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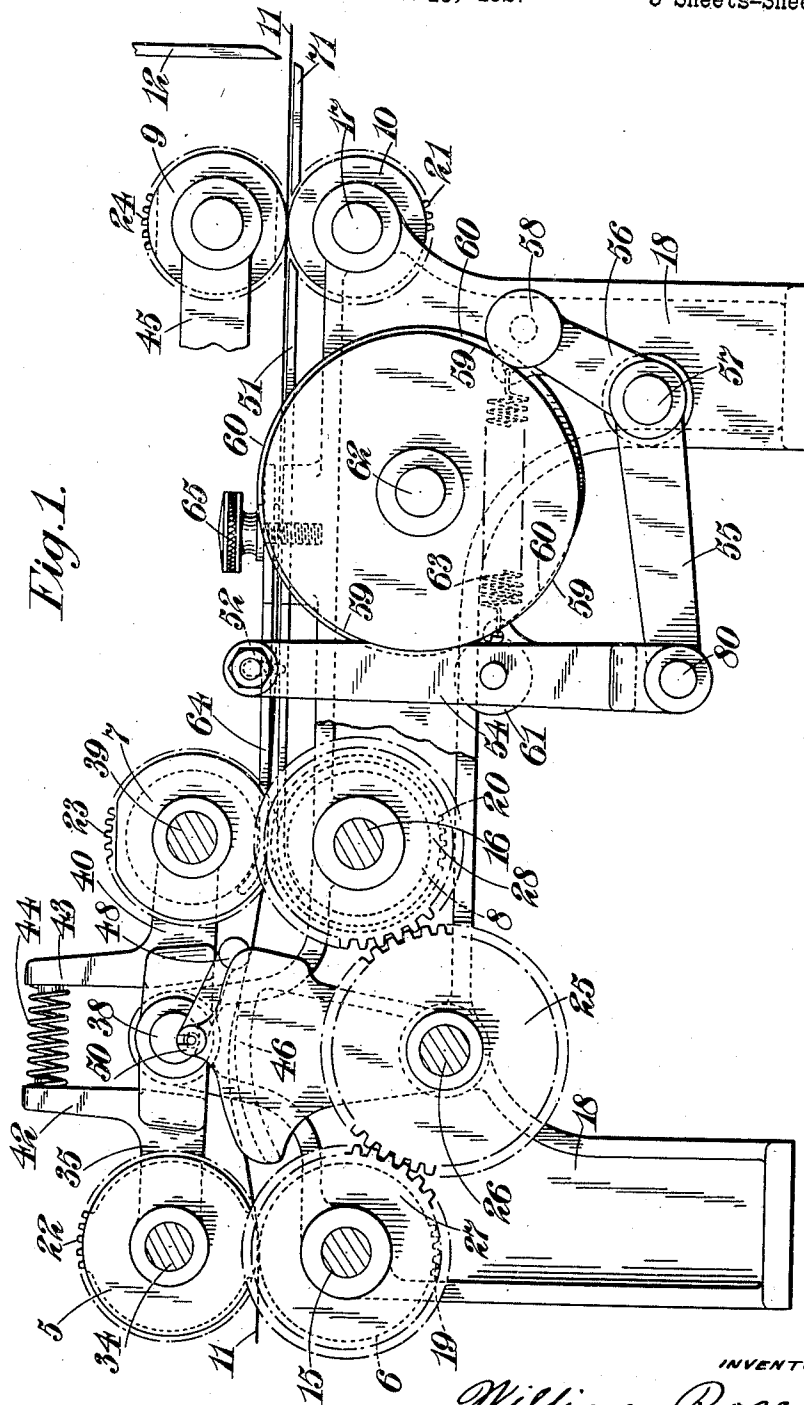
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APPARATUS FOR FEEDING AND REGISTERING A PAPER WEB

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3 Sheets-Sheet 1.



