March 4, 1952 D. L. HARRISON 2,587,843

COLLATING MACHINE

Filed Feb. 26, 1949 4 Sheets-Sheet 1

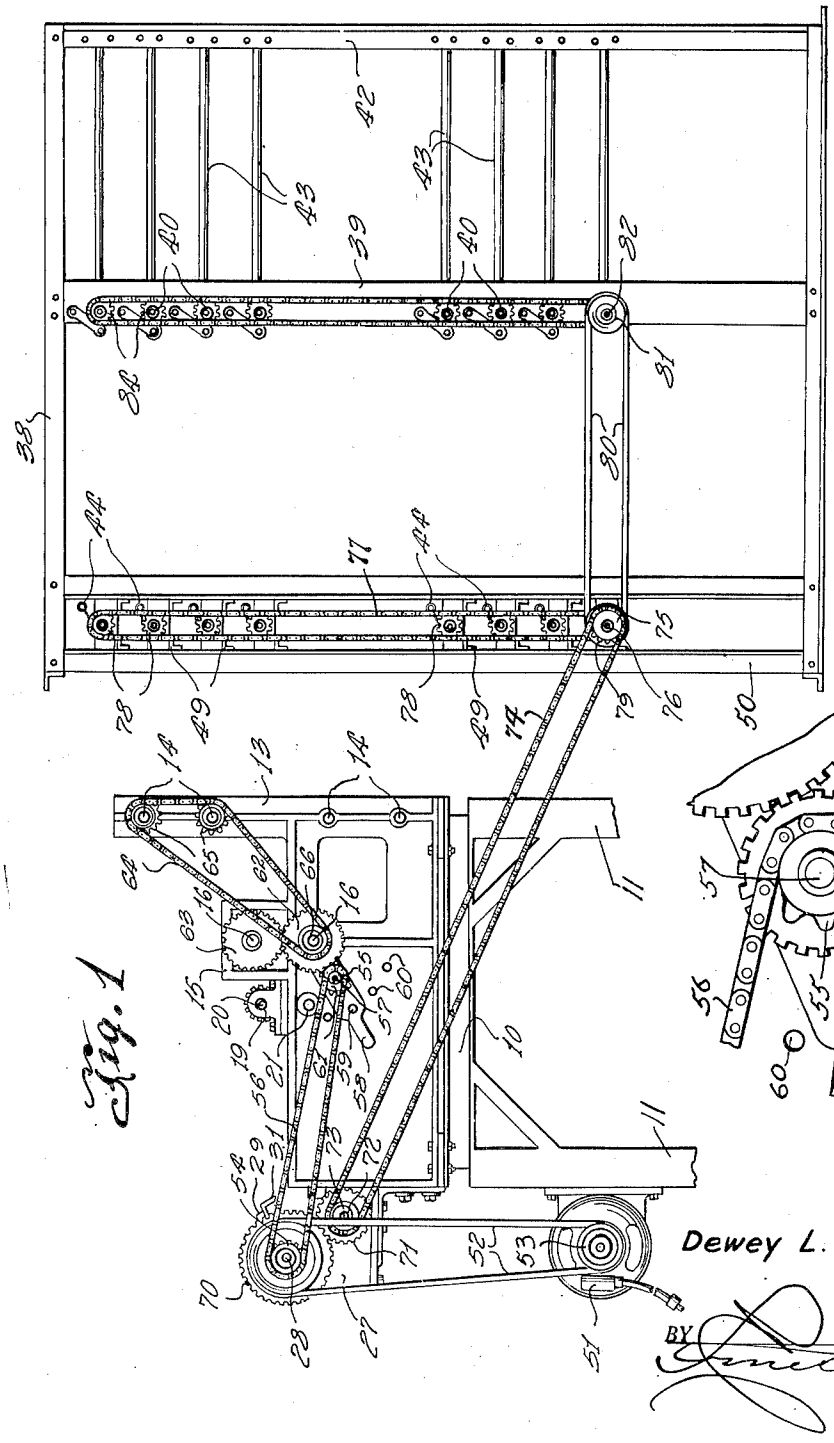


Fig. 1.

