

July 23, 1940.

R. B. DOTY ET AL

2,208,964

INTERMITTENT FEEDER

Filed July 1, 1936

3 Sheets-Sheet 1

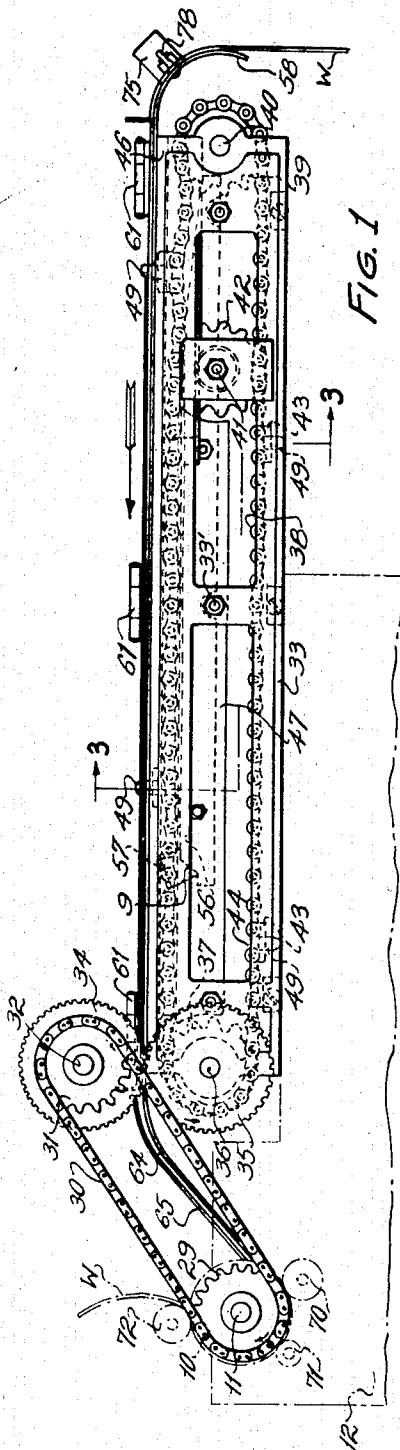


FIG. 1

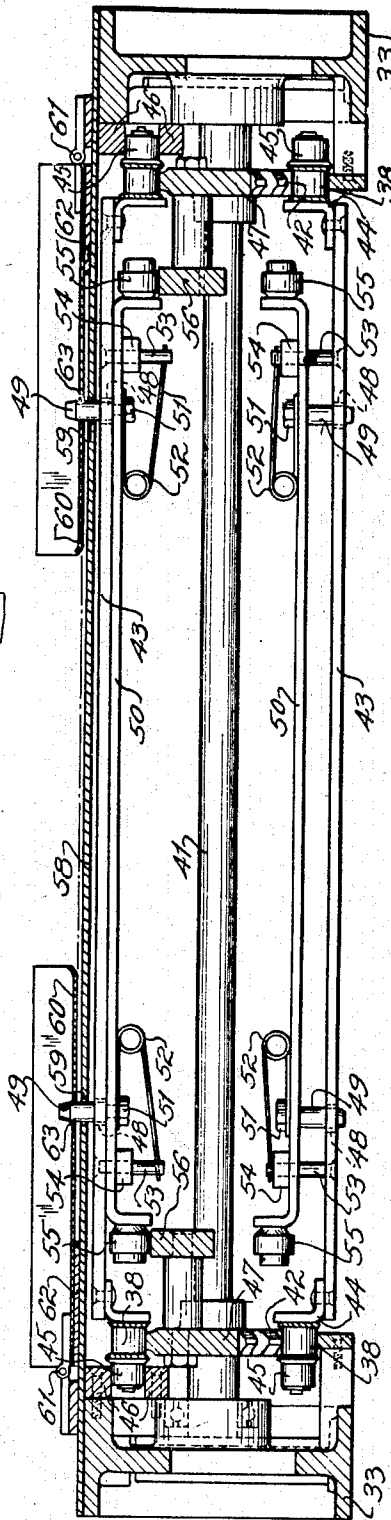


FIG. 3

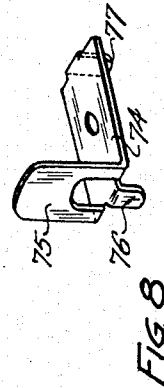


FIG. 8

INVENTORS  
RAYMOND B. DOTY  
BY FRED A. ROSS  
Havis, Hudson & Kent  
ATTORNEYS

July 23, 1940.

