April 11, 1939. J. B. FULK 2,154,157

MEANS FOR MAKING MANIFOLD FORMS

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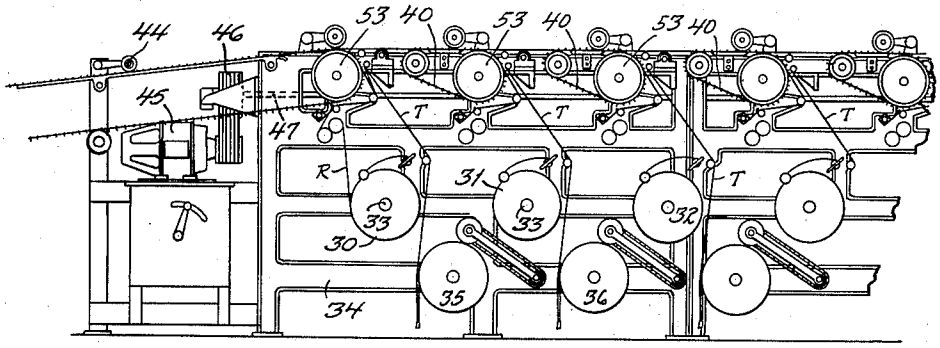


FIG. 1

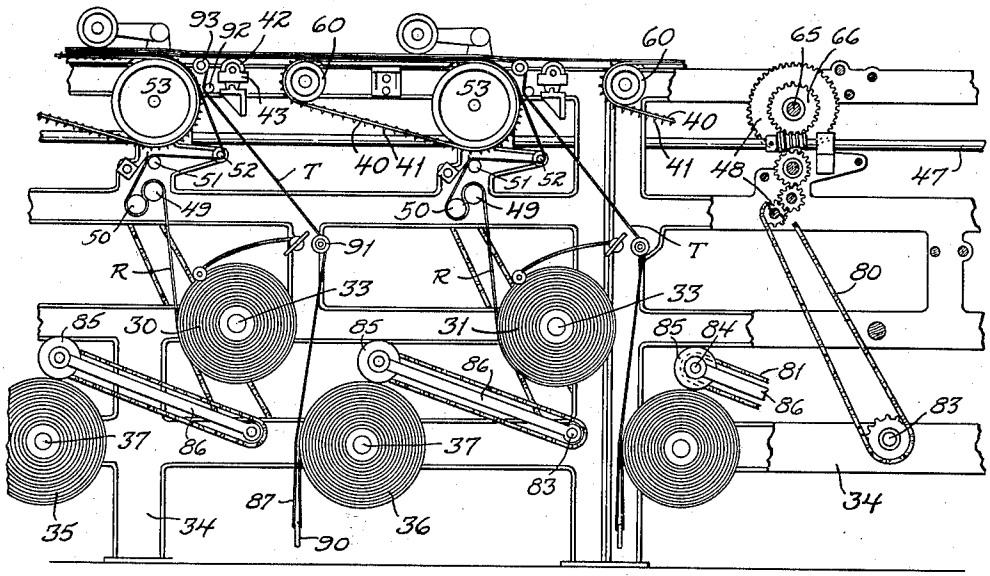


FIG. 2

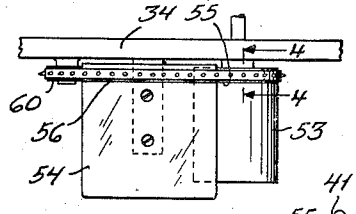


FIG. 3

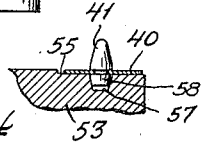


FIG. 4

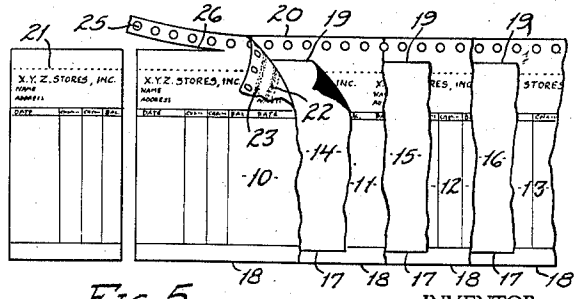


FIG. 5

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MEANS FOR MAKING MANIFOLD FORMS

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13 Claims. (Cl. 270—52)

This invention relates to an improved method and apparatus for making manifold register forms or packs in which carbons are utilized for making a record on superimposed record strips and which carbons are so arranged to 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 or strips interleaved with transfer sheets to form a single unit.

