

Feb. 2, 1954

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2,667,924

SHUTTLE MECHANISM FOR FEEDING WEBS TO PUNCH PRESSES

Filed Aug. 22, 1950

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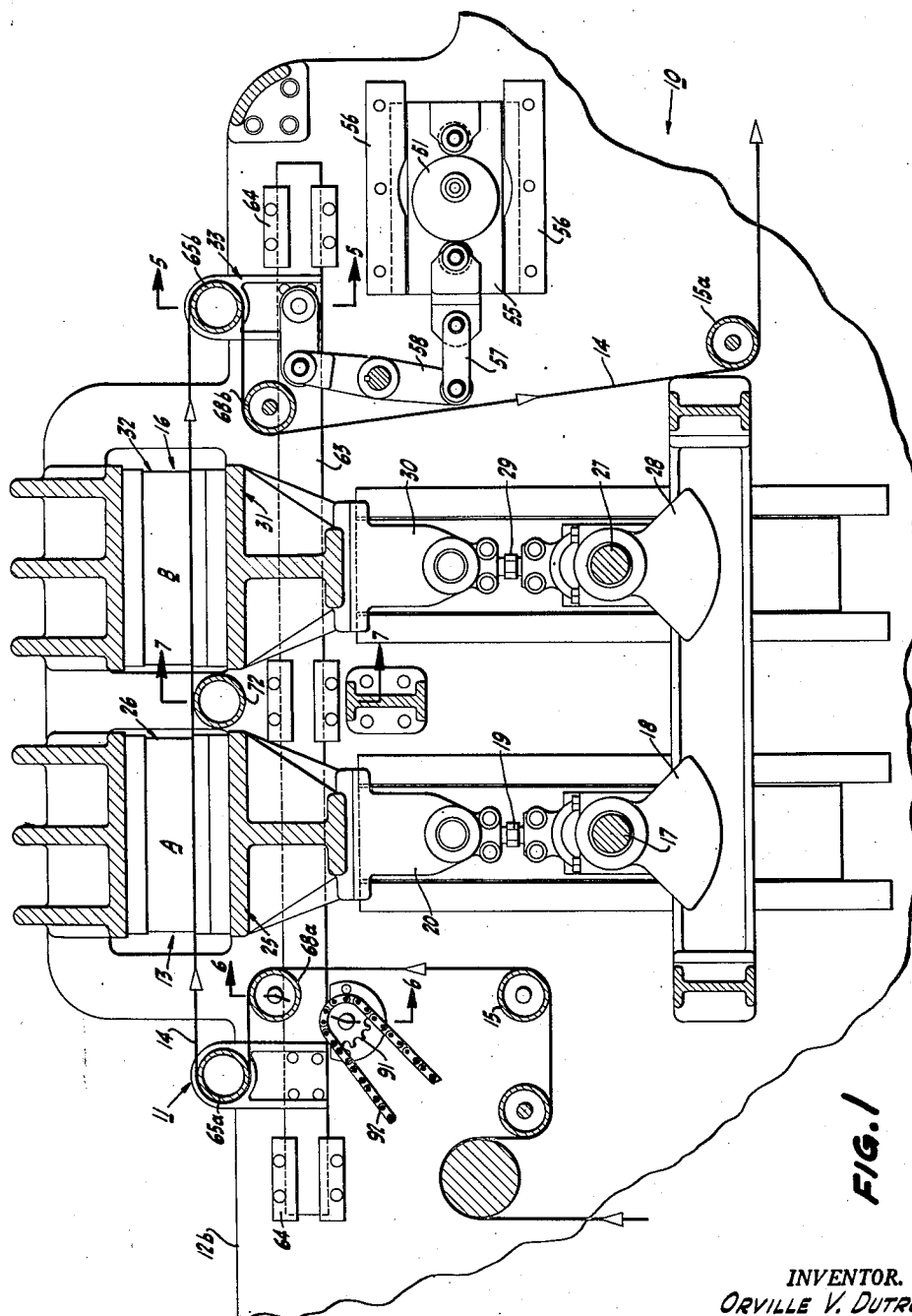


