

July 30, 1940.

G. L. FULK

2,209,692

MACHINE AND METHOD FOR MAKING MANIFOLD FORMS

Filed June 10, 1938

4 Sheets-Sheet 1

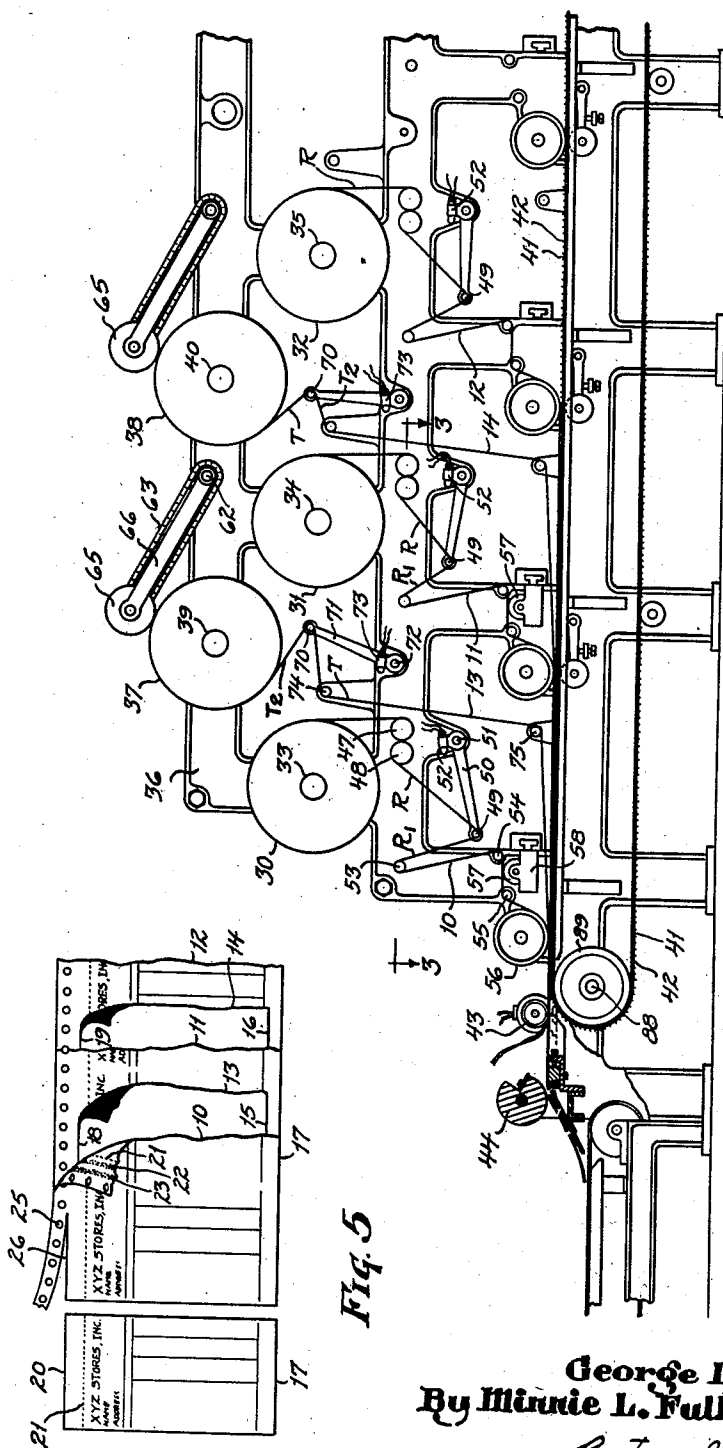


Fig. 1

Fig. 5

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July 30, 1940.

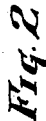
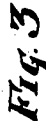
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MACHINE AND METHOD FOR MAKING MANIFOLD FORMS