R. B. DOTY ET AL

2,208,964

INTERMITTENT FEEDER

Filed July 1, 1936

3 Sheets-Sheet 2

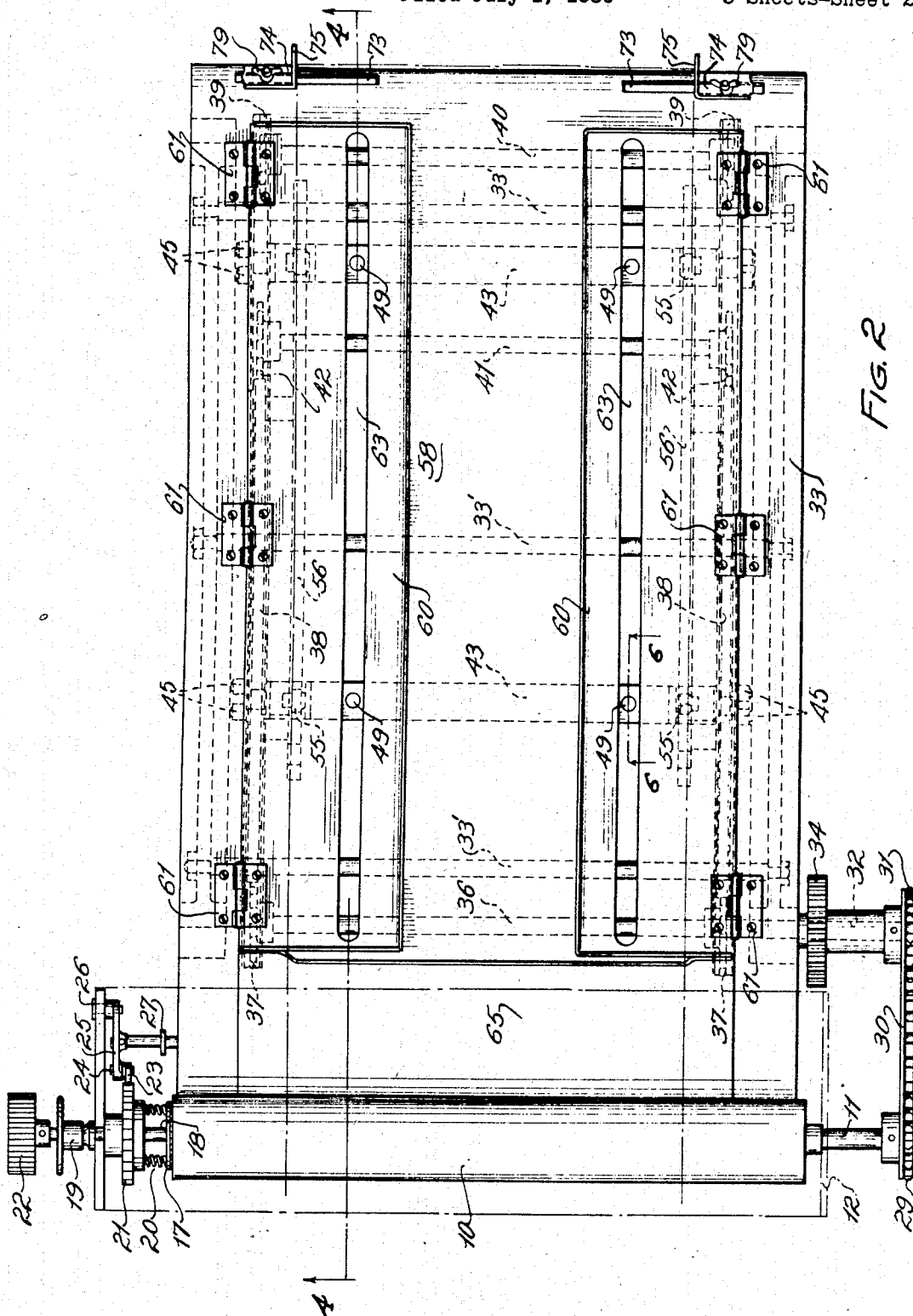


FIG. 2

INVENTORS  
 RAYMOND B. DOTY  
 BY FRED A. ROSS  
*Flavis, Hudson & Kent*  
 ATTORNEYS

July 23, 1940.