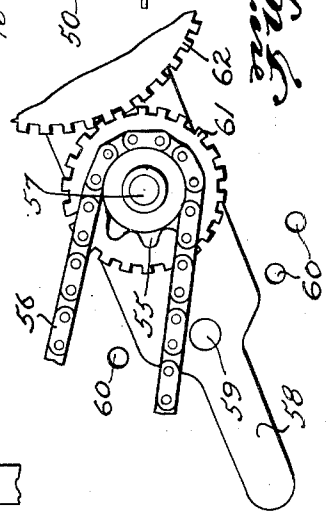


Fig. 12.

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Fig. 2

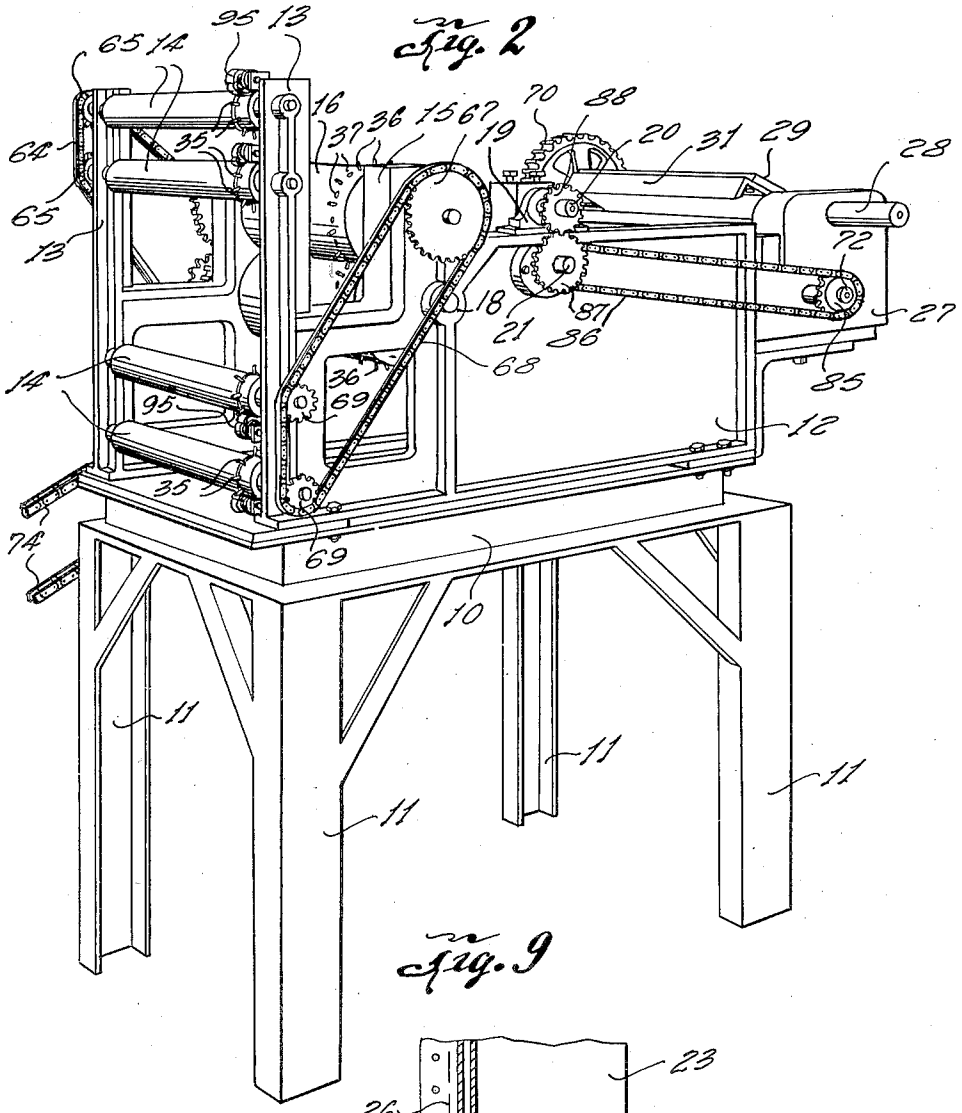
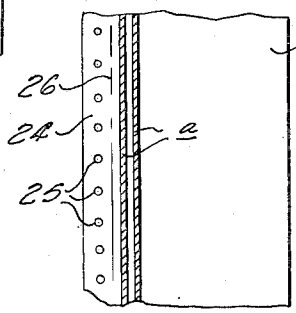