FIG. 1

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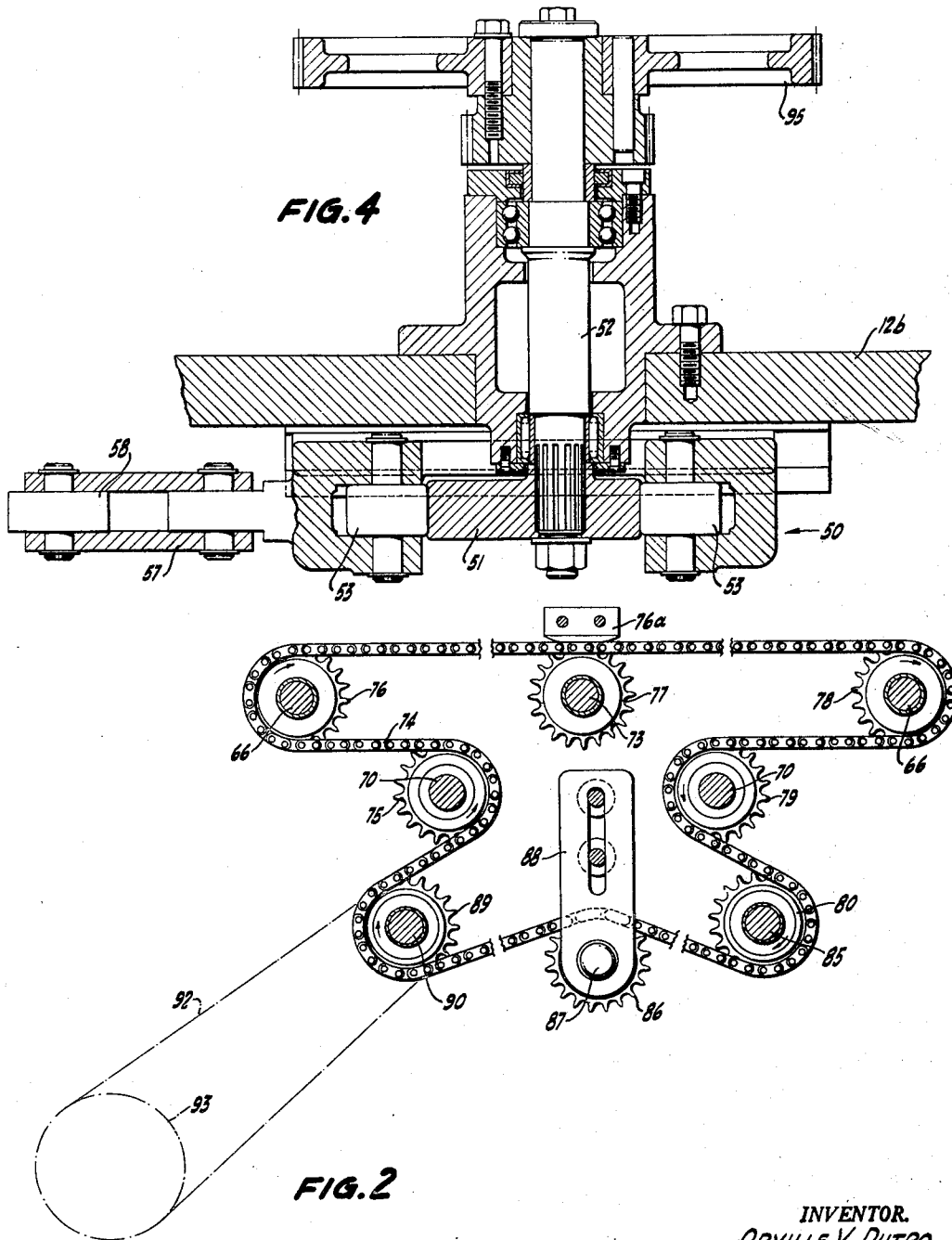
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4 Sheets-Sheet 2



