

Dec. 5, 1933.

C. W. BRENN

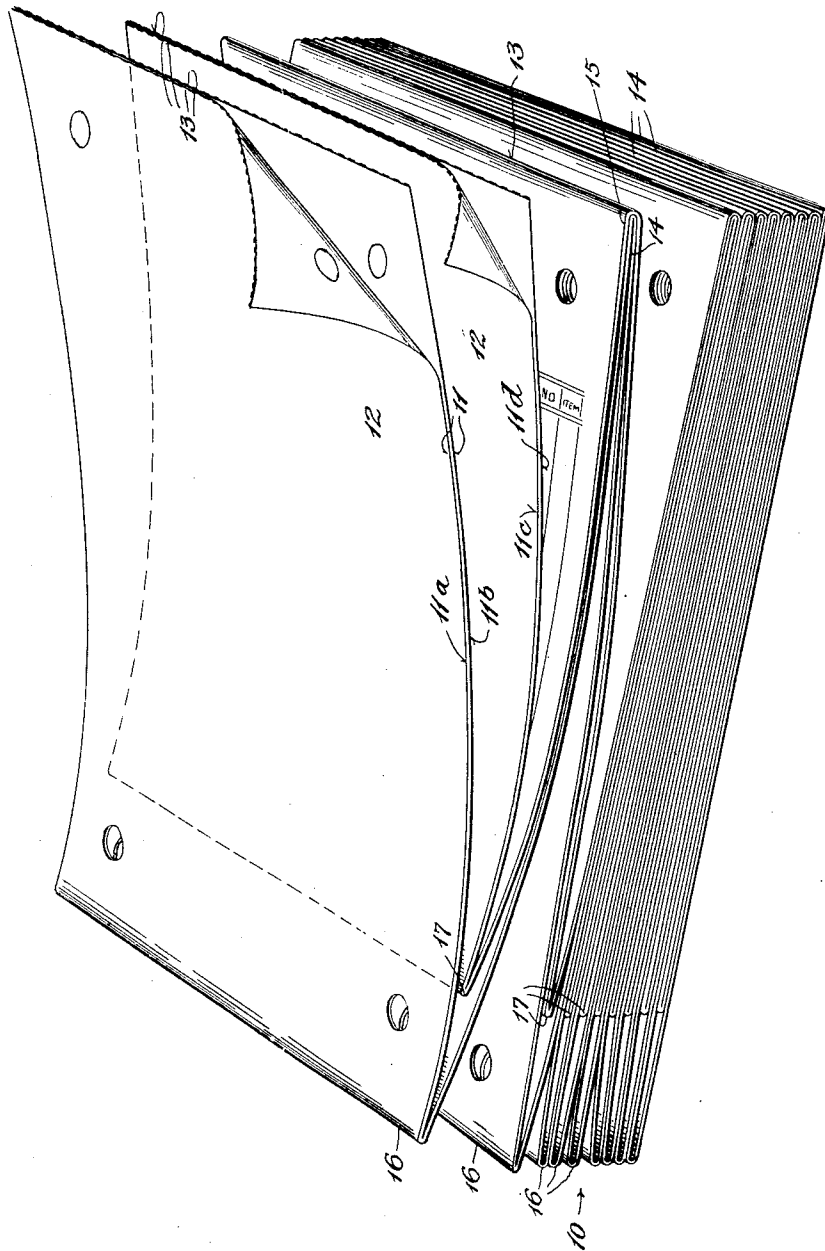
1,938,536

FOLDING MACHINE

Original Filed Feb. 2, 1931

3 Sheets-Sheet 1

Fig. 1.