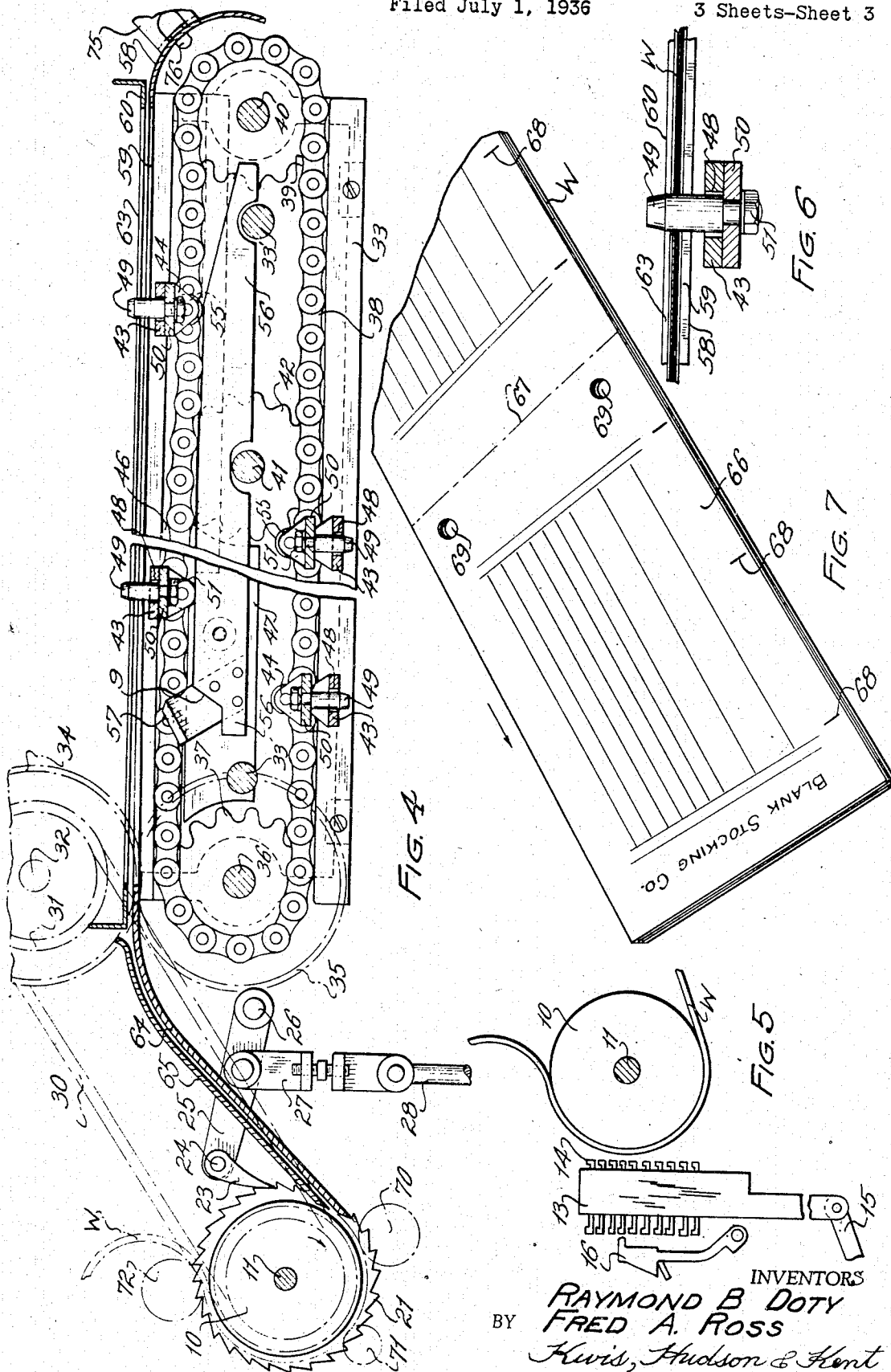
R. B. DOTY ET AL

2,208,964

INTERMITTENT FEEDER

Filed July 1, 1936

3 Sheets-Sheet 3



INVENTORS  
RAYMOND B DOTY  
FRED A. ROSS  
BY  
Kewis, Hudson & Kent  
ATTORNEYS

## UNITED STATES PATENT OFFICE

2,208,964

## INTERMITTENT FEEDER

Raymond B. Doty, Cleveland, and Fred A. Ross,  
Lakewood, Ohio, assignors to Bonnar-Vawter  
Fanform Company, Inc., Cleveland, Ohio, a  
corporation of Delaware