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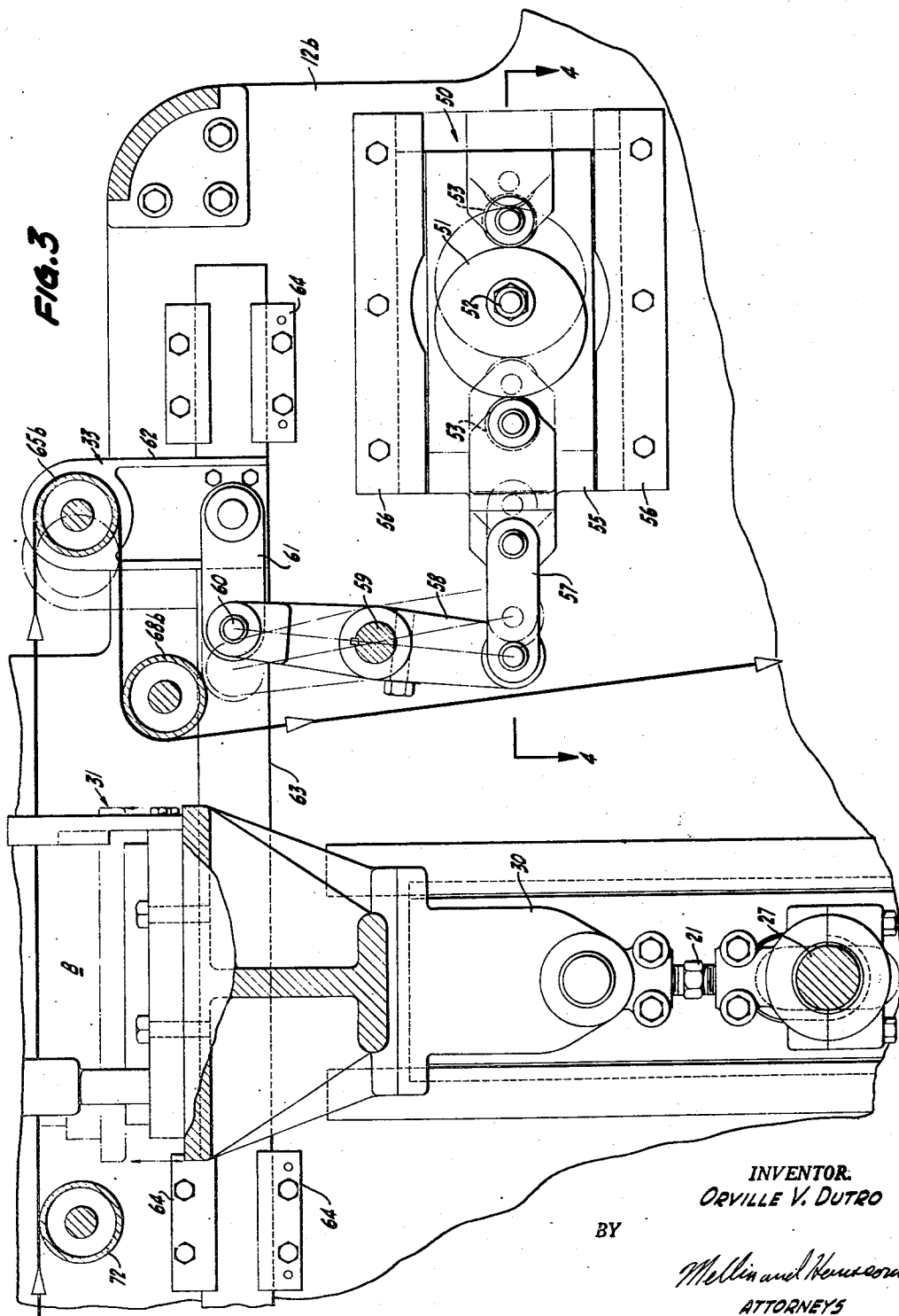
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FIG. 5