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4 Sheets-Sheet 2



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MACHINE AND METHOD FOR MAKING MANIFOLD FORMS

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4 Sheets-Sheet 3

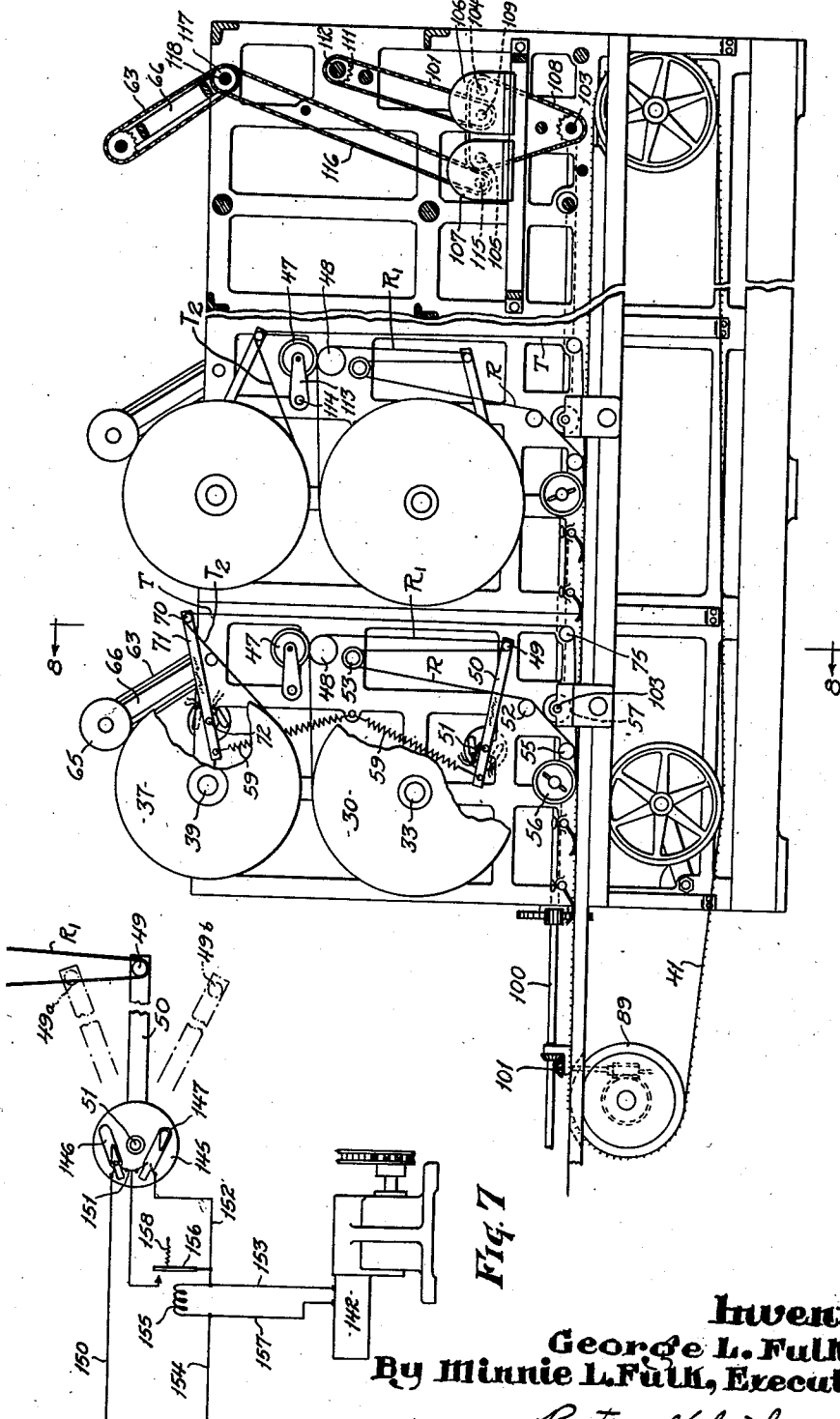


Fig. 6

Fig. 7

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MACHINE AND METHOD FOR MAKING MANIFOLD FORMS

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4 Sheets-Sheet 4

Fig. 8

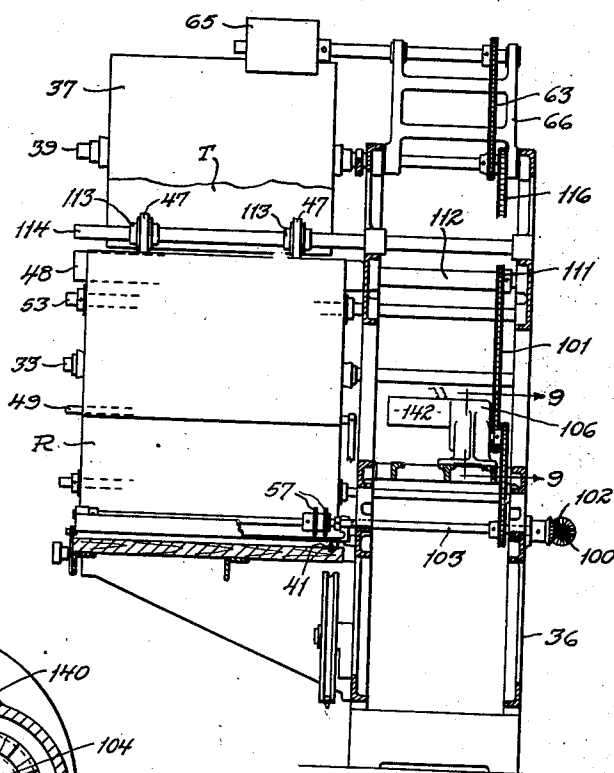
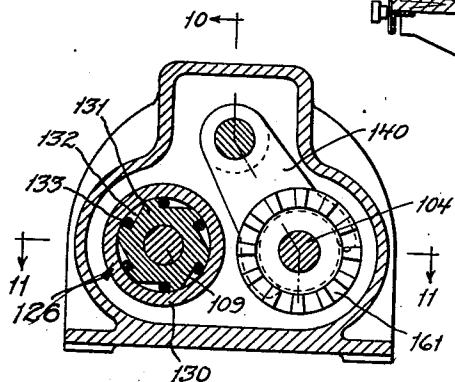