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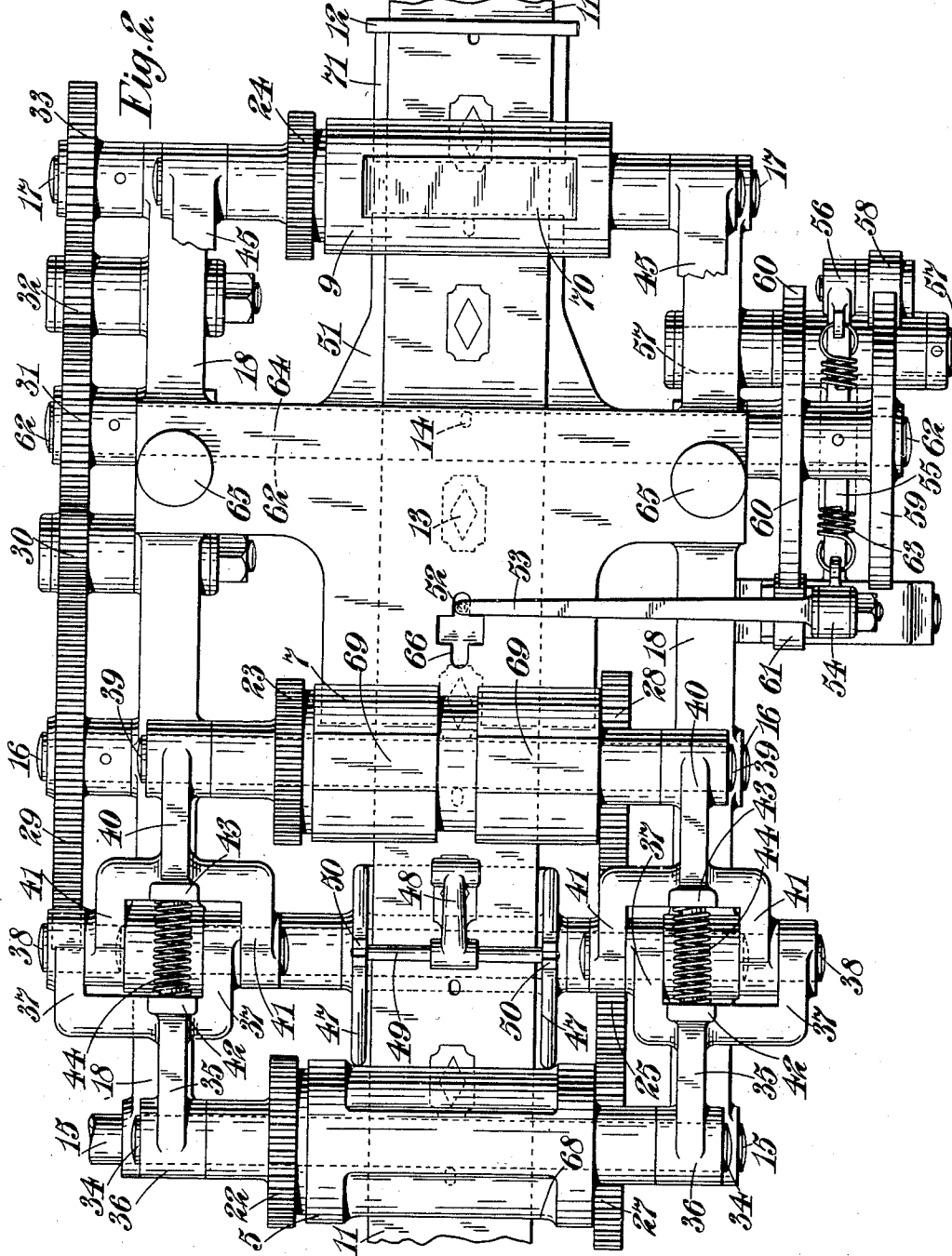
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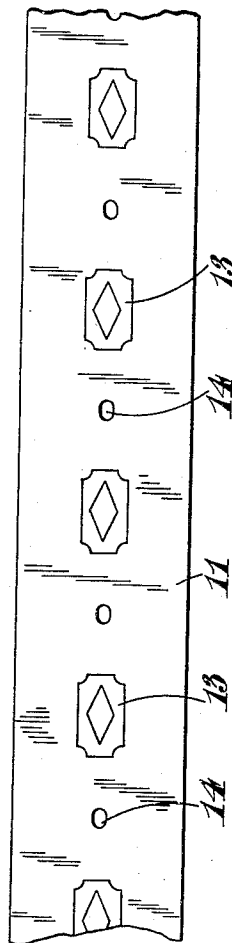
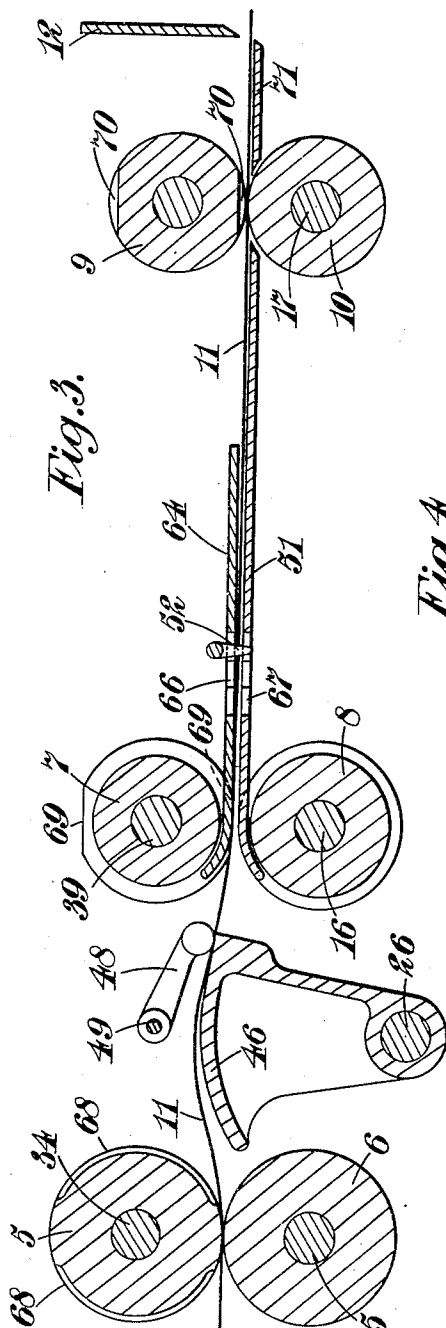
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APPARATUS FOR FEEDING AND REGISTERING A PAPER WEB