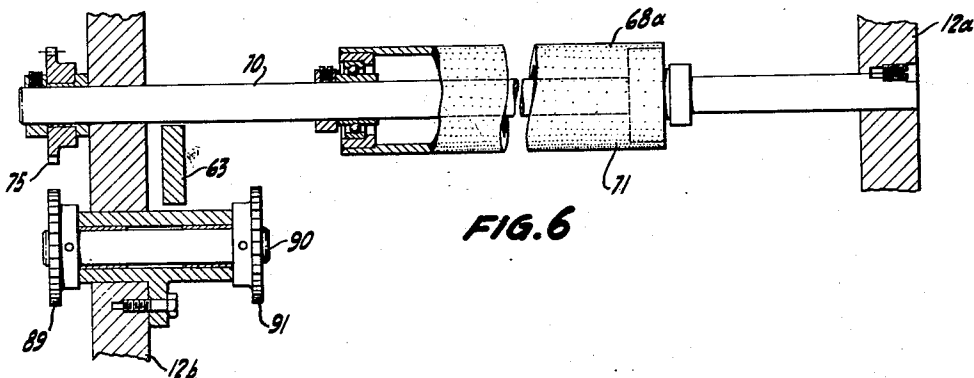
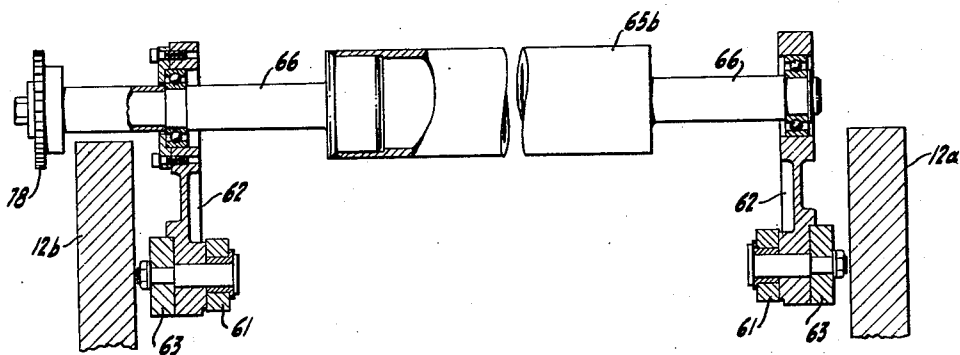


FIG. 6

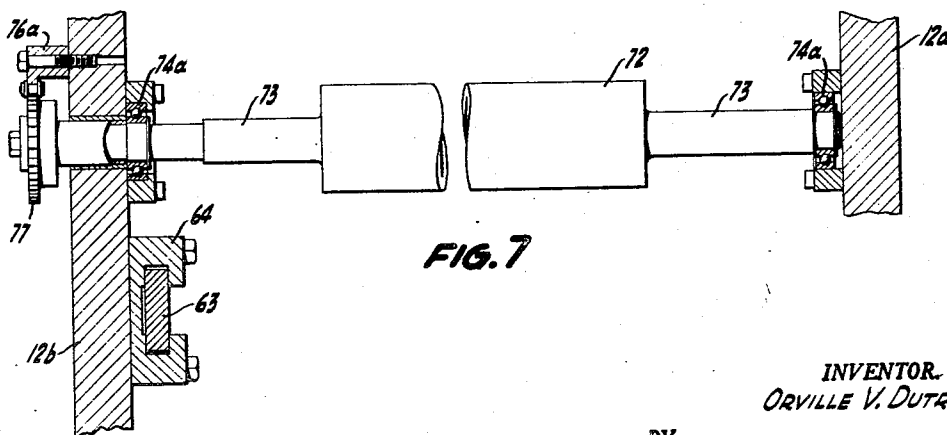


FIG. 7

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2,667,924

SHUTTLE MECHANISM FOR FEEDING WEB
TO PUNCH PRESSESOrville V. Dutro, La Canada, Calif., assignor to
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Application August 22, 1950, Serial No. 180,831

6 Claims. (Cl. 164—87)

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This invention relates to a shuttle mechanism. More particularly it relates to a shuttle mechanism which is operable to hold a web stationary at a punching station in a punch press during the punching operation notwithstanding the fact that the web is being continuously fed to the press and is being continuously taken from the press.