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3 Sheets-Sheet 2

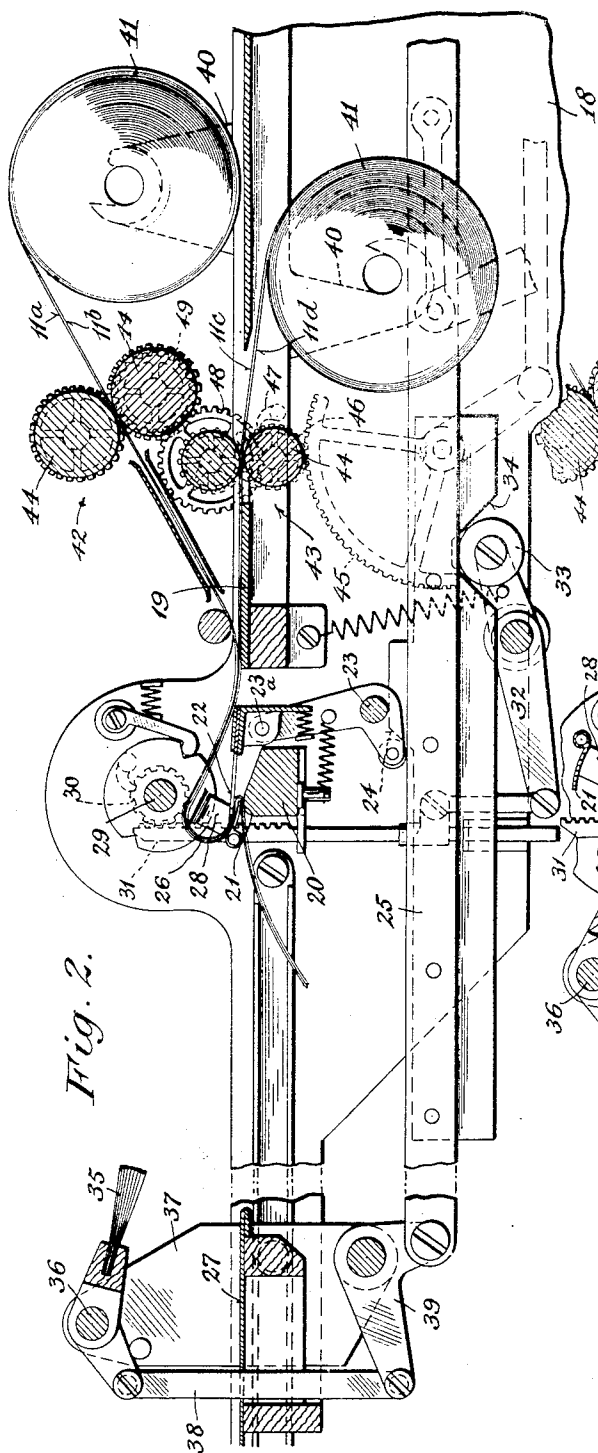


Fig. 2.