Fig. 9

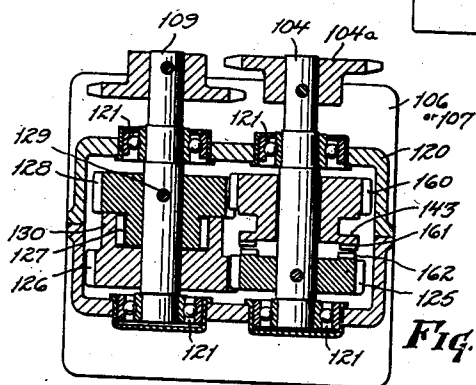
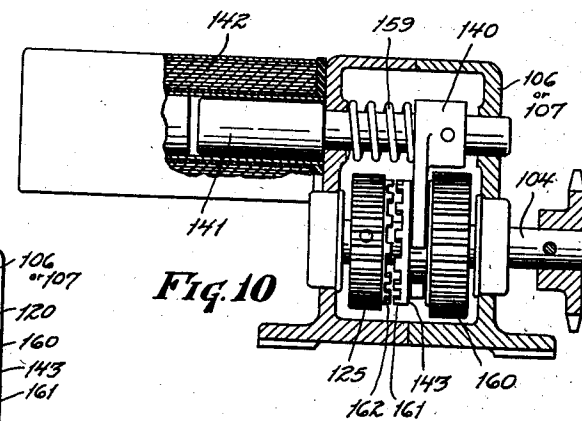


Fig. 10



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UNITED STATES PATENT OFFICE

2,209,692

MACHINE AND METHOD FOR MAKING
MANIFOLD FORMS

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ments, to James B. Fulk

Application June 10, 1938, Serial No. 212,990

16 Claims. (Cl. 270—52)

This invention relates to a method and apparatus for making manifold register forms, in which carbons are utilized for making a record, and which are so arranged that they may be quickly removed from their position in the pack at the completion of the record. Manifold packs of this character comprise a plurality of record sheets interleaved with transfer sheets to form a single unit.

One form of apparatus heretofore developed for making a manifold pack is illustrated in co-pending application, Serial No. 99,104, filed September 2, 1936, now Patent Number 2,144,331, dated January 17, 1939. In such apparatus, the rolls of record paper have been led upwardly over spaced drums which have been provided with projections that coact with openings along one side of the webs to hold the webs in registration. In view of the fact that the distances between the holes may vary slightly in different weights of paper, or because of differences between the moisture content of the paper when the perforations are made and the moisture content of the paper when the forms are assembled, and in view of the fact that the drums are spaced apart permitting the webs to slide one on the other in the stretches between the drums, considerable difficulty has been experienced in maintaining accurate registration of the webs and in rapidly adjusting the mechanism to avoid tearing of the paper.

An important object of the present invention is to provide a method and apparatus for making a manifold pack from substantially continuous webs of material at comparatively high rates of speed and in such manner that the difficulties experienced in maintaining accurate registration of the webs with spaced drums are avoided. In this connection, the invention contemplates a method and apparatus by means of which a machine may run faster and with less strain upon the paper than any machine heretofore used for this purpose.

In the apparatus heretofore developed, the webs of record and transfer paper have been drawn from their respective supply rolls by a pair of feeding rollers which engaged only the surface of the webs. The feed rollers fed the paper from the rolls by frictional engagement with the surface of the paper whereas the registering drums fed the paper by the inter-engagement of their projections with the perforations in the paper, thus those portions of the paper adjacent the openings were not damaged by the strains of unwinding the paper from the rolls thereby in-

creasing the accuracy of the registration. The length of the web fed by the feed roller was therefore entirely dependent upon the peripheral speed of the feed rollers whereas the length of the web handled by the registering device was dependent upon the number of perforations engaged thereby and the distance between such perforations. Hence variations of the distance between perforations such as might be caused by different climatic conditions, different weights or kinds of paper has damaged the paper web and affected the tension on the web. For instance, when the difference between perforations was slightly longer than usual, a greater length of web was demanded by the registering device than was provided by the feed rollers, and when the machine was run at high speeds the accumulation of this discrepancy increased the tension on the web as to enlarge the perforations thus destroying their utility as a registering means, and even tearing the web itself. These variations of the distance between the openings in the web caused the paper to be drawn from the supply roll either too fast or too slow, resulting in either the decreasing or increasing of the tension of the web to such an extent that it could not be compensated for by ordinary methods such as the use of an idler or take up roller.

Therefore, a further object of the invention is to provide a feeding device which will act automatically to draw paper from its supply rolls and permit the tension on the paper so withdrawn to be maintained substantially constant even though the paper so withdrawn is passed through mechanism of the machine at a slightly different rate of lineal speed than the lineal speed of withdrawal, due to slight inaccuracies in the distance between the openings in the paper, and also to maintain the length of the paper web between the withdrawing means and the registering mechanism within fixed limits.