Fig. 9



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Fig. 3

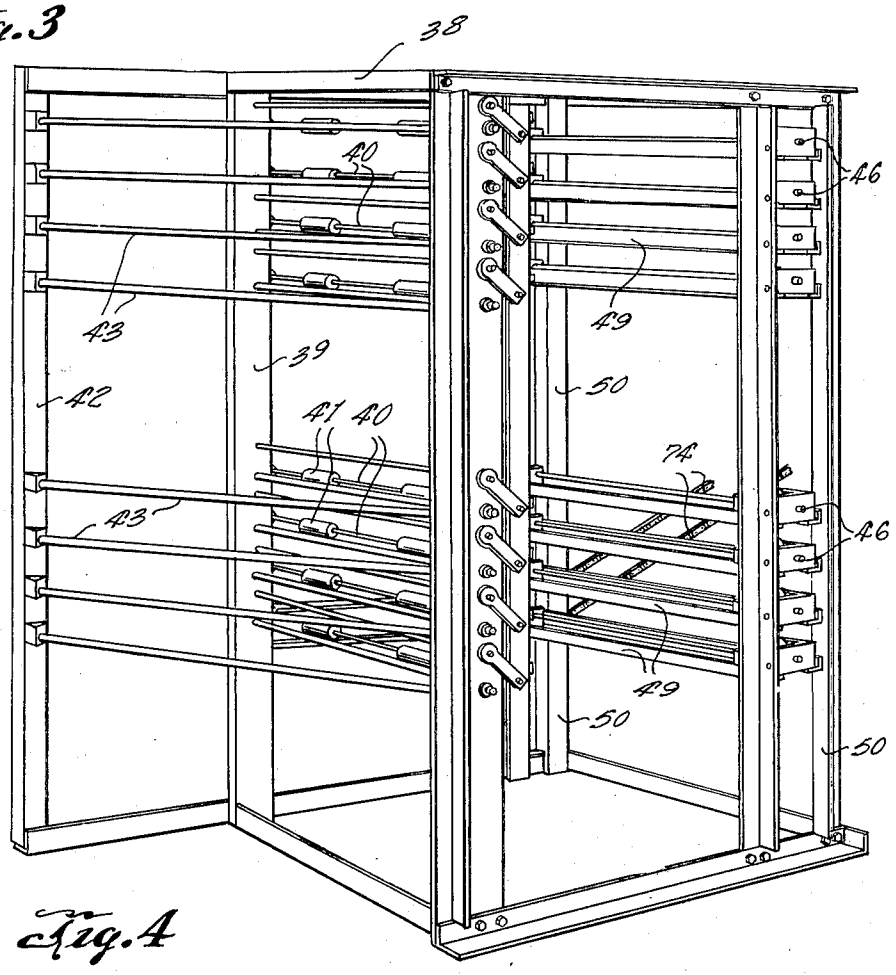


Fig. 4

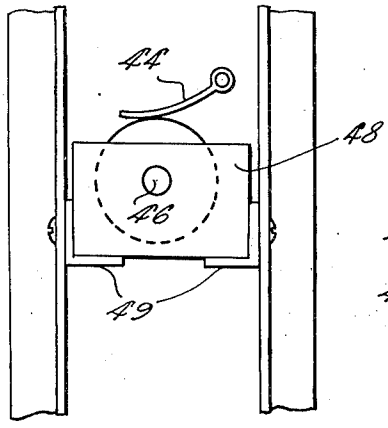
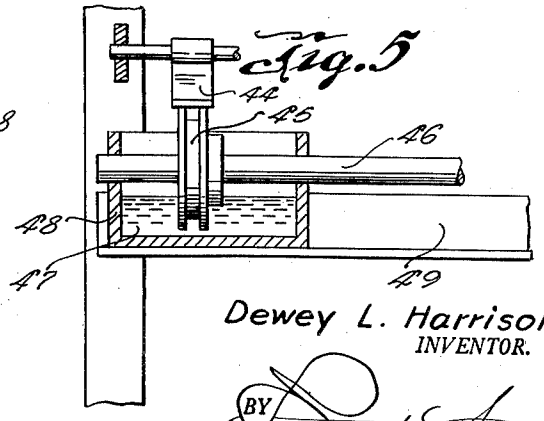