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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR FEEDING AND REGISTERING A PAPER WEB.

Application filed February 10, 1927, Serial No. 167,330, and in Great Britain September 23, 1925.

This invention relates to apparatus for feeding paper or like material in the form of a continuous web and for effecting longitudinal register of successive portions in the length of the web.

The invention deals with that type of apparatus in which the feeding of the web is effected wholly or mainly by rollers or the like which make frictional engagement with the web, and longitudinal register is obtained by means of a peg or equivalent device which is operated to make a positive engagement in turn with each of a succession of apertures formed in the web at regularly spaced intervals throughout its length. In this type of apparatus (examples of which are described in British specifications Nos. 2810/03 and 200238) the operation of the feed rollers is such that, at those periods when the registering peg is brought into engagement with one of the web apertures there is an interruption of the roller feed and the web (or that portion of it which is to be registered) is free to be adjusted in a longitudinal direction by the peg. In order to free the web periodically as aforesaid it has been proposed to provide a flat or flats on one or each of two co-operating roller surfaces, or alternatively to cam one of two co-operating rollers out of engagement with the other.

Hitherto in all machines of the type referred to above the registering peg or equivalent device for engaging the web apertures has taken the form of a projection or tooth extending radially outwards from the surface of one of two co-operating feed rollers through which the web is passed, the tooth aforesaid being formed at a point where the roller surfaces are out of contact, for example at a flattened portion on the roller periphery.