Application July 1, 1936, Serial No. 88,462

12 Claims. (Cl. 197—133)

This invention relates to improvements in intermittent feeders, that is to say feeders for moving webs intermittently into a printing machine or the like. The invention has utility in connection with computing machines wherein several columns of figures are written one line at a time, particularly machines which are automatically operated in connection with previously prepared control cards. In machines of this character the web may be caused to move around a portion of the periphery of an impression cylinder or platen roller. When such a machine is employed for billing and similar purposes it is necessary to use a multi-ply web, that is one in which there are several paper strips with carbon paper interposed between successive strips in order that a number of copies may be made. Such a multi-ply web in traveling over the impression cylinder tends to be drawn out of register, because the inner thickness of paper is moving around a circle of lesser diameter than the outer thickness. The present invention is directed primarily to the maintenance of such a multi-ply web in condition to make the printing on all copies fall on substantially corresponding positions on the various plies.

One of the objects of the invention therefore is the provision of intermittent feeding means for multi-ply webs which shall eliminate wrinkling of the webs and shall eliminate any substantial relative longitudinal movement between the plies of the web, and shall prevent such relative movement as may occur from being transmitted from one unit of the web to the next succeeding unit.

Another object is the provision of separate means spaced from the impression cylinder for feeding the web through the printing zone in juxtaposition with that cylinder.

Another object is the provision of means for pushing the web through the printing zone, together with means for eliminating any looseness or wrinkles in the web between the pushing means and the printing zone.

A further object is the provision of feeding means for multi-ply webs which requires the provision of no more than two perforations in any one unit of the web, thereby improving the appearance of the units over those in which there are longitudinal lines of perforations along the edges of the web.

Other objects and features of novelty will appear as we proceed with the description of that embodiment of the invention which, for the purposes of the present application, we have illus-

trated in the accompanying drawings, in which Fig. 1 is a side elevational view of a feeder embodying the invention, shown in operative relation with the impression cylinder of a computing machine.

Fig. 2 is a plan view of the same.

Fig. 3 is a transverse sectional view on a larger scale, the section being taken substantially on the line 3—3 of Fig. 1.

Fig. 4 is a longitudinal sectional view on a larger scale, with parts broken away, the section being taken substantially on the line 4—4 of Fig. 2.

Fig. 5 is a diagrammatic view of a fragment of a computing machine with which the feeder may be employed.

Fig. 6 is a fragmental detail sectional view taken substantially on the line 6—6 of Fig. 2.

Fig. 7 is a fragment of a multi-ply web of a type which may be fed by the machine of the present invention, and

Fig. 8 is a perspective view of an adjustable guide which may be employed.

In the drawings we have indicated at 10 an impression cylinder or platen of a printing or typing machine. This cylinder or roller is preferably rubber covered. It is fixed upon a shaft 11 which has suitable bearings in the frame of the printing machine, the latter being indicated at 12 by dotted lines in Figs. 1 and 2. While the invention is probably susceptible of more or less wide application, it is particularly adapted for the feeding of multi-ply webs to computing machines which are automatic or semi-automatic in operation, wherein a complete transverse line is printed upon the web in a single actuation of the machine.

As indicated in Fig. 5, such a computing machine may comprise a series of type bars 13 arranged in alignment transversely of the machine, each bar carrying a series of type 14 and being connected with a vertically movable arm 15, the movement of which to various heights brings different types 14 into printing position. When the types for a given line of printing are set, so far as their vertical positions are concerned, a series of hammers 16 arranged behind the type bars 13 are moved toward the impression cylinder 10, causing the types of print upon the web W which is interposed between the cylinder and the type bars. After each such impression the cylinder 10 is advanced through a small angle in the direction of the arrow in Figs. 1 and 4. This movement of the cylinder may be effectively accomplished by a pawl and ratchet

mechanism, the operation of which is synchronized with the operation of the hammers 16. Since the driving mechanism per se for the pawl and ratchet and for the hammers forms no part of the present invention, and is known in the art, it will not be described herein.

In one end of the cylinder 10 there is a slightly tapered clutch surface, serrated or otherwise roughened, with which a correspondingly tapered clutch plate 17 is adapted to cooperate. The clutch plate 17 is carried by a short tubular shaft 18 surrounding shaft 11. Attached to the tubular shaft 18 outside of the frame there is a collar 19 which may be grasped by the operator and pulled out to disconnect the clutch plate 17 from the clutch surface of the cylinder, coil springs 20 being thereby compressed. When the collar 19 is released the springs 20 return the clutch elements to engaging position. A ratchet wheel 21 is slidably keyed to the tubular shaft 18. When it becomes desirable to make a small angular adjustment between the ratchet wheel 21 and the cylinder 10, the collar 19 is moved to disengage the clutch elements after which a knurled wheel 22 on the end of shaft 11 is turned through the desired angle, thereby turning the cylinder 10 through the same angle, after which the collar 19 is released and the clutch surfaces engaged.