In my copending application entitled Press, Serial No. 180,832, filed August 22, 1950, there is described a machine capable of receiving a continuously moving web having record cards such as the well-known "Keysort" cards printed thereon; of printing serial numbers on the cards at a numbering station; of punching the web at a piercing or perforating station to produce marginal perforations in each card; of punching the web again at a notching station to produce marginal notches in the cards to thereby code the cards with the same serial numbers; and of slitting and trimming the web at a shearing station to sever from the web individual cards of precise dimensions.

The present invention is directed to the shuttle mechanism of the aforesaid machine which is employed to hold the web stationary at the punching stations during each punching operation notwithstanding an overall continuous travel of the web through the machine, and this invention has for one of its objects the provision of a machine capable of the operation just described in a machine operating at high speed.

It is a further object of the invention to provide a shuttle mechanism of the character described having the above-mentioned utility and also a broader and more general utility, which stops a continuously moving web at a local point and at predetermined periodic moments and which prevents undue tension and slack from developing in the web.

These and other objects of the invention will be apparent from the ensuing description and the appended claims.

One form which the invention may assume is exemplified in the following description and illustrated by way of example in the accompanying drawings in which:

Figure 1 is a fragmentary vertical midsection of a machine such as described in the above-mentioned copending application showing the two punching assemblies and also the shuttle mechanism of the present invention.

Figure 2 is a view of the chain and sprocket

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drive for the shuttle as seen looking out from the side plate on the gear side of the machine.

Figure 3 is a partial view, on a larger scale, of the shuttle showing the cam drive therefor.

Figure 4 is a section taken along the line 4—4 of Figure 3.

Figures 5, 6 and 7 are views taken along the lines 5—5, 6—6 and 7—7, respectively, of Figure 1 showing certain of the shuttle rollers.

Referring to the drawings and more particularly to Figure 1, the machine as a whole is designated as 10 and the shuttle as 11. The machine is provided with a frame including side plates 12a and 12b, the side plate 12b shown in Figure 1 being on what is designated as the "gear side" of the machine outwardly of which are located the gears which drive and time the various parts of the machine. The opposite side plate 12a, shown fragmentarily in Figures 5, 6 and 7, is on the "works side" of the machine.

Still referring to Figure 1, a piercing or perforating station A and a notching station B are shown. At the piercing station A is located a piercing or perforating assembly 13 for punching marginal perforations in the cards of a web 14 which is fed continuously thereto over a guide roller 15. At the notching station B is located a notching assembly 16 for punching notches in the same web. A guide roller 15a is shown which guides the web from the notching station.

The piercing assembly 13 may be of conventional construction and it comprises a crankshaft 17 journaled in the side plates 12a and 12b, counterweights 18 fixed thereto, adjustable connecting rods 19, rams 20 and a vertically reciprocable female die assembly 25 which cooperates with a stationary male die assembly 26. The notching assembly 16 may be of any suitable construction but is preferably constructed in the manner described and claimed in my copending application entitled Punch Press For Notching, Serial No. 180,833, filed August 22, 1950. This notching assembly similarly comprises a crankshaft 27 journaled in the side plates 12a and 12b, counterweights 28, adjustable connecting rods 29, rams 30 and a vertically reciprocable female die assembly 31 cooperable with a stationary male die assembly 32.

As explained in the above-mentioned copending applications, it is important that the marginal perforations and notches in the cards be located with precision; otherwise sorting and

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classifying of the cards will be hindered or will be impossible. The web 14 is fed to the stations A and B very rapidly and it is impracticable to stop the whole web during the punching operations. A shuttle mechanism generally designated as 33 is provided for momentarily stopping the web at the stations A and B without interrupting the overall travel of the web through the machine. The shuttle mechanism 33 will now be described in detail.