One form of apparatus heretofore developed for making a manifold pack is illustrated in the copending application of George L. Fulk, Serial No. 99,104, filed September 2, 1936, now patented, Number 2,144,331, dated Jan. 17, 1939. In such apparatus, the rolls of record paper have been lead 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 distance between the holes on different strips may vary slightly due to different weights or kinds of paper or to differences in climatic condition at the time the strips are perforated, and in view of the fact that the drums are spaced apart, 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 an improved 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, my invention contemplates a method and apparatus by means of which a machine may run faster than machines heretofore used for this purpose and in which the supply rolls may be conveniently mounted below the interleaving mechanism thus permitting convenient access to such mechanism and to the strips being interleaved.

Heretofore it has been proposed to assemble the strips by means of a single elongated belt. While a single belt is satisfactory where the machine is constructed for a definite number of webs, it is desirable to construct a machine which is suitable for any number of webs, and in such instances it is advantageous to construct the machine in units which may be added as desired. This, therefore, is another object of the present invention.

An object of the present invention is to provide an improved interleaving apparatus which will enable the machine to be operated at higher speeds than heretofore and at the same time increasing the accuracy of registration of the record strips despite irregularities in the spacing of the perforations in the strips.

Other objects and advantages of my invention will become more apparent from the following specification which refers to a preferred embodiment of the invention illustrated in the accompanying drawing. The essential novel features of the invention will be summarized in the claims.

In the drawing, Fig. 1 is a partial side view of a machine embodying my invention; Fig. 2 is a fragmentary elevation similar to Fig. 1, but on an enlarged scale, certain parts being broken away to more clearly illustrate the driving mechanism; Fig. 3 is a fragmentary plan view of the mechanism; Fig. 4 is a sectional detail as indicated by the lines 4—4 on Fig. 3; and Fig. 5 is a view illustrating the manner of assembling the webs and also illustrating a finished pack.

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, 12 and 13, with interposed transfer or carbon strips 14, 15 and 16. In the form illustrated, the bottom edges 17 of the transfer strips terminate short of the bottom edges 18 of the record strips, while the top edges 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 between the top edges of the transfer strips and also beneath a 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 of perforations 25.

The perforations 25 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 strip 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 respective spindles 33 carried by a frame 34. Similarly, the transfer strips are withdrawn from supply rolls 35 and 36 which are mounted on re-

spective spindles 37 also mounted on the frame 34. From the various supply rolls the webs extend upwardly over suitable feeding, guiding and tension regulating devices until they engage respective power driven belts 40 which have projections 41 for engagement with the openings 25 along one edge of each record strip. The belts thus act to maintain a constant registration of the record strips, one with the other as they pass through the machine.

The adhesive is applied to each record web immediately preceding its engagement with the belt 40 of the next web, wherefore any slight relative motion between the webs as may be necessary to maintain accurate registration of them with the belts is not impaired because at the time of engagement of the web with the belt the adhesive has not had sufficient time to set. This adhesive is supplied to the record webs preferably by a roller 42 which engages the underside of the web just prior to the engagement of such web by the succeeding web. The roller 42 is journalled for rotation upon the adhesive container 43, so that the lower portion of the roller is submerged in the fluid adhesive in the container.

At the completion of the assembling operation, the strip containing the perforations 25 is severed from the assembly by a trimmer indicated in general at 44, and thereafter the forms may be cut into the proper length by any suitable transversely extending cutter.

While I have shown, in Fig. 2, three record web supply rolls and two transfer web supply rolls, it is to be understood that I am 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.

In the mechanism shown, an electric motor 45 operates through a power transmission belt 46, power shaft 47, and suitable gearing 48 to actuate feeding rolls 49 and 50 around which the web of record strips is arranged to pass. After leaving the supply roll, each record web indicated at R passes around the feed rolls, and thence around guides 51 and 52. After passing the guide 52, the web R extends upwardly over a drum 53 and thence horizontally to the next drum 53 across a stationary supporting table 54 carried by the frame 34.