An additional object of the present invention is to provide a regulating device which operates automatically to maintain a predetermined degree of pull on the supply roll and at the same time permits a slight variation in the rate of movement of each web with respect to the other webs so that the speed of any one roll may be automatically varied to compensate for any variations in tension that result from slight inaccuracies in the spacing of the openings in the sheet.

In the drawings, Fig. 1 is a partial side view of a machine embodying my invention; Fig. 2 is a top plan view of the machine; Fig. 3 is a section taken on the line 3—3 in Fig. 1; Fig. 4 is a wiring

diagram, and Fig. 5 is a view illustrating the manner of assembling the webs and also illustrating a finished pack; Fig. 6 is a partial side view of a machine embodying my invention but provided with a modified form of control mechanism; Fig. 7 is a diagram illustrating the electric circuits used in the modification illustrated in Fig. 6; Fig. 8 is a second view, the plane of the section being indicated by the lines 8—8 of Fig. 6; Fig. 9 is an enlarged sectional detail, as indicated by the lines 9—9 of Fig. 8; Figs. 10 and 11 are sectional details, the planes of the sections being indicated by the correspondingly numbered lines of Fig. 9.

The manifold pack with which the present machine is used may hold any number of record strips, such for example, as those illustrated in Fig. 5 at 10, 11 and 12 with interposed transfer or carbon strips 13 and 14. In the form illustrated, the bottom edges 15 and 16 of the transfer strips terminate short of the bottom edges 17 of the record strips, while the top edges 18 and 19 of the transfer strips terminate below the top edge 20 of the record sheets. Ordinarily, the record strips may contain a weakening line 21 which is disposed beneath the top edges of the transfer strips and also beneath the line 22 of adhesive material which connects the record strips to the transfer strips. There is an additional line 23 of adhesive material which connects the record strips together beyond the upper edge of the transfer strips and below the line 25 of perforations. The perforations in the record strips are used for maintaining the strips in registration during the assembling operation, but they are not required in the finished form, so provision is made for severing the narrow strip containing the perforations before the assembled webs are cut transversely into individual packs. The line of severance of the narrow strips is indicated at 26 in Fig. 5 as appearing above the adhesive line 23.

To make a pack illustrated at the left hand end of Fig. 5 the forms are withdrawn from supply rolls 30, 31 and 32 which are mounted on spindles 33, 34 and 35 respectively, upon a frame 36. Similarly, the transfer strips are withdrawn from supply rolls 37 and 38 which are mounted on spindles 39 and 40 respectively, that are carried by the frame 36. From the various supply rolls the webs extend downwardly over suitable withdrawing guiding and tensioning regulating devices until they engage a power driven belt 41 which has projections 42 along one edge thereof for engagement with the openings 25 along one edge of each record strip. The belt thus acts to maintain a constant coacting engagement with each record web from the time the first engagement is made until the assembly is complete. The belt 41 is preferably made of flexible steel or equivalent non-stretchable but flexible material.

The adhesive is applied to each record web immediately preceding its engagement with the belt 41, wherefore any slight relative motion between the webs as may be necessary to maintain accurate registration of them with the belt is not impaired because at the time of engagement of the web with the belt the adhesive has not had sufficient time to set. At the completion of the assembling operation the strip containing the perforations 25 is severed by a trimmer indicated in general at 43, and thereafter the forms may be cut into the proper length by any suitable transversely extending cutter, such as that

indicated by the power-actuated rotating cutter 44.

Although Fig. 5 shows three record web supply rolls and two transfer web supply rolls, it is to be understood that the invention is not limited to any definite number but that the machine is capable of supplying any number of multiple parts that are capable of being used in writing machines.

To facilitate the withdrawal of the various webs from their supply rolls and compensate for variations that may exist between the lengths of the different webs handled by the registering belt 41, due to variations in the distance between the perforations, the withdrawal of the various webs from their supply rolls is so controlled that compensation is made for such variations. To this end each supply roller is caused to operate normally to withdraw paper from its supply roll at a speed that will feed the webs to the registering belt 41 at a rate slightly less than the lineal speed of the belt. This difference normally keeps the webs under tension. To prevent the attainment of a tension that would tear or otherwise damage the webs, provision has been made for regulating the tension, and increasing the rate of speed at which the paper is withdrawn from the supply rolls so as to maintain the supply of paper between the withdrawing rollers and the registering belt above a predetermined minimum and hence maintain the tension on the paper below a predetermined maximum tension. Conversely, the rate of speed of withdrawal of the paper from the supply rolls is reduced as shown as soon as such supply reaches a predetermined maximum or the tension on the web reaches a predetermined minimum. In this way, compensation may be had between the supply of paper fed and the supply of paper demanded or handled by the registration mechanism and thus compensation is made for any discrepancies in the spacing of the perforations that would effect the accuracy of the registration.