Referring now to Figures 1 and 3, a shuttle drive mechanism 50 is provided comprising a shuttle drive cam 51 fixed to a shaft 52 journaled in the side plate 12b. The cam 51 actuates follower rollers 53 which are fixed to a slide plate 55 which is slidable in guides 56 bolted to the frame of the machine. One end of the slide plate 55 is pivotally connected to a link 57 the other end of which is pivotally connected to a lever 58 which is keyed to a shaft 59 journaled in the frame of the machine. The other end of the lever 58 is pivotally connected at 60 to one end of a link 61 the other end of which is pivotally connected to an upright post 62 which is fixed to a longitudinal horizontal slide bar 63 which is slidably supported by guides 64 bolted to the frame of the machine. There is, of course, a duplication of the slide bar 63, guides 64 and posts 62 on opposite sides of the machine and also at the opposite end of the shuttle. A driven shuttle roller 55b (see Figure 5) is fixed to trunnions 66 which are journaled in the posts 62. The corresponding shuttle roller 65a at the other end of the machine is exactly similar in structure and mounting to the driven shuttle roller 55b just described. As shown in Figures 1 and 6, stationary shuttle guide rollers 68a and 68b are provided each of which is rotatably mounted on a shaft 70 which is non-rotatably mounted in the side plates of the machine and these rollers are provided with frictional facings 71 such as rubber. A center guide roller 72 is provided which, as shown in Figure 7, is fixed to trunnions 73 which are carried in bearings 74a fixed to the side plates of the machine.

The shuttle drive cam 51 is so designed, and is driven by means hereinafter described at such a rate in relation to the speed of the web through the press, that at the instant of perforating and notching, the web is fed rearwardly by the shuttle mechanism at the same rate that it is fed forwardly toward the stations A and B. Therefore at this critical instant the web is held stationary at the perforating and notching stations and accurate perforating and notching are accomplished. The web is then fed forwardly by the shuttle mechanism at an accelerated rate to "catch up" with its normal rate of forward travel through the machine.

During oscillation of web at the perforating and notching stations means must be provided to prevent development of abnormal tension or slack in the web. Thus, referring to Figure 1, as the shuttle mechanism 33 moves to the left the center-to-center distance between the shuttle rollers 68a and 65a increases while the center-to-center distance between the shuttle rollers 68b and 65b decreases. The opposite conditions exist on return movement of the shuttle.

To provide against the possibility of abnormal tension or slack in the web and to co-operate with the shuttle drive cam 51, a chain and sprocket drive is provided for the shuttle rollers as illustrated in Figure 2.

Referring now to Figure 2, an endless chain 74

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is provided which is led over a sprocket 75 which is rotatable on the shaft or trunnion 70 of guide roller 68a, a sprocket 76 fixed to the shaft 66 of the left-hand shuttle roller 65a, thence under a guide 76a and over a sprocket 77 fixed to the shaft 73 of shuttle guide roller 72. The chain then passes over a sprocket 78 fixed to the shaft 66 of the right-hand shuttle roller 65b and a sprocket 79 which is rotatable on the shaft 70 of the right-hand shuttle guide roller 68b. The chain is also led over a sprocket 80 fixed to a shaft 85 journaled in the frame of the machine, a take-up sprocket 86 fixed to a shaft 87 journaled in an adjustable bracket 88, and, finally, over a drive sprocket 89 fixed to a shaft 90 journaled in the frame of the machine.

In Figure 2 this roller drive compensating mechanism is viewed as it would be seen looking out from the side plate 12b on the gear side of the machine. On the inside of the side plate 12b and fixed to the shaft 90 is a drive sprocket 91 (see Figure 6) which is driven by a chain 92 and a sprocket 93 fixed to a shaft 94. The shaft 94 may carry an impression roller (not shown) employed in printing numbers on the web, as described in my copending application entitled Press, Serial No. 180,832, filed August 22, 1950, wherein the corresponding shaft is shown in Fig. 39 and given the reference numeral 494, and wherein the corresponding sprocket is shown and given the reference numeral 493. The sprockets 75, 76, 77, 78, 79, 80, 86, 89 and 91 are identical with one another and the ratio between the sprocket 91 and the sprocket 93 is such that the chain 74 is driven at the linear speed of the web. It will be apparent, of course, that any suitable means may be employed for driving the sprocket 91 provided such means moves at a constant rate in relation to the linear speed of the web and drives the chain 74 at the linear speed of the web.

