto the pin band without possibility of moving out of registration with the latter. Also, it will be noted that the pins **43** gradually and smoothly pass through the holes **37** in the drum and through the perforations in the strip and similarly withdraw just as the pins **16** of the pin band gradually enter the same holes and perforations, thus providing complete control of the strip.

As the strip is withdrawn from the roll **22**, it passes over a dancer arm **55** which is pivotally supported at **56** and urged clockwise by gravity. From the arm **55** the strip passes over a guide roller **57**, past a star wheel **58** and onto the smooth periphery of the drum **30** before engaging the pins **43** of the sleeve **38**. Thus, the pins **43** will become effective to properly align the strip as it passes over the drum and before engagement with the pin band.

Means are provided for frictionally driving each roll **22** to reduce the load of driving such roll by the pins **43**, thereby enabling such pins to more accurately register the strips without tearing the sprocket hole perforations in the strip **23**. For this purpose, a weighted arm **60** is pivotally supported at **61** directly over each roll **22**. The arm is provided with an endless belt **62** wrapped over two pulleys **63** and **64** on the arm. The latter pulley is driven by a belt **65** from a pulley **66** (see also FIG. 8) mounted on the pivot shaft **61** of the arm. The latter pulley is driven through a third belt **67** wrapped over a drive pulley **68** connected to a gear **69** meshing with the drive gear **46** of the associated collating station. The belt **62** rests against the periphery of the roll **22** and thus is effective to frictionally drive the same.

The transfer strip roll **25** of each collator station is driven in a similar manner by an endless belt **70** carried by pulleys **71** and **72** supported on a weighted arm **73**. The pulley **72** is mounted on the pivot shaft of the arm **73** and is driven through a train of gears **74** (FIG. 8) from the associated gear **69**.

The transfer strips **26** may, if desired, be of less width than paper strips **23** and their rear edges, as indicated at **79** in FIG. 2, may terminate short of the perforations **27** in the strips **23** so that no perforations need be punched in such transfer strips.

It will be noted in FIG. 3 that each transfer strip **26**, after leaving its roll **25**, passes around a dancer arm **75** which is urged clockwise by gravity and thence over a guide bar **59** and onto the guide drum **30**. Suitable adhesive applicators **76** and **77** may be located in the path of the strip **23** to apply adhesive to the surface thereof adjacent the perforations **27** to form attached manifolded packs as is well known in the art. The star wheel **58** is driven by an associated gear of the train **74** and is effective, when the applicator **76** is used, to intermittently press the strip **23** against the applicator **76** to thus apply spots of adhesive along the length of the strip.

When it is desired to apply a continuous strip of adhesive to the strip **23**, the applicator **77** is used and the applicator **76** is rendered ineffective. Also, two or more applicators may be located side by side.

Referring to FIG. 7, which shows a typical support unit and brake control for the various paper and transfer strip rolls, the shaft **21** is suitably secured to the rear wall **13** and is screw threaded at **78** adjacent its forward end to receive a manually adjustable nut **80**. A sleeve **81** surrounds the shaft and has secured thereto adjacent opposite ends thereof the outer races of ball-bearings **82** and **83**. The inner races of these bearings are slideable axially along the shaft.

A spacer ring **84**, also slideable along the shaft, is interposed between the inner race of bearing **83** and the nut **80**. A pair of keys **85** and **86** are slideably fitted in diametrically opposed keyways formed in the shaft directly below the nut **80** and bearing **83**. Each key has outwardly extending projections **87** and **88** at the opposite ends thereof to slideably embrace the bearing **83** and the nut. Thus, the nut may be manually adjusted along the shaft, causing the sleeve to follow so as to laterally align a roll of strip material carried by the sleeve relative to the remaining strips. A retainer disc **89** is secured to the outer end of the shaft **21** by a screw **90** to prevent accidental removal of the nut **80**.