According to the present invention the registering peg, instead of being carried by and rotatable with a feed roller as aforesaid, is a separate device spaced apart from the feed rollers in the longitudinal direction of the web and arranged for reciprocatory movement into and out of the path of the web.

In the prior machines (hereinbefore referred to) in which the registering peg is carried by one of the feed rollers, the operation of the peg takes place at the nip of the rollers and at such the peg is not readily visible to the machine attendant. This draw-

back is removed by the present invention according to which the peg, being spaced apart from the feed rollers, is visible throughout its entire operation. Moreover the peg is more reliable in action and being presented in a readily accessible position the initial setting of the web, in order to obtain approximate register between the peg and a web aperture, is facilitated.

The registering peg may operate merely to centralize itself in a web aperture without imparting any appreciable movement to the web. Preferably however the operation of the peg is such that it first enters the path of the web (and in so doing engages one of the web apertures) then travels along said path in the direction of feed (carrying the web with it) and finally recedes from the path of the web and returns to its initial position.

In one construction embodying the invention there are two co-operating feed rollers operating alternately to engage and release the web, the registering peg comes into action when the web is released by the rollers, and an auxiliary feeding device (such as auxiliary rollers feeding at a speed in excess of the feed imparted by the peg) is arranged to advance the web towards the registering peg while the latter is in operation. Preferably in this construction a yielding brake is provided for the purpose of retarding the advance of the web from the auxiliary feeding device towards the registering peg.

In one application of the invention the feeding and registering apparatus described above is employed in conjunction with a wrapping machine such as a caramel wrapping machine. The web of paper has printed on it or otherwise applied to it a design which is repeated at equal intervals throughout the length of the web. In the operation of the apparatus successive design-bearing portions of the web are severed and constitute individual wrappers which are then applied by the wrapping machine to the caramels or other articles. In a case of this kind it is essential that accurate registration of the web be obtained, so that on each wrapper the design will occupy the same relative position. There are of course other applications of the apparatus provided by the invention.

One embodiment of the invention will now be described with reference to the accom-

panying drawings (to some extent diagrammatic), in which—

Figures 1 and 2 show the feeding and registering apparatus in side elevation and plan respectively.

Figure 3 is a diagram showing certain of the parts in section and illustrating the operation of the apparatus and

Figure 4 is a plan view showing a portion of the paper web.

Like reference letters indicate like parts throughout the figures.

The apparatus comprises three pairs of co-operating feed rollers—a first pair 5, 6, second pair 7, 8 and third pair 9, 10—all rotatable about parallel horizontal axes and operable to feed a continuous paper web 11 (drawn for example from a reel) up to a knife 12.

Recurrent designs or repeats 13 (see Figure 4) are printed on the web 11 at equally spaced intervals throughout its length and midway in the spaces between adjacent designs the web is formed with elongated apertures 14. The function of the apparatus about to be described is to feed the web 11 up to the knife 12 by a step-by-step advance and to ensure the accurate registration of successive portions in the length of the web with respect to the operation of the knife, so that at each operation of the latter the web will be severed at a line midway between adjacent designs, i. e. at a line passing through the centre of one of the apertures 14.

The three pairs of feed rollers are driven in the following manner. The bottom rollers 6, 8 and 10 are mounted respectively on shafts 15, 16 and 17 which are supported for rotation by the machine frame 18. The top roller of each pair is driven from the corresponding bottom roller by means of intermeshing pinions. For this purpose the bottom rollers 6, 8 and 10 are provided respectively with pinions 19, 20 and 21 located at corresponding ends of the rollers and meshing respectively with pinions 22, 23 and 24 carried at the adjacent ends of the top rollers 5, 7 and 9. At the opposite ends of the rollers the drive is transmitted from the first to the second pair of rollers by means of an intermediate pinion 25 mounted on a stationary shaft 26 and in mesh with pinions 27 and 28 provided on the corresponding ends of the bottom rollers 6 and 8 respectively. The third pair of rollers 9, 10 is driven by means of a train of intermeshing pinions 29—33, the first and last of which are carried respectively on the shafts 16 and 17 of the bottom rollers 8 and 10. Conveniently the apparatus as a whole is driven by an electric motor in geared or equivalent connection with the shaft 15 of the first bottom roller 6.