The present invention is especially concerned with the registration of the record strips one with the other as accomplished by the belts 40 heretofore mentioned. Those belts 40 are best illustrated in Figs. 2 and 3. As there shown each belt comprises a continuous looped band of flexible but non-stretchable material. The belts or bands 40 are comparatively narrow being in fact, only wide enough to support the projections 41 and maintain them in an upstanding position when the belt is stretched taut. Each belt is looped at one end about its respective drum 53 and at its other end is looped around a roll 60. These belts or bands are positioned adjacent the inner side of the respective drums 53 and their upper reaches pass across and are supported by the respective tables 54 heretofore described.

The distance between the belts 40 is comparatively small and I have found that even though the record strips are not engaged by belt projections over such distances, accurate registration is nevertheless maintained. This is due to the fact that the accumulation of errors in the spacing of the perforations for such a short distance is never great enough to prevent the restoring of the registration of the record strips by the projections 41 of the next succeeding belt 40 engaged thereby.

If desired the drums 53 as well as the rollers 60 may be provided with annular peripheral recesses 55 to receive the belts 40 and thus maintain the belts in proper alignment. The tables may also be recessed as at 56 whereby the belts may be set below the surface of the drums and tables, thus causing the drums and tables to form the entire support for the record strips, thereby freeing the belt from all supporting strains.

Each belt or band 40 is driven in synchronism with the other bands 40. As indicated in Fig. 2, each drum 40 is drivingly secured to a shaft 65 journalled in the frame 34. Each shaft 65 is driven from the drum shaft 47 by the gearing 48 heretofore described. One of the gears of such gearing, namely the gear 66 is drivingly secured to the respective drum shaft 65.

To insure accurate registration, the projections 41 on each belt 40 are spaced the same predetermined distance from the other projection on the same belt, and are spaced a multiple of such distance from the projections of each other belt. To insure the maintenance of the spacings of the projections of one belt relative to the other belts, each drum 53 is provided with radially extending openings 57 which are interengaged by projections 58 on the inner surface of the belts. As the drums are each positively driven from the same power shaft, namely the shaft 47, the interengagement of the projections 58 of the belts with the openings 57 of the drums maintain the desired relationship between the various belts.

To feed the transfer webs, which are indicated at T, I couple the gearing 48, through drive chains 80 and 81, to a shaft 84 on which a roller 85 is rigidly mounted. The shaft 84 may be journalled in arms 86 which are pivotally mounted on a shaft 83, so that the roller 85 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 transfer web T passes from its supply roll downwardly and thence upwardly forming a loop 87 in which a weight 90 is positioned to tension the transfer material. From the loop, the transfer web passes over a guide 91, and thence around guides 92 and 93 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.

By utilizing a series of narrow bands to interengage the openings in the record strips, I maintain registration of the strips throughout the length of the machine despite slight irregularities in the spacing of the openings of one strip relative to the spacing of the openings in the other strips. I likewise permit the supply webs to be mounted below the plane of interleaving, thus decreasing the size of the machine and permitting interleaving on a substantially exposed table top whereby the visibility of the record strips while being interleaved is substantially unrestricted. Likewise, by so arranging the belts that they do not support the record strips as they progress through the machine, I minimize the strains on the belt, I also decrease the strains on the belt by making the belt compara-

tively narrow and thus reducing its weight as well as the tendency of the belt to distort or elongate thereby increasing the speed of the interleaving operation while increasing the accuracy of registration and safety factor of the mechanism.

I claim:

1. A machine for making manifold forms comprising a frame, means on the frame for supporting rolls of record material, a plurality of spaced belts for receiving the webs from said rolls and means for engaging the webs throughout the linear reach of the belt means to guide said webs onto the belts through the spaces between the belts, and means for simultaneously progressing the belts to move the webs into interleaved relationship.

2. A machine for making manifold forms comprising a frame, means on the frame for supporting rolls of record material, means to withdraw webs from said rolls, aligned but spaced stationary supports for said webs and on which the webs are interleaved, means to guide the withdrawn webs onto said supports through the space between the supports, an individual means movable across each respective support to engage and progress the webs throughout their linear travel thereacross, and means to simultaneously progress said last named means.

3. A machine for making manifold forms comprising a frame, means on the frame for supporting rolls of record and transfer material, means to withdraw webs from said rolls, aligned but spaced stationary supports for said webs and on which the webs are interleaved, means to guide the withdrawn webs onto said supports, individual endless belts looped around each support to engage and progress the webs throughout their linear travel thereacross, and means to simultaneously drive said belts.