Fig. 5



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Fig. 6

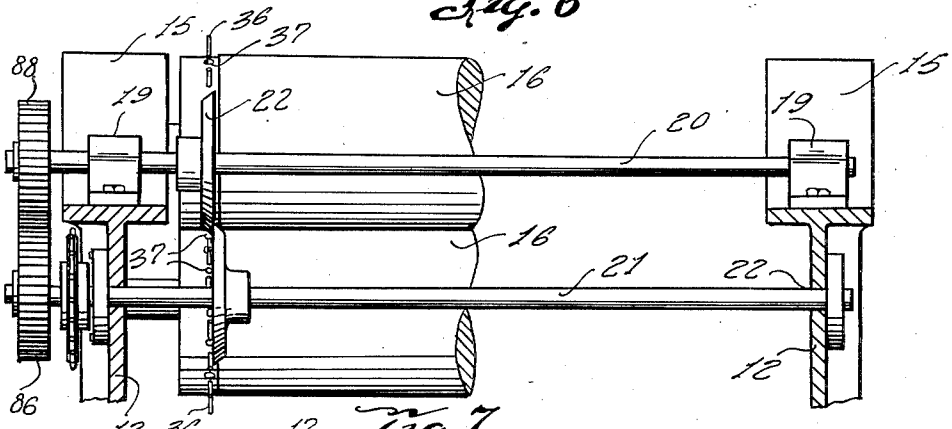


Fig. 7

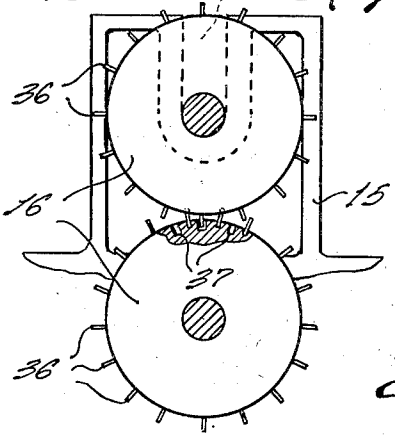


Fig. 8

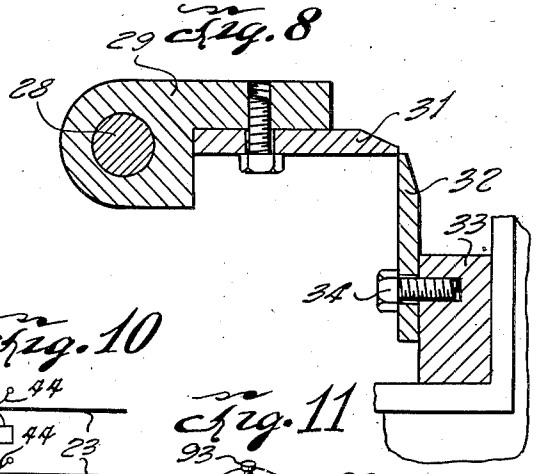


Fig. 10

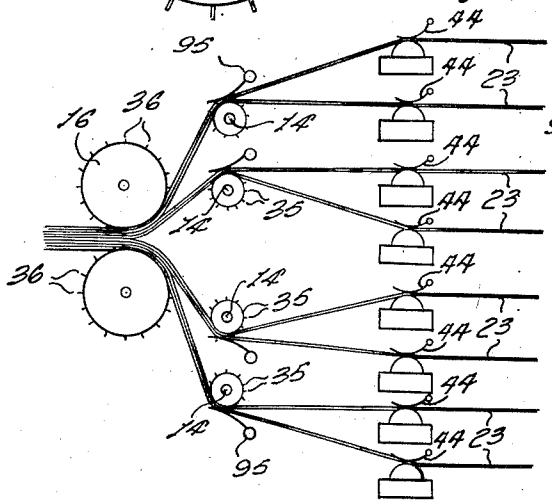
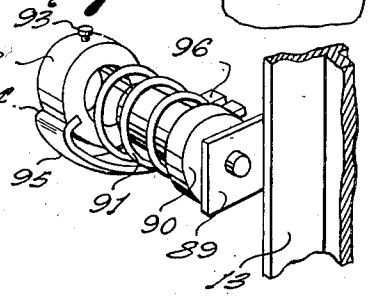


Fig. 11



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Patented Mar. 4, 1952

2,587,843

UNITED STATES PATENT OFFICE

2,587,843

COLLATING MACHINE

Dewey L. Harrison, Dallas, Tex.

Application February 26, 1949, Serial No. 78,631

4 Claims. (Cl. 270—52)

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This invention relates to machines for collating a plurality of continuous paper webs in the production of manifold forms for any purpose and it has particular reference to such a machine which assembles printed forms from rolls, interposes carbon paper and glues the edges of the printed forms in a continuous process and severs the manifold web at intervals into predetermined lengths.

Machines for making manifold business forms have been produced for many years and involve many different designs but among the most popular of these machines is the type employing rollers or drums having circumferentially spaced studs or pins cooperating with correspondingly spaced, marginal apertures of a paper web to advance the latter through the machine. This advancing arrangement has been found to be the most practical, although it has its disadvantages in that it limits the number of sheets which can be accumulated on the studs of the rollers, making it necessary to manually glue two or more runs of manifold sheets when the required number of sheets in each manifold exceeds the capacity of the machine for a single run. This condition cannot be corrected by lengthening the studs of the rollers since they would then fail to register with the spaced perforations in the margin of the paper web and hence would be ineffective to advance the latter through the machine.