The top roller 5 of the first pair is secured to a shaft 34 which is supported by two

pivotaly mounted brackets 35. Each bracket 35 is formed at one end with a boss 36 within which the shaft 34 is rotatable and at the other end the bracket is provided with forked arms 37 which are pivotaly mounted on a fixed transverse spindle 38. The top roller 7 of the second pair is secured to a shaft 39 which in turn is supported by brackets 40 (similar to the brackets 35) provided with forked ends 41, to engage the spindle 38. The brackets 35 and 40 are formed with upwardly extending lugs 42, 43 between which springs 44 are arranged in compression. The springs 44 constrain the top rollers 5 and 7 towards the corresponding bottom rollers by a yielding pressure adapted to accommodate small variations in the thickness of the web. The top roller 9 of the third pair is supported on pivotaly mounted arms 45 and is constrained by gravity (which may if desired be supplemented by the pressure of a spring) towards the bottom roller 10.

Between the first two pairs of rollers a curved guide 46 is supported on the stationary shaft 26, and this guide is formed with side flanges 47 to locate the paper web between them. The web is pressed into contact with the guide 46 by means of a pivotaly mounted arm 48 which acts as a brake to exert a yielding pressure on the web. The arm 48 is carried on a spindle 49 which at its ends is pivotaly supported in slotted lugs 50 upstanding from the flanges 47.

The web after passing through the nip of the second pair of rollers is guided up to the third pair by a horizontal support 51. Registration of successive portions of the web is effected between the second and third pair of rollers by means of a registering peg 52. The peg 52 extends at right angles to the path of the web and is carried at one end of a horizontal arm 53. The opposite end of the arm 53 is secured to the upper end of a link 54 whereof the lower end is pivotaly connected to one arm 55 of a cranked lever 55, 56. This lever is fulcrumed on a spindle 57 supported by the machine frame and the other arm 56 of the lever carries a roller 58 constituting a cam follower. Reciprocatory movement in a vertical direction is imparted to the registering peg 52 by means of a cam 59 the surface of which engages the cam follower 58. Reciprocatory movement in a horizontal direction is imparted to the registering peg by a second cam 60 which engages a roller 61 (constituting a cam follower) mounted on the link 54. The two cams 59, 60 are located side by side at one end to a transverse spindle 62 whereof the other end is secured to and rotatable by the pinion 31 which forms one element of the train 29, 33 for transmitting the feed roller drive from the second to the third pair. The followers 58, 61 are held in engagement with their respective cams by

means of a spring 63 coupled in tension between the link 54 and the free end of the lever arm 56. The connection between the lower end of the link 54 and the lever arm 55 forms a floating pivot 80 for the link. The motion imparted to the registering peg by the aforesaid mechanism is such that it first descends into the path of the web, then travels for a short distance along said path in a direction towards the third roller pair, and finally rises clear of the path of the web and returned by a horizontal movement to its initial position; when the same sequence of operations is again repeated. Throughout the travel of the peg the latter is maintained at right angles to the path of the web. A cover plate 64 is arranged above the support 51 and is secured to the machine frame by screws 65. Elongated apertures 66, 67 are provided in the cover plate 64 and support 51 respectively for the purpose of permitting the registering peg to cross the path of the paper web and travel a short distance along it.