In Figs. 1 to 4 the withdrawal of each web from its supply roll is accomplished by an individual electric motor 45, the speed of rotation of which is controlled by the web withdrawn thereby. Each motor 45 operates through suitable gearing 46 to actuate respective feeding rollers 47 and 48 around which the web of paper is arranged to pass. After leaving the supply roll, each record web indicated at R passes around and between the feed rollers and thence over a guide 53 and downwardly around a guide 54, over a guide 55 and thence beneath a drum 56 onto the belt 41.

To compensate for variations that may exist between the lengths of web withdrawn and the lengths of web handled by the registering belt 41, a finger 49 is employed to maintain a bight or loop R₁ in the web between the feeding roller 48 and the guide 53. The finger 49 is secured and carried on an arm 50 which is secured to a shaft 51 journaled in the frame. A spring 59 acts on the shaft to resiliently maintain the finger 49 in a loop forming position. This spring therefore, controls the tension on the web and maintains it substantially constant, the tension varying only as the finger 49 rocks about the axis of the shaft 51, thereby increasing or decreasing the pressure of the spring and thus increasing or decreasing the tension on the web accordingly.

Each motor 45 normally operates at a speed such as will withdraw the web from its roll at a slower rate of speed than the belt 41 handles the

web. Ordinarily this would soon cause the elimination of the loop R1 in the web and eventually tear the web. However, the arm 50 carries a mercury switch, which so controls the motor 45 that before the loop is eliminated, or the tension on the web increased beyond a predetermined limit, the motor speed is increased. The motor maintains such increased speed until the loop is replenished and the tension on the web accordingly decreased to a predetermined minimum.

Adhesive is supplied to the record webs preferably by means of a roller 57 which engages the web between the guides 54 and 55 and which is journaled for rotation upon an adhesive container 58. The web arrangement for each record strip and the tension regulation of the unit is the same for each strip and consequently the same reference characters have been applied to corresponding parts in each group.

To maintain uniform tension on the transfer webs which are indicated at T, and at the same time to permit continuous feeding of the webs in manifolding relationship to the record strips, a separate electric motor 60 is utilized for operating each transfer strip supply roll. Each motor is connected through suitable gearing 61 to a drive shaft 62 while the drive shaft in turn is connected through a chain belt 63 to a shaft 64 on which a roller 65 is rigidly mounted. The shaft 64 may be journaled in arms 66 which are pivotally mounted on the shaft 62, so that the roller 65 which bears against the upper surface of the transfer strip supply roll may move downwardly and progressively as the diameter of the supply roll is diminished.

Each motor 60 preferably is operated at a speed that will draw the transfer material from its supply roll at a rate slightly less than that at which the web is pulled into the assembly by virtue of its interleaved relationship with the record strips. This arrangement would normally result in the tearing of the web and so to maintain the tension within definite limits, the web extends in a bight T2, around a finger 70 on an arm 71, which in turn, is pivoted at 72 on the frame and carries a mercury switch 73 for controlling the circuit to the motor 60. From the bight, the transfer web passes over a guide 74 and thence downwardly around a guide 75, from whence it passes into interleaved relationship between the adjacent record webs. It is to be understood, however, that the transfer webs are guided laterally so as to maintain the relationship of the longitudinal edges to those of the record strips, as is indicated in Fig. 5.

While the mechanism for feeding only one transfer strip and for automatically regulating the tension of it has been described, it is to be understood that a similar mechanism is used for operating and controlling the other transfer webs, and accordingly, the corresponding parts have been designated with identical reference characters.

In Fig. 4 a wiring diagram is shown which illustrates the manner in which the mercury switch controls the speed of each web motor 40 and 60. In this illustration, the switch is indicated as being in circuit with a relay 76 which when actuated controls a switch 77 that is normally open. The closing of the switch 77 due to the decreasing of the extent of the bight caused by the fingers 49 or 70 shunts the current around a resistance 78 in the motor field and thereby increases the motor speed. The mercury switch circuit includes a source of current supply 79 while

the motor source of current supplied is indicated by the service lines 80 and 81. The increased speed of the motor is sufficient to withdraw the web from the roll at a rate faster than the peripheral speed of the assembly belt, hence the length of the bight will increase. As the length of the bight increases, the mercury switch is tilted in reverse direction and when the length of the bight reaches a predetermined maximum, the circuit through the mercury switch is interrupted. Thereupon, the shunt is cut out and the current flows again through the resistance in the motor field, as a result of which the speed of the motor is reduced to the normal rate. This intermittent operation of the motor speed assures an adequate length of material in each web bight to maintain the proper tension on the web while allowing a slight relative movement between the webs to compensate for discrepancies in the spacing of the holes therein.