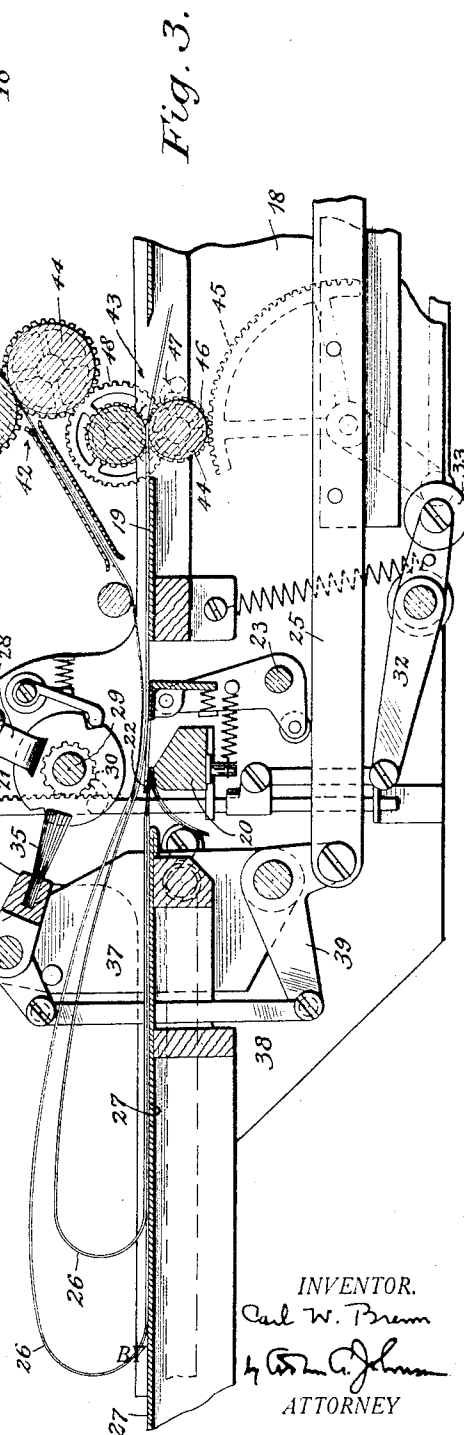


Fig. 3.

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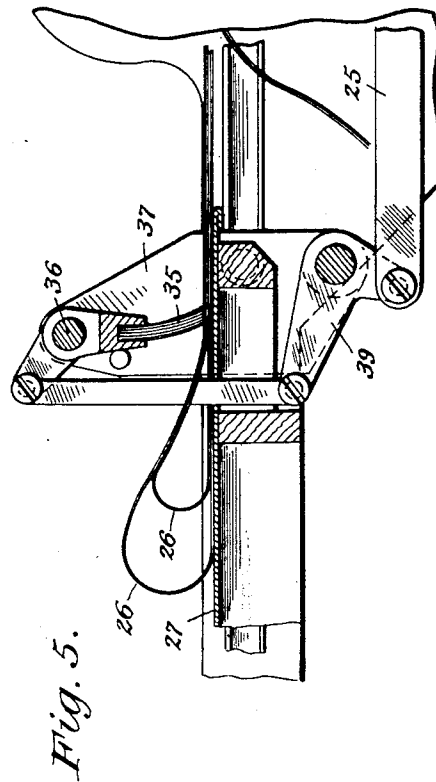
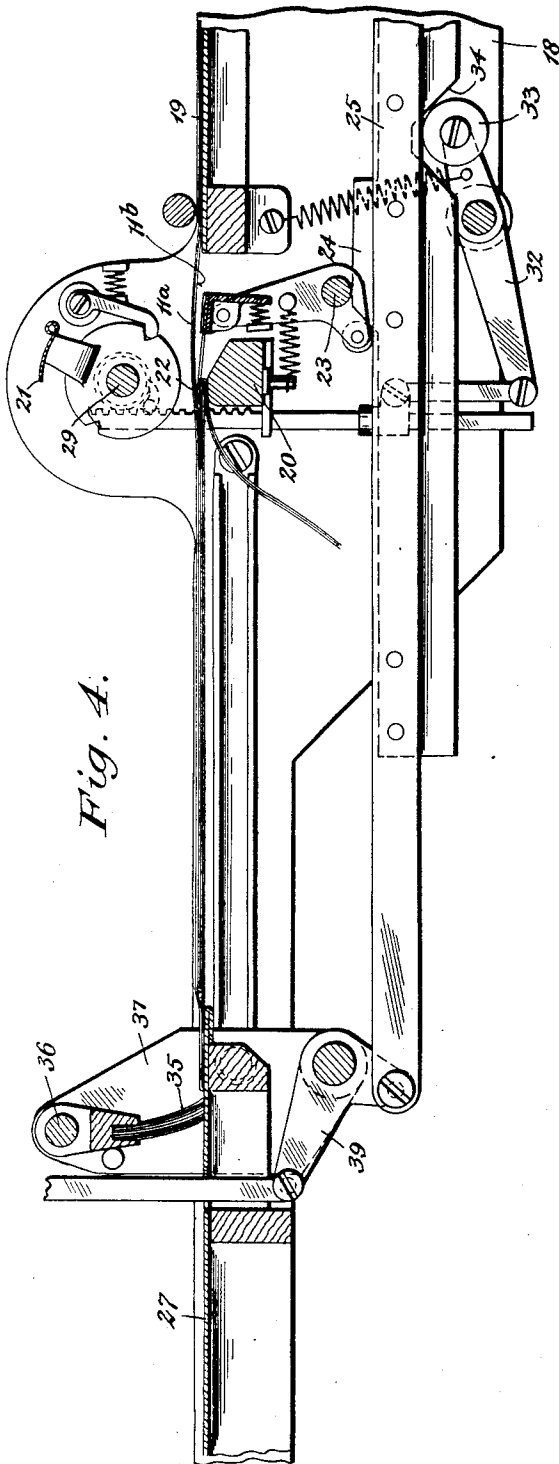
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FOLDING MACHINE