It is the principal object of the present invention to provide a collating machine having all of the advantages of conventional machines for the purpose but possessed of an additional advantage characterized by feeding web forms singly across each of a plurality of vertically spaced minor rollers between a pair of major rollers whose location in relation to the group of minor rollers is such that there will be no increase in radius at the point of accumulation of the individual webs on the major rollers beyond the ability of the studs thereof to remain in register with the perforations of the webs. Hence the number of individual web forms which the machine is capable of handling is limited only to the number of minor feeding rollers which latter may be increased or decreased according to the number of sheets desired in a manifold.

Another object of the invention is to provide a paper web guiding frame so designed that paper may be directed at right angles from the rolls of a supply frame into the assembling machines or in a straight line, depending upon floor accommodations, said frame having provisions for directing carbon strips to be interposed between the paper sheets.

Another object of the invention is to provide means for depositing glue in a continuous line of predetermined width on the perforated margin of each web which is separable from the web after assembling of the manifold. Moreover, the invention includes means for severing the assembled and glued strips into predetermined lengths, each constituting completed manifold forms.

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With the foregoing objects in view, the invention has further reference to certain features of accomplishment which will become apparent as the description proceeds, taken in connection with the accompanying drawings wherein:

Figure 1 is a side elevational view of a collating machine and stock supply frame constructed according to the invention.

Figure 2 is a rear perspective of the collator per se.

Figure 3 is a perspective view of the paper stock supply frame.

Figure 4 is a fragmentary view of the frame showing a glue pot and distributing roller.

Figure 5 is a view rotated 90° from Figure 4, showing the glue pot in vertical section.

Figure 6 is a fragmentary front elevational view of the accumulating rollers and showing the cutting discs for severing the perforated margin from the assembled manifold strips.