The top roller 5 of the first pair is formed with two cut-away portions 68 located diametrically opposite each other. The top rollers 7 and 9 of the second and third pairs are likewise provided with cut-away portions or flats 69 and 70 respectively, the two flats on each roller being at diametrically opposite points. While the reduced portion of any one of the top rollers is adjacent to the surface of the corresponding bottom roller that particular pair of rollers is inoperative so far as the feeding of the paper web is concerned. It will be seen from Figure 3 that the diametral line which passes through the centre of the cut-away portions 68 of the first top roller is at right-angles to the diameter on which the flats 69 of the second top roller are arranged, and that the reduced portions of the roller 5 are of approximately the same circumferential extent as the unbroken i. e. operative portions of the second top roller 7. Thus while the first roller pair is in action the second roller pair is out of action and vice versa. The flats on the second and third top rollers 7 and 9 are located on parallel diameters, and the relative angular settings of all three top rollers is maintained throughout the operation of the machine. The registering peg 52 is timed to come into operation when the second and third top rollers are inoperative.

The action of the apparatus as a whole will now be described.

The paper web 11 is fed between the nip of the first roller pair, under the brake arm 48 through the nip of the second rollers and along the support 51 up to the third roller pair and from thence over a shearing plate 71 to the knife 12. The brake arm 48 by its pressure on the web prevents that portion of the latter which is ahead of the brake arm

from being advanced unless and until it is pulled forward by the second roller pair or by the registering peg. Thus when the first roller pair is in operation (and the second roller pair inoperative) as shown in Figure 3 a portion of the web accumulates between the first rollers and the brake arm. At this stage the registering peg 52 comes into action to engage one of the perforations in the paper web and to advance the web a short distance towards the third roller pair. In Figure 3 the registering peg is shown at approximately the end of its operative travel. The peg pulls on that portion of the web which is being accumulated between the first roller pair and the brake arm 48. The pressure exerted by the brake arm is comparatively slight so that there is very little resistance to the pull of the registering peg on the web. The small advance of the web under the action of the registering peg may therefore be effected without danger of damaging the web (which may be very thin and consequently weak) in the region of the perforation. The first roller pair delivers the web up to the brake arm at a speed greater than that at which the web is withdrawn by the peg and the accumulating portion of the web is caused (by the curved guide 46) to assume the arched form shown in Figure 3. When the registering peg has completed its travel in a direction towards the knife it is lifted clear of the path of the web and the second and third roller pairs then come into operation, while the first roller pair is rendered inoperative. The effective movement of the second and third roller pairs is such as to bring the end portion of the web into the desired position with respect to the knife 12 (which operates on the completion of said operative movement) and to advance the trailing or following portion of the web into such a position that when the registering peg is again brought into action it will overlies another web aperture. It is to be noted that the method by which the third top roller 9 is supported permits of slip taking place between the operative surfaces of the rollers 9, 10 and the paper web. If therefore there is a tendency (caused for example by slight inaccuracies on the initial setting of the mechanism) for the third roller pair to feed at a surface speed greater than that of the second pair any such difference in speed will be accommodated by slip as aforesaid and in this way damage to the web will be prevented.

By the apparatus described above the paper web is advanced in a succession of steps, a portion of each of which is effected by the registering peg. It will be understood that the entry of the peg into successive web apertures may not take place on each occasion at precisely the same point in the length of the aperture, but as the peg advances the

web by engagement with the forward end of the aperture and has exactly the same longitudinal traverse at each operation, the relative position into which the web is advanced by the peg is always the same and thus accurate longitudinal register is obtained.

The illustrated construction described herein may be modified in various ways without departing from the scope of the invention. For example the third roller pair may be omitted and the web fed directly from the peg to the knife. Again the peg need not necessarily follow the second pair of rollers; it might be located immediately after the retarding device 46, 48 and be followed by the second roller pair. Means other than the rollers 5, 6 and brake 46, 48 may be employed for ensuring that comparatively little resistance is offered by the web to the pull exerted by the peg. Instead of a single web aperture 14 between adjacent designs, there may be two or more such apertures arranged in line at intervals across the width of the web, and in this case the peg device would have two or more projections to engage the several apertures respectively.