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UNITED STATES PATENT OFFICE

1,938,536

FOLDING MACHINE

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Application February 2, 1931, Serial No. 512,761
Renewed March 3, 1933

10 Claims. (Cl. 270—39)

This invention relates to machines for folding strips of indefinite length in zig-zag fashion to form a pile.

In my copending application, Serial No. 5 319,315, filed November 14, 1928, now matured into Patent No. 1,805,161, issued May 12, 1931, I have disclosed a folding machine which without adjustment will fold a wide variety of different length sheets in zig-zag fashion, the 10 length of fold being controlled by the distance of advancement of the strips and not depending upon any timing of the folding mechanism. To obtain this result, the folding machine is provided with separate means for forming the 15 right-hand and left-hand folds of the pile.

An object of the present invention is to improve the folding machine disclosed in my application aforesaid so that a plurality of superpositioned strips may be fed and folded in col- 20 lated form with the leaves or layers of the several strips having different lengths, thereby permitting the production by machine of the manifolded pack described and claimed in my copending application, Serial No. 300,680, filed 25 August 20, 1928, now Patent No. 1,848,459, issued March 8, 1932.

This is accomplished in the form of the invention disclosed herein by providing a plurality of feed mechanisms, one for each strip or set of 30 strips of different length and so advancing the strips by these separate feed mechanisms that the points of fold in one direction on all of the strips lie in registry just prior to the formation of the said fold, while the folds in the other di- 35 rection fall where they may depending upon the lengths of the folds or layers of the several strips.

Other features and advantages will herein- 40 after appear.

In the accompanying drawings which illus- 45 trate my present invention—

Figure 1 is a perspective view of a pile of manifolded strips which can be made on the 50 folding machine of the present invention.

Fig. 2 is a sectional view through the fold- 55 ing machine showing the separate feeding devices and the large or jumbo rolls of printed strips which are to be superposed and folded, the parts of the folding machine being shown in positions which they occupy just after the right-hand fold has been formed.

Fig. 3 is a view similar to Fig. 2, showing the strips at the end of the strip-feeding operation and just before the device for producing the 55 right-hand folds begins to operate.

Fig. 4 is a view like Fig. 3 of the folding mechanism, showing the left-hand folds formed.

Fig. 5 is a similar view of part of the folding mechanism with the means for forming the left-hand fold in position between those shown in 60 Figs. 3 and 4.

The machine of the present invention is intended to make a zig-zag folded pack or stack 10 of mainfolding strips 11, each of which contains a succession of printed forms or leaves 12 65 between each adjacent two of which there is a line of perforations 13 along which strips 11 are folded alternately after being superposed to form the pack 10.

As pointed out in my application Serial No. 70 300,680, filed August 20, 1928, now Patent No. 1,848,459, issued March 8, 1932, it is sometimes desirable to have some of the leaves or forms 12 shorter than others to save paper which is not 75 needed on some of the leaves, and accordingly as shown, the strips 11a and 11b have forms 12 of greater length than the strips 11c and 11d, and hence both the right and left-hand folds of the pile 10 cannot all be superposed and in 80 registry.

In my said copending application, Serial No. 300,680, now Patent No. 1,848,459, issued March 8, 1932, I have disclosed the method of manu- 85 facturing the pack shown in Fig. 1 herein which consists in having the forms of one length to form a zig-zag pile separately fold the strips 85 having forms of different length and then collating the folded strips so that the folds extending in one direction in one strip or set of strips are nested with the folds extending in the same 90 direction in the other folded strip or sets of strips, so that as shown in Fig. 1, the right-hand folds 14 in the strips 11a and 11b are nested with the right-hand folds 15 of the 95 strips 11c and 11d, while the left-hand folds 16 of the strips 11a and 11b are out of registry and located beyond the left-hand folds 17 of the strips 11c and 11d.