Figure 7 is an end elevational view of the assembling rollers showing adjustability of the upper of said rollers.

Figure 8 is a vertical sectional view of the cooperating blades for cutting the assembled manifold into predetermined lengths as it emerges from the assembling rollers.

Figure 9 is a fragmentary view of a paper web constituting one of many making up the manifold.

Figure 10 is a schematic view showing the course of individual webs over the glue pots, across the feeding rollers and between the accumulating rollers, and

Figure 11 is a perspective view of an assembly for holding the webs on their respective feeding rollers, and

Figure 12 is a detail view on a larger scale showing the assembling roll driving and speed adjusting means.

Continuing with a more detailed description of the drawing, reference numeral 10 denotes a support for the assembling machine which rests on legs 11. The assembling machine has parallel side members 12, at the rear of each is integrally formed an upright 13 and between these uprights is disposed a series of vertically spaced web feeding rollers 14 whose ends are journaled in bearings provided therefor in the said uprights 13.

Spaced forwardly on each side member 12 of the assembling machine is a frame 15 providing a mounting for the bearings for the ends of the upper of two assembling rollers 16, said upper roller being vertically adjustable with respect to the lower roller as indicated by the slot 17 (Fig. 7). The lowest of the two rollers 16 has its shaft ends journaled in bearings 18 provided therefor in the side members 12 of the machine (Fig. 2).

Disposed on each side member 12, in front of

the assembling rollers 16 is a pair of bearings 19 in which are journaled the ends of a shaft 20 which is parallel with a similar shaft 21 therebelow whose ends are journaled in the side members 12 of the machine frame. Mounted on each of the shafts 20 and 21 is a disc 22 (Fig. 6) whose edges are beveled and in contiguous overlapping relationship. It will be observed that the meeting edges of the discs 22, which are adapted to cut the perforated margins from paper webs, are in horizontal alignment with the space between the assembling rollers 16 so that the assembled webs will move therebetween to be divested of the perforated margin. The form of web adapted to be assembled by the machine is conventional and is identified in Figure 9 by reference numeral 23 whose margin 24 is provided with spaced perforations 25 and is separated from the web proper along the longitudinal line 26.

At the front of the assembling machine is mounted a support 27 for a transverse shaft 28 on which is mounted a plate 29 and to this plate is secured by means of bolts 30, a blade 31. When the shaft 28 is rotated, the blade 31 is brought into shearing relationship with a stationary, vertically disposed blade 32 (Fig. 8), mounted on a transverse bar 33 by bolts 34, hence the assembled webs, in their passage between these blades will be severed into manifold units of predetermined length.

Each of the feeding rollers 14, which are vertically spaced apart in the rear portion of the machine frame, are provided with circumferentially spaced pins or studs 35 adjacent one end thereof. The assembling rollers 16 are also provided with like studs 36, correspondingly spaced and between each stud 36 is an opening 37. The studs on one roller 16 are staggered with respect to the studs on the companion roller in order that the studs on one roller will enter the holes 37 in the other roller, as exemplified in Figure 7. Hence, the apertures in the margins of the paper webs brought into assembly between the rollers will not escape engagement by the studs of each of the latter.

Situated rearwardly of the collating machine described above is a frame 38 (Figs. 1 and 3) between whose rear uprights 39 extends a series of vertically spaced shafts 40, each of which carries a pair of rollers 41 over which webs of paper, not shown, are adapted to pass as they are unrolled from rolls of paper mounted in a supply fame, not shown. Rearwardly of the uprights 39 is a single upright 42 from which rods 43 extend diagonally to one of the rear uprights 39 in vertically spaced relationship for guiding paper webs from rolls in a supply frame at right angles into the guide frame 38 in order that the webs may advance over rollers 41 and directly into the collating machine.

In its course through the guide frame 38, each paper web is constrained by a pivoted lug 44 (Fig. 10) to engage an annularly grooved wheel 45 (Fig. 5) mounted on a shaft 46 and whose periphery is submerged in glue 47 in a pot 48. This wheel distributes onto the web 23 two parallel lines of glue as shown at *a* in Figure 9, as the web is advanced thereover. The glue pots 48 are mounted on supports 49 which extend between the foremost uprights 50 of the frame 38.