The sleeve **81** carries a gear **91** keyed thereto which meshes with a wide faced gear **92** suitably secured to the shaft of an electric brake **93**. The latter may be of any well known construction, and as shown in FIG. 9, the energizing coil of such brake is connected in circuit with a switch **94** and a rheostat **95** across a power supply circuit **96**.

The switch **94** (see also FIG. 8) is arranged to be actuated by the associated dancer arm **55** or **75** in the associated collator station. Thus, when the section of a strip **23** or **26** extending between its supply roll and the associated guide drum **30** lengthens it will allow the dancer arm to be rocked clockwise to close the associated switch **94** and thereby energize its brake **93** to retard rotation of the supply roll by its friction drive means. As such section shortens, the switch will be opened to release the brake a sufficient amount to permit the roll to again be driven.

It will be noted that the various rheostats are provided with control knobs **97** located at the front of the table adjacent the corresponding collating station to permit the machine operator to readily control the effectiveness of the brakes as he sees fit.

Although eight collating stations **19** are shown any desired number of such stations may be provided. Also, not all stations need be loaded during operation. Further, if desired, the transfer strips **26** may be omitted in those cases where the strips **23** have suitable transfer coatings applied thereto.

Although the invention has been described in detail and certain specific terms and languages have been used, it is to be understood that the present disclosure is illustrative rather than restrictive and that changes and modifications may be made without departing from the spirit or scope of the invention as set forth in the claims appended hereto.

Having thus described the invention, what is desired to be secured by United States Letters Patent is:

1. Feed mechanism for collating machines or the like comprising a feed belt for feeding a strip therealong, said belt having pins spaced therealong and engageable with spaced perforations in said strip, a hollow guide drum arranged to guide said strip onto said belt, said drum having openings therein to receive said pins, a feed wheel within said drum, said wheel being of smaller diameter than said drum, the axis of said wheel being offset from the axis of said drum, and pins on said wheel projectible through said openings and engageable with said perforations of said strip in advance of engagement of said strip by said belt.

2. Feed mechanism for collating machines or the like comprising a feed belt for feeding a strip therealong, said belt having pins spaced therealong and engageable with spaced perforations in said strip, a hollow guide drum arranged to guide said strip onto said belt at a first station, said drum having openings therein to receive said pins, a feed wheel within said drum, the axis of said wheel being offset from the axis of said drum, and pins on said wheel projectible through said openings at a second station spaced from said first station, said pins of said wheel engaging said perforations of said strip in advance of engagement of said strip by said pins of said belt.

3. Feed mechanism for collating machines or the like comprising a feed belt for feeding a strip therealong, said belt having pins spaced therealong and engageable with spaced perforations in said strip, a guide drum arranged to guide said strip onto said belt at a first station, means rotatably supporting said drum adjacent said belt, a feed wheel having a smaller diameter than said drum, means rotatably supporting said wheel for rotation about an axis extending parallel to the axis of said drum, said axis of said wheel being located intermediate said axis of said drum and the periphery of said drum, and pins on said wheel engageable with said strip as it passes over said drum at a second station spaced from said first station, said pins engaging said perforations of said strip in advance of engagement of said strip by said pins of said belt.

4. Feed mechanism for collating machines or the like comprising a feed belt for feeding a strip therealong, said belt having pins spaced therealong and engageable with spaced perforations in said strip, a hollow guide drum arranged to guide said strip onto said feed belt at a first station, means rotatably supporting said feed drum adjacent said belt, said feed drum having openings therein to receive said pins, a feed wheel, means rotatably supporting said wheel for rotation about an axis extending parallel to the axis of said drum, said axis of said wheel being located intermediate said axis of said drum and the periphery of said drum, and pins on said feed wheel projectible through said openings at a second station spaced from said first station, said pins of said wheel engaging said perforations of said strip in advance of engagement of said strip by said pins of said belt.