Cooperating with the teeth on the ratchet wheel 21 is a pawl 23 pivoted at 24 to a lever 25 which swings upon a pivot 26 mounted in the frame. The lever 25, intermediate its ends, has pivotally connected thereto an adjustable link 27 to which is connected a reciprocating rod 28 by means of which lever 25 is rocked. By any suitable means, not shown, the rod 28 is operated in timed relation with the hammers 16, previously described. The swing of the lever 25 may be regulated by suitable means, as for example by an adjustable connection with link 27 to cause the pawl 23 to engage every ratchet tooth, or to skip one tooth or two teeth, as may be desired. By this means single, double or treble spacing may be effected in a manner which will presently appear.

The parts thus far described are regular equipment upon a computing machine which is now in extensive commercial use, except that we substitute a special ratchet wheel with fewer teeth than the one furnished with the machine. By this means the impression cylinder is given a complete revolution for a smaller number of reciprocations of the rod 28, and consequently each reciprocation advances the cylinder somewhat further than it would be advanced were the regular ratchet wheel employed.

The shaft 11, at the end opposite the ratchet wheel 21, carries a sprocket wheel 29 over which runs a chain 30 that extends also over a sprocket wheel 31 on a short shaft 32 that is mounted in the frame 33 of the feeder. The sprocket wheels 29 and 31 are of the same size. Shaft 32 also carries a spur gear 34 which meshes with another spur gear 35 that is keyed to a shaft 36 which is rotatably mounted in the frame 33 and extends entirely across the same. The gear 35 has a greater number of teeth than the gear 34, so that the rate of rotation of the shaft 36 is somewhat slower than that of shaft 32. The side bars of frame 33 may be connected together by tie rods 33'.

Within the frame 33, at short distances from the opposite side walls thereof, the shaft 36 carries two sprocket wheels 37 over which run two conveyor chains 38. At the opposite end of the

conveyor these chains are supported on sprocket wheels 39 keyed to a shaft 40 which is rotatably mounted at its ends in the frame of the feeder. At an intermediate point of the conveyor, but nearer shaft 40 than shaft 36, there is another idler shaft 41 upon which are keyed sprocket wheels 42 that also engage the chains 38. The wheels 37, 39 and 42 are all of the same size. Both runs of the chains between the sprocket wheels 37 and 42 are taut. Between the wheels 42 and 39 the lower runs of the chains are taut, but the upper runs are slack, that is there is a greater length of chain in each upper run between the wheels 39 and 42 than in the corresponding lower run.

The chains are connected together at evenly spaced intervals by transverse bars 43. Special links of the chains include small angle plates 44 which are attached to the ends of these bars. These special links also carry a pair of rollers 45 which are engaged by upper and lower guide rails 46 on the frame, acting to maintain those links in a horizontal position and prevent tilting of the bars 43. Between the sprocket wheels 42 and 37 all links of the upper chains run upon guide rails 47. In the present instance four bars 43 are used, but their number may be varied as conditions require. In the case illustrated the chains are 44 inches long, and the bars are spaced 11 inches apart, thereby conforming with the 11 inch length of the units of the web being fed.

In each bar 43 there are two holes 48, through which project pins 49 that are straight for a portion of their length, but are provided with tapered or rounded extremities. These pins 49 have constricted threaded ends which extend through openings formed in transverse bars 50. The shoulders formed by the restrictions rest against one side of the bar, and the pin is drawn up to and held in that position by a nut 51 bearing against the opposite side of the bar. The nut 51 is used also to attach to the bar 50 a spring 52, the free end of which is connected with a post 53 that is anchored in the corresponding bar 43 and extends through a smooth hole in bar 50 and in a guide block 54 attached to bar 50. The springs 52 tend to separate the two bars 43 and 50, as shown at the bottom of Fig. 3.