In the form illustrated in Figs. 1 to 4, the belt 41 is driven by an electric motor which operates independently of those for driving the supply rolls. Accordingly in Fig. 2 a motor 85 is shown which operates through gearing 86 and 87 to actuate a shaft 88 on which pulleys 89 are rigidly mounted. Preferably there are three of such pulleys, one of which engages the belt 41 and the others of which engage belts 90 and 91 and provide a support for the webs as they are moved into manifolding relationship. It is to be understood that the belts pass around freely moving pulleys journaled in the end of the frame opposite the shaft 88.

The motor 85 may also be used for operating the cutter 44 and to this end the cutter is shown in Fig. 2 as being mounted on a shaft 92 which is connected through gearing 93 and gearing 86 to the motor. In this way, the forms may be cut into packs while the strips are being continuously assembled.

In Figs. 7 to 10 a modified form of control mechanism is illustrated, to compensate for variations between the lengths of web withdrawn from the supply roll and the length of the web handled by the registering belt 41. The general arrangement of the web feeding mechanism is much the same as heretofore described in connection with Figs. 1 to 4, and accordingly, the corresponding parts have been designated by identical reference numerals.

In the mechanism shown in Figs. 6 to 11, inclusive, the feed rollers 47 and 48, which withdraw the record strip from the supply rolls, are driven from the motor 85, which as heretofore explained, drives the cutters and registering belt 41. The motor 85 is drivingly connected with a longitudinally extending power shaft 100 by suitable gearing, not shown. This power shaft is drivingly connected with the driving member 89 which supports said registering web 41 by gearing 101.

The drive shaft 100 is also drivingly connected with the record strip and feed roll 47 and 48, and with the roller 65, which withdraws the transfer strip from its roll. As shown in the drawings, and especially Figs. 6 and 7, the power shaft 100 is drivingly connected by a pair of bevelled gears 102, and with a shaft 103, which in turn is drivingly connected with the driven shafts 104 of a pair of change speed transmission mechanism 106 and 107, by a driving chain 108. The driving shafts 109 of the change speed mechanism 106 is connected by suitable sprockets and a driving chain 110 with a sprocket 111, secured to the shaft 112 of the feed roll 48. The feed roll 47 may be mounted as shown in Fig. 6 on a pair of

brackets or arms 113 pivotally mounted on the frame as at 114, and so arranged as to permit the roll 47 to rest by gravity on the roll 48, and thus maintain the web in contact with the driving roll 48. The driving shaft 115 of the change speed mechanism 107 is connected by a driving chain 116, with a sprocket 117, secured to a shaft 118, which drives the roll 65 as heretofore described in connection with Figs. 1 to 4.

The change speed mechanisms 106 and 107 are arranged so that they normally function to drive the feed rollers 48 and 65 at a speed which withdraws the web material from their respective supply rolls at a rate slightly slower than the rate of travel of the belt 41. As heretofore explained in connection with Figs. 1 to 4, such condition would tend to deplete or shorten the loops T2 and R1 Fig. 6. When any loop has been depleted at a predetermined extent, its transmission mechanism is actuated to increase the speed of its respective driving roller 48 or 65 to such an extent that it will feed material from its respective supply rolls at a rate faster than the rate of travel of the belt 41, thereby replenishing the loops in the web material. When such loops have been restored, the transmission mechanism is automatically actuated to decrease the speed of its withdrawing rollers 48 or 65 restoring it to its normal operating speed.

The transmissions 106 and 107 are best illustrated in Figs. 9 to 11, inclusive, and as both units are identical, only the unit 106 will be described in detail. As shown, the transmission mechanism comprises a casing 120, in which the driven shaft 104 and the driving shaft 109 are rotatably mounted in anti-friction bearings 121. The shaft 104 is constantly driven by the motor 85 as heretofore explained. Drivably secured to the shaft 104 is a gear 125, which constantly meshes with a gear 126, rotatably journaled on the driving shaft 109. The gear 126 is connected by a roller clutch formation 127, with a gear 128 secured to the driving shaft 109 as by a pin 129. When the transmission is operating normally, the arrangement is such that the power is transmitted from the shaft 104 through gears 125, 126, the clutch 127 to the shaft 109.

The clutch 127 is the usual overrunning roller clutch and comprises, as shown, in Figs. 9 and 10, an external ring 130, formed on the gear 126 and into which the hub 131 of the gear 128 extends. The periphery of this gear hub 131 is notched as indicated at 132, and in these notches rollers 133 are placed. When the gear 126 rotates in the direction of the arrow, as shown in Fig. 9, the rollers are wedged between the ring 130 and the hub 131 of the gear 128, thereby providing a driving connection to the shaft 109.