5. Feed mechanism for collating machines or the like comprising a feed belt for feeding a strip therealong, said feed belt having pins spaced therealong and engageable with spaced perforations in said strip, a hollow guide drum arranged to guide said strip onto said pins of said belt at a first station, said drum having openings therein to receive said pins, a feed wheel within said drum, means rotatably supporting said wheel eccentrically of said drum, pins in said wheel projectible through said openings at a second station spaced from said first station, said pins of said wheel engaging said perforations of said strip in advance of engagement of said strip by said pins of said belt, and means for separately driving said belt, said drum and said wheel in synchronism with each other.

6. Feed mechanism for collating machines or the like comprising a feed belt for feeding a strip therealong, said belt having pins spaced therealong and engageable with spaced perforations in said strip, a guide drum arranged to guide said strip onto said belt, means rotatably supporting said drum adjacent said belt, a feed wheel having a smaller diameter than said drum, means rotatably supporting said wheel for rotation about an axis extending parallel to the axis of said drum, said axis of said wheel being located intermediate said axis of said drum and the periphery of said drum, pins on said wheel engageable with said strip as it passes over said drum, said pins engaging said perforations of said strip in advance of engagement of said strip by said pins of said belt, and means for separately driving said belt, said drum and said wheel in synchronism with each other.

7. Feed mechanism for collating machines or the like comprising a feed belt for feeding superimposed strips therealong, said belt having pins spaced therealong and engageable with spaced perforations in said strips, a hollow drum arranged to guide one of said strips onto said pins of said belt and in superimposition with others of said strips on said belt at one station, said drum having openings therein to receive said pins, a feed wheel within said drum, means rotatably supporting said wheel eccentrically of said drum, pins on said wheel projectible through said openings at a second station spaced from said first station, said pins of said wheel engaging said perforations of said one strip in advance of engagement of said one strip by said pins of said belt, said openings being larger than said pins of said wheel and said belt, and means for separately driving said belt, said drum and said wheel in synchronism with each other.

8. Feed mechanism for collating machines or the like comprising a feed belt for feeding a strip therealong, said belt having pins spaced therealong engageable with spaced perforations in said strip, a rotatable drive shaft, a guide drum carried by said shaft and adapted to guide said strip onto said belt at a first station, a hollow feed wheel surrounding said shaft, means rotatably supporting said wheel eccentrically of said shaft and said drum, pins on said wheel engageable with said perforations as said strip passes over said drum and at a second station in advance of said first station, an internal gear carried by said shaft, said gear having a pitch diameter equal to the diameter of said drum, and an external gear carried by said wheel and meshing with said internal gear whereby to drive said wheel in synchronism with said drum.

9. Feed mechanism for collating machines or the like comprising a feed belt for feeding a strip therealong, said belt having pins spaced therealong engageable with spaced perforations in said strip, a rotatable drive shaft, a hollow guide drum carried by said shaft and adapted to guide said strip onto said belt at a first station, said drum having openings therein to receive said pins, a hollow feed wheel surrounding said shaft, means rotatably supporting said wheel eccentrically of said shaft and said drum, pins on said wheel engageable with said perforations as said strip passes over said drum and at a second station in advance of said first station, said pins on said wheel projecting through said openings in said drum at said second station, an internal gear carried by said shaft, said gear having a pitch diameter equal to the diameter of said drum, and an external gear carried by said wheel and meshing with said internal gear whereby to drive said wheel in synchronism with said drum.

10. Feed mechanism for collating machines or the like comprising a feed belt for feeding a strip therealong, said belt having pins spaced therealong engageable with spaced perforations in said strip, a rotatable drive shaft, a hollow guide drum carried by said shaft and adapted to guide said strip onto said belt at a first station, said drum having openings therein to receive said pins, a hollow feed wheel surrounding said shaft, means rotatably supporting said wheel eccentrically of said shaft and said drum, pins on said wheel engageable with said perfora-

tions as said strip passes over said drum and at a second station in advance of said first station, said openings being larger than said pins, an internal gear carried by said shaft, said gear having a pitch diameter equal to the diameter of said drum, an external gear carried by said wheel and meshing with said internal gear, and means for separately driving said belt and said shaft whereby to separately drive said belt, said drum and said wheel in synchronism with each other.

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