The ends of bar 50 are bent at right angles to the body of the bar and carry anti-friction rollers 55. These rollers run upon cam tracks 56 supported from the frame at opposite sides of the feeder and spaced inwardly somewhat from the rails 47. When a pair of these rollers move upwardly upon the inclined surfaces at the rear ends of the cam tracks, the bar upon which they are mounted rises, and the pins 49 carried by the bar are projected upwardly. The springs 52 are thereby flexed. Inasmuch as the bar 43 is held against tilting and the posts 53 are anchored in that bar, and inasmuch as the movement of bar 50 is guided by the posts 53 in the holes provided therefor in bar 50 and block 54, the pins 49 are held in a vertical position as they rise. The upper surface of cam track 56 drops off suddenly at the forward end of the track as indicated at 9, permitting the springs 52 to depress the bar 50 and pull the pins 49 downwardly. If for any reason the springs 52 should fail to function as intended, the pins will nevertheless be depressed by a cam plate 57 attached to the track 56 and adapted to engage the roller 55 and pull it downwardly.

A sheet metal plate 58, hereinafter referred to

as a table, extends over the top of practically the complete feeder, being secured to the frame by any suitable means. This table is provided with longitudinal slots 59 through which the pins 49 extend as they travel along the upper run of the conveyor. The web W rests upon and slides over this table in its travel toward the printing line or zone. A pair of sheet metal cover plates 60 are attached to the table 58 by means of hinges 61. Interposed between each cover plate and the table there is a spacer 62 serving to space the cover plate slightly away from the table. This spacer is preferably attached to the table, although it could be carried by the cover plate if desired. Each cover plate has a slot 63 which, when the cover plate is down, registers with the corresponding slot 59 so that the pins 49 may extend upwardly beyond the level of the cover plates. When any work is being placed in the machine the cover plates 60 are swung up on their hinges, and as soon as the work is in position they are swung down again and permitted to rest upon the work which is thus held flat against the table, the weight of the cover plates being sufficient to accomplish this purpose.

The sheet of metal from which the table 58 is formed is continued forwardly beyond the forward end of the table, as indicated at 64, to constitute a curved and inclined bed over which the web passes in its travel from the table to the impression cylinder 10. 65 is a cover for this inclined bed 64, being spaced from the latter a distance sufficient to guide the web accurately without interposing any needless friction.

In Fig. 7 we have illustrated a portion of a multi-ply web which may be fed by the machine of the present invention. As illustrated, it comprises a number of thicknesses or plies of paper, some of which may be carbon paper in order that several duplicate copies may be made, this being desirable for instance where bills or invoices are being printed. One unit consisting of a form for a single invoice, comprising a number of plies, is indicated at 66. Its ends are defined by transverse perforated lines 67 which extend through all the plies. If desired, the various plies of the web may be secured together, as by means of small wire clips 68. When a unit has been printed upon and passed through the machine it may be torn from the web along a line 67. A pair of holes 69 are punched through each unit in transverse alignment, these holes being of a size to receive the straight part of pins 49 with a comparatively snug fit.

**Operation.**—When the machine is to be set in operation, the cover plates 60 are raised, a web is placed upon the table with holes 69 fitting whatever pairs of pins 49 are projected above the surface of the table at the time. The cover plates are then swung down and the web is advanced so that its forward end moves between the inclined bed 64 and the cover 65 and down around the impression cylinder 10. In order to guide it and hold it in operative relation with the cylinder we employ small rollers 70, 71 and 72.

In the curved portion of the table 58 at the rear end thereof, we form two aligned slots 73 in which we mount adjustable guides 74 having guide flanges 75 and downturned lips 76 and 77 which take into the slots 73. These guide members are held in adjusted position by means of bolts 78 extending through the slots and having heads engaging the table on the under side thereof and wing nuts 79 for clamping the guides in place. These guides serve to so direct the in-

coming web as to insure a position for the same such that the perforations will come in line with the pins 49.