When the supply of material in the loops caused by the fingers 49 and 70 has been depleted a predetermined amount, the transmission is actuated to increase the speed of the driving shaft 109. As shown in Figs. 10 and 11, a gear 160 is rotatably mounted on the driven shaft 104 of the transmission unit, and is provided on its face with a clutch formation 161, arranged to be moved into and out of engagement with a similar clutch formation 162 on the face of the gear 125, heretofore described. When the tension on the web is increased a predetermined amount, or the bight caused by the roller 49 or 70 as the case may be, is decreased a predetermined amount, as heretofore described, the gear 160 is automatically shifted axially causing the clutch members 161 to engage the clutch member 162 and thereby drive the gear 160 and

the gear 128 which is in constant meshing engagement therewith. Inasmuch as the ratio between the various gears is such that the gear 160 will drive the gear 128 at a faster rate of speed than it is driven by the gears 125 and 126, the shaft 109 will be rotated at a higher rate of speed. The overrunning clutch 127, however, permits such increased speed of the gear 128 without disturbing the normal driving connections heretofore described.

The clutch formation on the gear 160 is shifted into and out of engagement with a clutch formation of the gear 125 by a shifter fork 140 mounted on a plunger 141 of a solenoid 142. This fork engages an annular recess 143 in the hub of the gear 160. The solenoid 142 is controlled by a pair of mercury switches, which are operated automatically consequent upon the movement of the loop forming finger 49, or 70, as the case may be.

The electrical circuits employed to operate the solenoid 142, are best illustrated in Fig. 7. As there shown, a disc 145 is mounted on the pivot 51, and is secured to the arm 50. This disc carries a pair of mercury switches 146 and 147. When the transmission is operating normally, that is at reduced speed, the electrical circuit is as shown in Fig. 7. When however, finger 49, for instance, is drawn upward to the position indicated by the dotted lines 49a, the mercury switches 146 make a contact between the power line 150 and the line 151, leading to the mercury switch 147, which at this time bridges the contact between the line 151 and the line 152 leading to the solenoid 142, which in turn is connected by a line 157 to the other power line 154. As the line 152 is energized, the solenoid 155 in parallel with the solenoid 142 is also energized, thereby closing a switch 156 between the lines 152 and the line 151. The closing of the switch 156 by-passes the mercury switch 147, thus maintaining the circuit to the solenoid 142, until such time as the finger 49 swings to the position indicated by the dotted lines 49b in Fig. 7, at which time the circuit between the power line 150 and line 151 is broken by the mercury switch 146. This, therefore, releases the solenoids 142 and 155, whereupon a suitable spring 158 returns the switch 156 to its normal or open condition, and a spring 159 (Fig. 10) restores the plunger 141 of the solenoid 142 to its normal condition, reducing thereby the speed of the driving shaft of the transmission unit.

From the foregoing it may be seen that either individual motors may be used to withdraw the webs from their respective supply rolls and so control the speed of such motors, as to cause them to maintain a sufficient supply of material between the supply rolls and the belt 41 to compensate for any variations heretofore explained, or, on the other hand, a single motor may be utilized for driving the entire apparatus at interposed suitable chain speed gearing, between this motor and the driving rolls which withdraw the material from the supply roll.

By feeding the record and transfer strips downwardly, the material is withdrawn from the webs in a manner that facilitates the use of a tension regulator on each web. The regulation of the tension in turn assures continuous feeding of the material at a high rate of speed without endangering the webs through a tearing operation. Furthermore, the use of individual motors for withdrawing the material from each supply roll and the use of a separate motor for operating the assembly belt enables each web to be accu-

ately controlled until it reaches the assembly belt and thereafter to be maintained in varying relationship to the other webs until the assembly is completed. Thus a method and apparatus have been provided which has overcome the difficulty inherent in discrepancies which occur in various webs that are intended to be assembled.

Claims:

1. A method of making a manifold assembly comprising withdrawing record and transfer strips in a downward direction from supply rolls, guiding the strips onto the upper reach of a moving belt and into interleaved relationship thereon, and maintaining an individual driving relationship between the belt and each of the record strips continuously from the time each strip leaves the supply roll and is fed onto the belt until the completion of the assembly operation.

2. A method of making manifold forms comprising feeding record and transfer strips of stretchable material into interleaved registration with other strips on a conveying and assembling belt, moving the webs independently of the belt and varying the rate of movement of the webs with respect to the speed of the belt so as to maintain the tension on each web within predetermined limits.

3. A method of maintaining within predetermined limits, the tension on a web of stretchable material that is fed into registration with other strips in a manifold machine comprising pulling the web at spaced points and varying the rate at which the web is moved at one of the points in order to maintain the tension of the web at the other point within predetermined limits.

4. A method of maintaining the tension within predetermined limits on a strip of stretchable material that is fed from a supply roll into registration with other strips on a manifold machine, comprising forming a portion of the web into a bight and utilizing variations in the depth of the bight for varying the rate at which the web is withdrawn from the roll.

5. A machine for interleaving record and carbon strips, comprising in combination a frame, a belt journaled thereon, means for moving the belt, means on the frame for supporting rolls of record and transfer material, means on the belt for coacting with the record strips to move them at a uniform rate, other means on the frame for feeding the webs independently of the belt, tensioning means for the webs and mechanism controlled by movement of the webs for varying the rate of movement of the tensioning means.