I claim:

1. In feeding and registering apparatus of the class specified operating on a paper web in which apertures are formed at regularly spaced intervals in its length, the combination of feeding means operable to engage the web and impart to it a step-by-step advance in the direction of its length, means to free the web for longitudinal adjustment between consecutive steps in its advance, a peg device shaped for engagement with the web apertures and spaced apart from the feeding means aforesaid in the longitudinal direction of the web, and means to reciprocate the peg device into and out of the path of the web in such manner that the device enters said path only when the web is free as aforesaid for longitudinal adjustment, and means to move the web in the direction of web feed.

2. In feeding and registering apparatus of the class specified operating on a paper web in which apertures are formed at regularly spaced intervals in its length, the combination of feeding means operable alternately to engage and release the web thereby imparting a step-by-step advance to it, a peg device which is shaped for engagement with the web apertures, is spaced apart from the feeding means in the lengthwise direction of the web and is movable transversely into and out of the path of the web, and means operable when the web is released as aforesaid by the feeding means to move the peg device first transversely into the path of the web, then along said path in the direction of feed, and finally out of the path aforesaid and back to its initial position.

3. In feeding and registering apparatus

of the class specified operating on a paper web in which apertures are formed at regularly spaced intervals in its length, the combination of feeding means operable alternately to engage and release the web thereby imparting a step-by-step advance to it, a peg device which is shaped for engagement with the web apertures and is spaced apart from the feeding means in the lengthwise direction of the web, and mechanism, operable when the web is released as aforesaid by the feeding means, for reciprocating the peg device into and out of the path of the web, said mechanism comprising a link mounted at one end on a floating pivot and at the other end operatively connected to the peg device, means for oscillating the link about its pivot in the direction of the length of the web, and means for reciprocating the floating pivot in a direction transverse to the path of the web.

4. In feeding and registering apparatus of the class specified operating on a paper web in which apertures are formed at regularly spaced intervals in its length, the combination of two main feed rollers operable on the web alternately to engage and release it, a peg device spaced apart from the feed rollers along the path of the web, and means operable to bring the peg device into engagement in turn with successive web apertures at those periods when the web is released as aforesaid by the feed rollers, and means to move the web in the direction of web feed.

5. In feeding and registering apparatus of the class specified operating on a paper web in which apertures are formed at regularly spaced intervals in its length, the combination of two main feed rollers operable on the web alternately to engage and release it, a peg device spaced apart from the feed rollers along the path of the web, and means, operable when the web is released as aforesaid by the feed rollers, to bring the peg device into engagement with a web aperture then to advance said device in the direction of feed and finally to withdraw the device from engagement with the web.

6. Apparatus according to claim 5, combined with auxiliary feeding means to advance the web towards the peg device while the latter is in engagement with the web.

7. Apparatus according to claim 5 combined with auxiliary feed rollers operable, while the peg device is in engagement with the web, to feed the web towards said device at a speed greater than the feeding speed of the peg.

8. Apparatus according to claim 5 combined with auxiliary feed rollers operable, while the peg device is in engagement with the web, to feed the web towards said device at a speed greater than the feeding speed of the peg, and a yielding brake arranged to

retard the advance of the web from the auxiliary feed rollers to the peg device.

9. Apparatus according to claim 4 combined with an additional pair of feed rollers 5 located in advance of the peg device and operable on the web in synchronism with the main feed rollers aforesaid.

10. In feeding and registering apparatus of the class specified operating on a paper 10 web in which apertures are formed at regularly spaced intervals in its length, the combination of feeding means operable alter-

nately to engage and release the web, a peg device shaped for engagement with the web apertures and mechanism operable, when the 15 web is released by the feeding means aforesaid, to reciprocate the peg device into and out of the path of the web and to maintain the peg throughout its travel at right-angles to the plane of the web, and means to move 20 the web in the direction of web feed.

In testimony whereof I affix my signature.

WILLIAM ROSE.