When the position for the first line of writing on the first unit comes opposite the line of print, it may or may not coincide precisely with the printed form on the unit. By the adjustment of the clutch 17 previously described however, it may be caused to coincide perfectly. The operator then sets the machine in operation. After each line is printed the pawl and ratchet mechanism acts to advance the cylinder 10 one step. This movement of the cylinder acting through the sprocket 29, the chain 30 and the sprocket 31 serves to impart the same angular movement to shaft 32, and by means of gears 34 and 35 a somewhat smaller angular movement is imparted to the shaft 36, with a corresponding straight line movement to the pins 49. The parts of the driving mechanism are so proportioned and arranged that the pins 49 advance the work one printing space, but the cylinder 10 turns through slightly more than one space, and because of the slight friction between the rubber covered roller and the web the latter is over-fed slightly, thereby removing any wrinkles which might otherwise tend to form between the foremost pins 49 and the roller. It should be understood however that this over-feed of the roller results merely in slip-page between the roller and the work, as the latter is not gripped between the roller 10 and the auxiliary rollers 70, 71 and 72. The latter rollers merely guide the web in its travel over the roller 10. The extent of the feed is controlled entirely by the pins 49. As an example of driving mechanism suitable for use in the invention, it may be stated that the ratchet wheel 21 may be provided with 28 teeth instead of the conventional number of 33, and the gears 34 and 35 may have 56 teeth and 66 teeth, respectively. The sprockets for the chains 38 are the same size as those for the chain 30, and as the ratio 28:33 is the same as the ratio 56:66, it will be apparent that the travel imparted to the web by the pins 49 is at the same rate as would be imparted to the web by the cylinder 10 if that cylinder were constituted to positively feed the web and were driven by a 33 tooth ratchet.

At about the time the forward edge of a web unit engages the roller 10, the pins 49 in engagement with that unit drop away and the further travel of the unit is imparted to it from the next unit behind, which is then in engagement with the next succeeding pair of pins. When any given pair of pins has moved about half-way between the sprockets 42 and 37 the next pair of pins come up around the rear end of the conveyor and start forward on the upper run. As soon as the rollers 45 engage the guides 46 the pins 49 are brought into vertical position. They are at that time depressed, so that only their upper tapered or rounded extremities project into the path of the web. The holes in the web, being considerably larger than the tapered ends of the pins, are always able to receive the pins. As the rollers 55 run up the inclined rear ends of the tracks 56, the pins 49 gradually rise. The pins are free to move backward or forward in relation to the regular rate of travel of the chains so as to come into accurate alignment with the holes, because the slack in the chains permits such movement. If the spacing between the holes of successive units is not quite accurate, or is affected by expansion or contraction of the paper subsequent to the punching of the

holes therein, this provision of slack in the chains nevertheless permits accurate registration between the holes and the pins. As soon as the pins arrive above the axis of shaft 41 further relative movement is impossible, but it is at about this time that the pair of pins next in advance drop away from the web. Hence there is no tendency for the pins to tear the paper or enlarge the holes.

10 It will be apparent that variations may be made in the location of the holes in the web and in the number of holes used in each unit. One hole and one pin may be sufficient when narrow strips are being fed. Other variations from the described structure may be employed. Accordingly we desire it to be understood that the scope of the invention is to be regarded as defined exclusively by the appended claims rather than by the foregoing description or the accompanying illustrations.

20 Having thus described our invention, we claim:

1. In an intermittent feeder for paper webs for use in connection with a printing machine adapted to make intermittent impressions transversely of the web, traveling means engaging the web to the rear of the printing means moving with the web for a predetermined plurality of intermittent web advancing movements and then releasing the web at a point to the rear of the printing zone, actuating means operated in synchronism with the printing means for advancing the traveling means step by step, lateral guides for the web, and means operating forwardly of said traveling means for tensioning the web as it is pushed forward to prevent movement of the web in a direction normal to its surface, whereby buckling of the web in advance of the traveling means is prevented.

2. In a feeder for a multi-ply paper web upon which are printed units of substantially the same length, said web having a series of longitudinally aligned perforations one for each unit, said perforations being spaced apart a distance equal to the length of a unit, a web advancing mechanism comprising an endless conveyor and a series of moving pins carried thereby adapted to engage one after another in said perforations, and means for providing slack in the rear portion of the advancing run of the conveyor for permitting each pin as it comes into engagement with a perforation to depart slightly from its normal rate of travel until the pin next ahead begins to move out of engagement with its perforation.

3. In a feeder for a multi-ply paper web upon which are printed units of substantially the same length, said web having a series of longitudinally aligned perforations one for each unit, said perforations being spaced apart a distance equal to the length of a unit, a web advancing mechanism comprising an endless conveyor and a series of moving pins carried thereby adapted to engage one after another in said perforations, means for providing slack in the rear portion of the advancing run of the conveyor for permitting each pin as it comes into engagement with a perforation to depart slightly from its normal rate of travel until the pin next ahead begins to move out of engagement with its perforation, and means for thereafter holding the pin strictly to its normal rate of travel during the balance of its engagement with its perforation.