It will be apparent that when the shuttle mechanism 33 shifts from right to left, the sprockets 76, 77 and 79 will be rotated in a clockwise direction by travel of the chain at a peripheral speed equal to the speed of the web to the press. However, these sprockets also roll on the chain 74 at a linear speed which is determined by the speed and design of the shuttle drive cam 51. This imparts to the sprockets 76, 77 and 88, hence also to the shuttle rollers 65a, 71 and 65b, a counter-clockwise rotation opposing the clockwise component. At the critical instant of punching, these components are equal, hence the rollers 65a, 71 and 65b are motionless. Hence the web is absolutely motionless at the perforating and notching stations. On return of the shuttle, these components are in the same direction and will therefor add. Consequently, the rollers 65a, 71 and 65b are accelerated to feed the web forwardly at an accelerated rate.

Referring now to Figure 4, it will be seen that a gear 95 is fixed to the outer end of the cam drive shaft 52. The gear 95 is driven in timed relation to travel of the web by any suitable means; for example, by means of the gear train described in my above-mentioned copending application entitled Press, Serial No. 108,832.

It will thus be apparent that a shuttle mechanism is provided which is capable of shifting a web in opposition to its normal travel and of decelerating the rollers which guide the web, so as to hold the web stationary for a brief interval of time during a critical punching operation, so as to obtain accurate punching of the web. It will also be apparent that the shuttle mechanism

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is capable of maintaining at all times a suitable degree of tension on the web, not allowing undue tension or slack to develop therein.

While I have shown the preferred form of my invention, it is to be understood that various changes may be made therein by those skilled in the art without departing from the spirit of the invention as defined in the appended claims.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. A machine of the class described, comprising punching means for automatically punching a web at a punching station in timed relation to travel of the web, a pair of shuttle rollers mounted on opposite sides of the punching station with their axes parallel, for rotation about said axes and for oscillation along the line of travel of the web, a pair of bodily stationary rollers rotatable about parallel axes contained in a plane parallel to the plane containing the axes of the shuttle rollers and having a center-to-center distance less than that of the shuttle rollers and adapted to feed the web to and receive the web from the shuttle rollers, means for oscillating the shuttle rollers in timed relation to travel of the web for periodically causing the web to remain stationary at the punching station, a sprocket rotatable coaxially with each of the bodily stationary rollers, a continuous chain meshing with the sprockets, and means for driving the chain at the linear speed of the web.

2. A machine of the class described, comprising punching means for automatically punching a web at a punching station in timed relation to travel of the web, a pair of shuttle rollers mounted on opposite sides of the punching station with their axes parallel, for rotation about said axes and for oscillation along the line of travel of the web, a pair of bodily stationary rollers rotatable about parallel axes contained in a plane parallel to the plane containing the axes of the shuttle rollers and having a center-to-center distance less than that of the shuttle rollers and adapted to feed the web to and receive the web from the shuttle rollers, means for continuously feeding a web to the leading bodily stationary roller, means for oscillating the shuttle rollers in timed relation to travel of the web for periodically causing the web to remain stationary at the punching station, a sprocket fixed coaxially to each shuttle roller and a sprocket rotatable coaxially with each of the bodily stationary rollers, a continuous chain meshing with the sprockets, and means driving the chain at the linear speed of the web.