4. A machine for interleaving record and carbon strips, comprising in combination a frame, a plurality of spaced belts journalled therein, means for moving said belts simultaneously, means on the frame for supporting rolls of record and carbon strips, and means on each belt for coacting with the record strips throughout the linear reach of the belt and to move them at a uniform speed.

5. A machine for interleaving record and carbon strips, comprising in combination a frame, a plurality of spaced belts journalled therein, means for moving said belts simultaneously, means on the frame for supporting rolls of record and carbon strips, means on each belt for coacting with the record strips throughout the linear reach of the belt and to move them at a uniform rate of speed, and means other than said belts to support the strips while they are being moved into interleaving relation by said belts.

6. A machine for interleaving manifold forms including perforated record strips and transfer strips comprising a frame, a plurality of spaced belts journalled in said frame, each belt having projections to interengage with the perforations in the record strips throughout the linear reach of the belt and means to progress said belts simultaneously, said last named means including a series of rollers and means to simultaneously drive said rollers.

7. A machine for interleaving perforated record strips comprising in combination a frame, a plurality of spaced belts journalled therein, means for moving said belts simultaneously, means on the frame for supporting rolls of record and carbon strips beneath said belts, means to guide the strips upwardly onto the belts through the spaces between the belts, means on each belt for coacting with the perforations in the record strips throughout the linear reach of the belt and to move them at a uniform rate of speed, and means other than said belts to support the strips while they are being moved into interleaving relation by said belts.

8. A machine for interleaving manifold forms including perforated record strips and transfer strips comprising a frame, a plurality of spaced belts journalled in said frame, each belt having projections to interengage with the perforations in the record strips throughout the linear reach of the belt, means to feed the webs through the spaces between the belts and into position on the belts, means to progress said belts simultaneously, said last named means including a series of rollers having spaced openings, and means to simultaneously drive said rollers, and a series of spaced projections on each belt adapted and arranged to interengage the openings in respective rollers to progress the belts.

9. A machine for making manifold forms comprising a frame, means on the frame for supporting rolls of perforated record material, a series of pairs of rollers, a plurality of spaced belts for receiving the webs from said rolls, each of said belts being looped about one pair of rollers, means to guide said webs onto the belts, said belts having projections being adapted to interengage the perforations in said strips throughout the linear reach of the belt, and a common operating means for one roller of each pair of rollers.

10. A machine for making manifold forms comprising a frame, means on the frame for supporting rolls of perforated record material, a series of pairs of rollers, one roller of each pair having spaced openings in its periphery, a plurality of spaced belts for receiving the webs from said rolls, each of said belts being looped about one pair of rollers, means to guide said webs onto the belts through the spaces between the belts, said belts having two sets of projections, one set being adapted to interengage with the openings in the respective roller and the other set being adapted to interengage with the perforations in said strips, throughout the linear reach of the belt and means for simultaneously rotating the rollers to cause the belts to move the webs into interleaved relationship.

11. A machine for making manifold forms comprising a frame, means on the frame for supporting rolls of perforated record material, means to withdraw webs from said rolls, aligned but spaced supports for said webs and on which the webs are interleaved, means to guide the withdrawn webs onto said supports, an individual narrow endless band looped about each support to progress the webs thereacross, means projecting from said belts to interengage the perforations in said material throughout the linear reach of the belt, and means to simultaneously drive said belts.

12. A machine for making manifold forms comprising a frame, means on the frame for supporting rolls of perforated record material, means to withdraw webs from said rolls, aligned but spaced supports for said webs and on which the webs are interleaved, means to guide the withdrawn webs onto said supports through the space between the supports, an individual narrow endless band looped about each support to progress the webs thereacross, said supports being recessed to receive the said belts, means projecting from

said belts to interengage the perforations in said material throughout the linear reach of the belt, and means to simultaneously drive said belts.

13. A machine for making manifold forms comprising a frame, means on said frame for supporting rolls of perforated record strips and rolls of transfer material, a series of spaced strip supporting units mounted above the rolls, each unit comprising a stationary table having a drum at one end thereof and a roller at the other end thereof, each unit being provided with an individual narrow looped belt having projections thereon to engage the perforations in the record strips throughout the linear reach of the belt and being looped around its respective drum and roller, one stretch of such belt passing across said support and laying below the general plane of the support, means to withdraw the strip from the rolls, means to guide the withdrawn strips upwardly between said units and across the drums and supports thereof, a common driving means for said drums, and interengaging means on said belts and said drums whereby registration of the various strips may be maintained.

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