To drive the described apparatus, an electric motor 51 is mounted on the front legs of the supporting frame 10 which drives a belt 52, the latter, in turn, driving a pulley 53, mounted on the shaft 28 which carries the shearing blade 29.

This same shaft carries a sprocket 54 which drives a sprocket 55 through chain 56. Sprocket 55 is mounted on a stub shaft 57 carried by an arm 58, the latter, in turn, being slidably and swingably mounted on the shaft of the lowest of the assembling rollers 16 and held in adjusted positions by a pin 59 extending therethrough and into a selected one of a group of holes 60 arcuately spaced in the side member 12 of the machine. By virtue of the adjustable arm 58, a change in the peripheral speed of the assembling rollers 16 and consequently the length of the manifold form may be made by substituting sprockets and gears of different diameters for the sprocket 55 and gear 61 which latter drives the lowest assembling roller 16 through gear 62, the adjustment of arm 58 compensating for the resultant difference in the length of the chain 56.

The stub shaft 57 carries also a gear 61 which engages and drives a large gear 62 mounted on the shaft of the lowest assembling roller 16, as may be seen in Figure 1. A gear 63, mounted on the shaft of the upper roller 16 is engaged and driven by gear 62, thus the assembling rollers 16 are driven in opposite directions and at the same rate of speed.

To drive the upper series of the feeding rollers 14, a chain 64 is passed over sprockets 65 mounted on the ends of the shafts of these rollers and over a sprocket 66, mounted on the shaft of the lowest assembling roller 16.

On the opposite side of the machine, a sprocket 67 is mounted on the extended end of the shaft of the upper assembling roller 16 which carries a chain 68 engaging sprockets 69 on the shafts of the lower series of feeding rollers 14, thereby rotating these rollers in the same direction as the upper series.

Mounted also on the shaft 29 which carries the shearing knife 31 is a gear 70 (Figs. 1 and 2). This gear meshes with a gear 71 mounted on a shaft 72 therebelow and which shaft also carries a sprocket 73. A chain 74 engages this sprocket and drives a sprocket 75, mounted on a shaft 76 extending between the foremost uprights 50 of the guide frame rearwardly of the assembling machine. A chain 77 having vertical leads extends parallel with one of the uprights 50 (Fig. 1) and engages all of the several sprockets 78 mounted on the ends of shafts 46 carrying the glue distributing wheels 45, thereby rotating the latter in unison.

The shaft 76, driven by chain 74, also carries a pulley 79 which drives a belt 80 which in turn drives a pulley 81 mounted on a shaft 82, journaled in bearings supported between uprights 39 of the guide frame 38. The shaft carries also a sprocket which drives a vertical lead chain 83 and which engages all of the sprockets 84 mounted on the vertically spaced shafts 40, thus to rotate the guide rollers 41 on these shafts.

Referring to Figure 2, the shaft 72 which is driven by enmeshed gears 70 and 71 on the opposite side of the assembling machine, carries a sprocket 85 which drives a chain 86, the latter, in turn, driving a sprocket on the shaft 21 which carries the lowest of the two cutting discs 22. The sprocket on shaft 21 is concealed in Figure 2 by a gear 87 also mounted on this shaft and which meshes with a gear 88 mounted on the shaft 20 thereabove and which drives the uppermost disc 22 in unison with the companion disc.

In Figure 11 is shown an exploded view of a paper web retaining assembly for each of the feeding rollers 14. This assembly consists of a

mounting 89 affixed to an upright 13 of the machine frame and which supports a member 90 at right angles to a roller 14. A coil spring 91 surrounds member 90 and is held under compression by a collar 92, the latter being secured in place on member 90 by a set screw 93. The collar 92 is slotted to receive an inwardly turned end 94 of a leaf spring 95, the latter having a slotted end 96 through which the studs 35 of rollers 14 pass when the spring 95 is tensionally held against the paper web as it passes over the roller to hold the same against displacement from the studs in event of too much play in the web between these rollers and the stock supporting rollers.