6. A machine for assembling record and transfer strips into manifold forms comprising in combination a belt, means for supporting record and supply rolls above the belt, means for guiding the record and transfer material from the rolls onto the belt, interengaging means on the belt and record strips for maintaining the record strips in registration tensioning means for the strips and means actuated by variations in said tensioning means for varying the rate at which the strips are withdrawn from the rolls whereby the tension on the strips adjacent the belt is maintained within predetermined limits.

7. A machine for making manifold forms comprising in combination, a frame, a belt having projections extending along one edge thereof, means for moving the belt, rolls of record and transfer material journaled on the frame in tandem relationship above the belt, means for guid-

ing the strips into interleaved relationship upon the top reach of the belt, the record strips having openings along one edge thereof for coacting with the projections on the belt to maintain them in registration, all of said strips having a bight formed therein, a member resting on each bight to tension the strip, said member being movable in accordance with the variations in depth of the bight and mechanism actuated by the movement of each member for controlling the speed at which the strips are withdrawn from the roll.

8. In a manifold machine, the combination of a frame, a belt journaled therein, an electric motor for operating the belt, means for journaling rolls of record and transfer material on the frame, means for guiding material from said rolls onto the belt, and an electric motor acting on each web independently of the belt for moving them into assembled relationship, and means acting upon each of the last-named motors to tension the respective webs in relationship to the pull exerted by the belt.

9. A method of feeding a web of stretchable paper material from a supply roll to a manifold folding apparatus, comprising withdrawing the web from the supply roll at a slower rate of speed than the web is handled by the apparatus, increasing the speed of withdrawal when the length of web between the supply roll and apparatus reaches a predetermined minimum, and reducing such speed when the supply reaches a predetermined maximum, to thereby regulate the tension on the paper material.

10. A method of making manifold forms comprising feeding record strips of stretchable paper material from supply rolls into interleaved relationship onto a conveying assembling member, varying the rate of movement between the webs with respect to the speed of movement of the assembling member so as to maintain the supply of each web between its supply roll and said member within predetermined limits, to thereby regulate the tension on the paper material.

11. A method of making manifold forms comprising withdrawing record strips of stretchable paper material from supply rolls and guiding the withdrawn strip onto a conveying and assembling apparatus, varying the rate of speed of such withdrawal to maintain a surplus of material within predetermined limits between the supply roll and the assembling apparatus, to thereby regulate the tension on the paper material.

12. A method of feeding a perforated web of stretchable paper material from a supply roll to a moving member engaging the perforations in the web, comprising withdrawing the web from the supply roll independently of the perforations in the web, maintaining a supply of web material between the supply roll and the moving member by increasing the speed of withdrawal when said supply reaches a predetermined minimum and decreasing the speed of withdrawal when the supply reaches a predetermined maximum, to thereby regulate the tension on the paper material.

13. A machine for assembling record and transfer webs into manifold forms comprising means for registering a plurality of superimposed webs by engaging perforations in the webs, means for supporting record supply rolls, means for guiding the record and transfer material from the rolls onto the first named means, means to tension the webs and means actuated by variations in the tension of the web between the rolls and

the first named means for varying the rate of speed with which the webs are withdrawn from the supply rolls whereby errors in the distance between perforations may be compensated for.

- 5 14. A machine for assembling record and transfer strips into manifold forms comprising means for progressing and registering a plurality of superimposed strips by engaging perforations in the respective strips, means to drive said registering means, means for supporting record supply rolls, means for guiding the record material from the rolls onto the first named means, 10 tensioning means for the strips and means driven by said driving means and controlled by variations in the tension of said strip material between the rolls and the first named means for 15 varying the rate at which the strips are withdrawn from the supply rolls whereby errors in the distance between perforations may be compensated for. 20

- 15 15. A machine for making manifold forms comprising in combination, a frame, a belt having projections extending along one edge thereof, means for moving the belt supply rolls of record and transfer material journaled on the frame in 25 tandem relationship above the belt, means for withdrawing the strips from the supply rolls at a slower rate of speed than the peripheral speed of said belts, means for guiding the withdrawn

strips into interleaved relationship upon the top reach of the belt, the record strips having openings along one edge thereof for coacting with the projections on the belt to maintain them in registration, all of said strips having a bight 5 formed therein, a member resting on each bight to tension the strips, said member being movable in accordance with the predetermined decrease in depth of the bight and mechanism actuated by such movement for increasing the speed at which 10 the strips are withdrawn from the rolls to a higher rate of speed than the peripheral speed of said belt.

16. In a manifolding machine, the combination of a frame, a belt journaled therein, an 15 electric motor for operating the belt, means for journaled rolls of record and transfer material on the frame, means for guiding material from said rolls onto the belt, individual feeding means acting on each web for moving them into 20 assembled relationship, and an individual change speed transmission drivingly connecting said motor with respective feeding means, and means acting upon each of said feeding means to tension the respective webs in relationship to the 25 pull exerted by the belt.

MINNIE L. FULK,

Executrix of the Estate of George L. Fulk, Deceased.