4. In a web feeder of the class described, a conveyor comprising an endless chain arranged in a vertical plane and provided at intervals with pins adapted to engage perforations in the web, two end sprocket wheels and an intermediate sprocket

wheel engaged by said chain, a horizontal rail for supporting the forwardly moving run of the chain between the intermediate and forward sprockets, the forwardly moving run of the chain between the intermediate and rear sprockets having slack therein, means between the intermediate and rear sprockets for guiding in a horizontal plane those chain links only which carry said pins, and cam means for moving the pins with respect to the chain in a direction toward the web during the movement of the pins between the rear and intermediate sprockets.

5. In a feeder for paper webs provided at regular intervals with transversely aligned perforations, a table over which the web runs, a conveyor arranged lengthwise of said table comprising a pair of endless flexible elements arranged in parallel vertical planes, transverse bars connecting said elements at regular intervals, pairs of pins carried by said bars adapted to fit said perforations, said bars being spaced apart a distance approximately equal to the longitudinal distance between perforations, and means for raising and lowering said bars with respect to the conveyor during the forward movement of the conveyor for causing each pair of pins in succession to enter transversely aligned perforations, to travel for a distance in engagement with the perforations and then withdraw from the perforations after a succeeding pair of pins have engaged their perforations.

6. In a feeder for a multi-ply paper web upon which are printed units of approximately the same length, said web having pairs of transversely aligned perforations spaced apart longitudinally a distance equal to the length of a unit, an endless conveyor, pairs of transversely aligned pins carried thereby adapted to engage one after another said pairs of transversely aligned perforations, and means for providing slack in the rear portion of the advancing run of the conveyor for permitting each pair of pins as it comes into engagement with a pair of perforations to depart slightly from its normal rate of travel until the pins next ahead begin to move out of engagement with their perforations.

7. In a feeder for a multi-ply paper web upon which are printed units of approximately the same length, said web having pairs of transversely aligned perforations spaced apart longitudinally a distance equal to the length of a unit, an endless conveyor, pairs of transversely aligned pins carried thereby adapted to engage one after another said pairs of transversely aligned perforations, means for providing slack in the rear portion of the advancing run of the conveyor for permitting each pair of pins as it comes into engagement with a pair of perforations to depart slightly from its normal rate of travel until the pins next ahead begin to move out of engagement with their perforations, and means for thereafter holding said first named pair of pins strictly to their normal rate of travel during the balance of their engagement with the perforations.

8. In a machine for feeding a web, an intermittently rotating impression cylinder, means for guiding the web around a portion of the periphery of the cylinder, web feeding means arranged to the rear of the cylinder, and means adapted to be actuated from the impression cylinder for driving said web feeding means, said web feeding means being adapted to advance the web at each step a distance slightly less than the rotational movement of the periphery of the cylinder.

9 In a machine for feeding a web, an impression cylinder having an intermittent small angle rotation, means for guiding the web around a portion of the cylinder and for holding it against the cylinder in printing position while permitting slippage, and means for pushing the web forwardly toward the cylinder intermittently a distance less than the intermittent peripheral movement of the cylinder.

10 10. In a web feeder of the class described, a conveyor comprising an endless chain arranged in a vertical plane and provided at intervals with pins adapted to engage perforations in the web, two end sprocket wheels and an intermediate sprocket wheel engaged by said chain, means for driving the forward end sprocket wheel, a supporting guide for the lower run of the chain whereby the chain is maintained in engagement with the lower teeth of all three of the sprocket wheels, the intermediate and rear end sprocket wheels being spaced to provide slack in the upper run of the chain between the latter sprocket wheels.

11 In a web feeder of the class described, a conveyor comprising an endless chain arranged in a vertical plane and provided at intervals with pins adapted to engage perforations in the web,

two end sprocket wheels and an intermediate sprocket wheel engaged by said chain, means for driving the forward end sprocket wheel, a supporting guide for the lower run of the chain whereby the chain is maintained in engagement with the lower teeth of all three of the sprocket wheels, the forwardly moving run of the chain between the intermediate and rear sprocket wheels, having slack therein, and means between the intermediate and rear sprocket wheels for guiding in a horizontal plane those chain links only which carry said pins.

12 A machine of the character set forth, comprising: a rotatable platen provided with cooperating presser means for feeding stationery provided with register perforations into typing position on said platen; and movable aligning mechanism on the receiving side of the platen having endless belts provided with pins adapted to engage said perforations and hold the stationery in alignment while advancing towards said platen, said endless belts being driven in timed relation to the rotation of the platen so as to retard the advance of said stationery.

RAYMOND B. DOTY.  
FRED A. ROSS.

25