It is of particular importance to observe the relationship of the vertical series of minor or feeding rollers 14 in Figures 1 and 10 with a pair of major or assembling rollers 16, which relationship constitutes the novel characteristic of the invention over conventional collating machines. It is of course obvious that while but four feeding rollers 14 are illustrated for convenience in illustrating, as many of such rollers may be incorporated as may be required to supply a complement of manifold forms. In some cases, as many as sixteen or eighteen forms are used. In conventional collators, this quantity of forms in a single manifold run would not be possible and it would be necessary to make two runs and manually glue the two together. In so producing the manifold forms the problem is encountered as to maintaining continuity in numbering since the form numbers are applied by the press which also prints and perforates the webs. When gluing by hand, many sets must be numbered also by hand, which is not only time consuming but gives rise to error and further, this is considered waste of printed forms.

By arranging the feeding rolls 14 in vertical alignment and locating these rollers in groups above and below the assembling rollers, a single web may be passed across each feeding roller, thence betweeen the assembling rollers to avoid dislocating the apertures in the webs in relation to the studs of the assembling rollers by too great accumulation of paper on the latter.

Manifestly, the construction as shown and described is capable of some modification and such modification as may be construed to fall within the scope and meaning of the appended claims is also considered to be within the spirit and intent of the invention.

What is claimed is:

1. In combination with a collating machine having a rack supporting rolls of marginally perforated paper and carbon webs, a web collecting and feeding mechanism comprising a frame, spaced uprights on one end of said frame, a group of vertically spaced web feeding rollers supported by said uprights, circumferentially spaced studs at one end of each of said feeding rollers adapted to be received by spaced and aligned perforations in the margins of said webs, a pair of web assembling rollers supported on said frame and disposed approximately midway between the top and bottom of said group of feeding rollers and between which all of said webs are constrained to pass, a circumferentially spaced series of studs in one end of each of said assembling rollers adapted to enter correspondingly spaced holes in the other of said rollers, means on said frame for severing the perforated margin from said webs, means for cutting the assembled webs into sections of predetermined length, and means for driving said feeding rollers and said assembling rollers at a predetermined speed ratio.

2. In combination with a collating machine having a rack supporting rolls of marginally perforated paper and carbon webs, a web collecting and feeding mechanism comprising a frame, a group of vertically spaced web feeding rollers supported on said frame, a pair of web assembling rollers disposed on said frame approximately midway between the top and bottom of said group of feeding rollers and between which said webs are adapted to pass in contiguity, means on each of said feeding and assembling rollers adapted to enter the marginal perforations in said webs to propel the same at a uniform rate of speed over and under said feeding rollers and between said assembling rollers, means on said frame for severing the perforated margin of said webs collectively, means for cutting the assembled webs into sections of predetermined length, and means for driving said feeding rollers and said assembly rollers at a predetermined speed ratio to maintain uniform tension on said webs.

3. In combination with a machine for collating continuous sheets of marginally perforated paper and interleaving continuous sheets of carbon therewith, a sheet collecting and feeding mechanism comprising a frame having spaced apart uprights at one end thereof, a series of rollers having their ends journaled in said uprights and with which said paper and carbon sheets are individually engaged, a pair of assembling rollers between which said sheets converge into contiguity from said feeding rollers, means on said feeding and assembling rollers cooperating with the spaced marginal perforations in said paper sheets for propelling the latter, a positive driving means for said feeding rollers, means on said frame for removing the perforated margin of said paper sheets, means for cutting the assembled sheets into sections and means for driving said assembling rollers at a predetermined speed ratio with respect to said feeding rollers to maintain uniform tension on said paper sheets.

4. A collating machine as set forth in claim 3, in which bifurcated leaf springs are held tensionally in continuous engagement with the paper sheets at their points of engagement with the feeding rollers to prohibit displacement thereof with said rollers, the studs of the latter being adapted to pass through the bifurcated ends of said springs.

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