3. A machine of the class described, comprising punching means for automatically punching a web at a punching station in timed relation to travel of the web, a pair of shuttle rollers mounted on opposite sides of the punching station with their axes parallel, for rotation about said axes and for oscillation along the line of travel of the web, a pair of bodily stationary rollers rotatable about parallel axes contained in a plane parallel to the plane containing the axes of the shuttle rollers and having a center-to-center distance less than that of the shuttle rollers and adapted to feed the web to and receive the web from the shuttle rollers, means for oscillating the shuttle rollers in timed relation to travel of the web for periodically causing the web to remain stationary at the punching station, a sprocket fixed coaxially to each shuttle roller and a sprocket rotatable coaxially with each bodily stationary roller, a third pair of sprockets mounted for rotation about parallel axes, spaced apart a distance great-

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er than the center-to-center distance of the bodily stationary sprockets, a continuous chain trained over the outwardly facing portions of the first pair of sprockets, over the inwardly facing portions of the second pair of sprockets and over the outwardly facing portions of the third pair of sprockets, and means for driving the chain at the linear speed of the web.

4. A machine of the class described, comprising punching means for automatically punching a web at a punching station in timed relation to travel of the web, a pair of shuttle rollers mounted on opposite sides of the punching station with their axes parallel, for rotation about said axes and for oscillation along the line of travel of the web, a pair of bodily stationary rollers rotatable about parallel axes contained in a plane parallel to the plane containing the axes of the shuttle rollers and having a center-to-center distance less than that of the shuttle rollers and adapted to feed the web to and receive the web from the shuttle rollers, means for continuously feeding a web to the leading bodily stationary roller, means for oscillating the shuttle rollers in timed relation to travel of the web for periodically causing the web to remain stationary at the punching station, a sprocket fixed coaxially to each shuttle roller and a sprocket rotatable coaxially with each of the bodily stationary rollers, a third pair of sprockets mounted for rotation about parallel axes spaced apart a distance greater than the center-to-center distance of the bodily stationary rollers, a continuous chain trained over the outwardly facing portions of the first pair of sprockets, over the inwardly facing portions of the second pair of sprockets, and over the outwardly facing portions of the third pair of sprockets, and means for driving the chain at the linear speed of the web.

5. A machine of the class described, comprising punching means for automatically punching a web at a punching station in timed relation to travel of the web, a pair of shuttle rollers mounted on opposite sides of the punching station with their axes parallel, for rotation about said axes and for oscillation along the line of travel of the web, a pair of bodily stationary rollers rotatable about parallel axes contained in a plane parallel to the plane containing the axes of the shuttle rollers and having a center-to-center distance less than that of the shuttle rollers and adapted to feed the web to and receive the web from the shuttle rollers, said bodily stationary rollers being disposed, considered in a direction transverse to the plane of their axes, generally between the shuttle rollers, means for oscillating the shuttle rollers in timed relation to travel of the web for periodically causing the web to remain stationary at the punching station, a sprocket fixed coaxially to each shuttle roller and a sprocket rotatable coaxially with each of the bodily stationary rollers, a continuous chain meshing with the sprockets, and means for driving the chain at the linear speed of the web.

6. A machine of the class described, comprising punching means for automatically punching a web at a punching station in timed relation to travel of the web, a pair of shuttle rollers mounted on opposite sides of the punching station with their axes parallel, for rotation about said axes and for oscillation along the line of travel of the web, a pair of bodily stationary rollers rotatable about parallel axes contained in a plane parallel to the plane containing the axes of the shuttle rollers and having a center-to-center distance less than that of the shuttle

rollers and adapted to feed the web to and receive the web from the shuttle rollers, said bodily stationary rollers being disposed, considered in a direction transverse to the plane of their axes, generally between the shuttle rollers, means for oscillating the shuttle rollers in timed relation to travel of the web for periodically causing the web to remain stationary at the punching station, means for continuously feeding a web to the leading bodily stationary roller, a sprocket fixed coaxially to each shuttle roller and a sprocket rotatable coaxially with each of the bodily stationary rollers, a third pair of sprockets mounted for rotation about parallel axes, spaced apart a distance greater than the center-to-center distance of the bodily stationary sprockets, a continuous chain trained over the outwardly facing portions of the first named pair of sprockets, over the in-

wardly facing portions of the second named pair of sprockets, and over the outwardly facing portions of the third named pair of sprockets, and means for driving the web.

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