According to the present invention, this manifolded pile or pack which is described and 100 claimed per se in my said copending application, Serial No. 300,680, now Patent No. 1,848,459, issued March 8, 1932, may be made on the folding machine disclosed in my Patent No. 1,805,161 or in my copending application Serial No. 392, 105 540, filed September 14, 1929, which are, as shown herein, improved so that they may make this pile of strips.

Accordingly, the folding machine disclosed herein is for the most part like that shown in 110

my Patent No. 1,805,161 and my application Serial No. 392,540, to which reference should be had for a more complete understanding of the folding mechanism proper. Suffice here to say
 5 that the folding machine comprises a base 18 having a table 19 over which the strips to be folded are fed in superposed relation. In advance of this table 19, there is a ledger bar 20 and cooperating with the ledger bar is a straight
 10 edge 21 over which the right-hand folds are formed in the strips 11 by a presser bar 22 fulcrumed at 23 and actuated at the proper time by a cam 24 on a reciprocating bar 25.

After the formation of the right-hand folds,
 15 as shown in Fig. 2, the strips 11 are fed so that a loop portion 26 rolls out on a table 27 until the feeding operation is concluded, as shown in Fig. 3. Immediately following the formation of the loop 26, as shown in Fig. 2, and
 20 the formation of the right-hand fold by the presser bar 22, the straight edge 21 is withdrawn from the fold and assumes the position shown in Fig. 3. For this purpose, the straight edge is mounted on an arm 28 on a shaft 29 having
 25 a gear 30 meshing with a rack 31 operated by a lever 32 having a roller 33 engaged by a cam 34 on the reciprocating bar 25.

After the loops 26 have been completely formed as shown in Fig. 3, the left-hand folds
 30 are formed by a wiper or brush 35 mounted on a shaft 36 carried by arms 37 on the reciprocating paper table 27 and which is brought down into engagement with the paper by a link 38 connected to the brush and at its other end to
 35 a bell crank 39 connected to the reciprocating bar 25. In its operation, the bar 25 first moves the brush into contact with the paper and then drives the reciprocated paper table to the left as viewed in Figs. 2 to 5, causing the brush to
 40 draw the paper tautly to the left so that when the lines of perforations 13 are reached the paper being thereby weakened will easily and accurately fold along said lines. The intermediate position in this travel of the brush 35
 45 is shown in Fig. 5, while the position which the brush occupies after the left-hand folds have been formed is shown in Fig. 4, where the brush has disengaged the paper and where the continued movement of the paper table 27 will
 50 allow the folded portion of the paper to fall on the previous folds below. At the same time this last-referred to operation occurs, the presser bar 22 recedes from its position shown in Fig. 4, and allows the right-hand fold by these two
 55 layers of the pile to fold thereon.

In the return movement of the reciprocating bar 25, the brush 35 is first lifted to the position shown in Fig. 2, and the straight edge 21 is again brought down on the paper over the
 60 ledger bar to firmly clamp the paper there preparatory to the next feeding operation of the strips at the beginning of which the table 27 returns to its position adjacent the ledger bar and straight edge, while the presser bar 22 moves
 65 to operative position.

In my copending application, Serial No. 319,315, now Patent No. 1,805,161 the folding machine is intended to operate in conjunction with the printing press in which case the feeding
 70 mechanism of the press also constitutes the feeding mechanism of the folding machine. According to the present invention, however, previously printed webs are intended to be folded and accordingly the frame 18 as shown herein
 75 is provided with supports or brackets 40 for car-

rying the jumbo rolls 41, each of which may contain one or more strips 11. When the pack shown in Fig. 1 has to be made, one of the jumbo rolls 41 carries the strips 11a and 11b while the other carries the strips 11c and 11d.

Further, the folding machine according to the present invention has its own web advancing and controlling device and, since the strips 11a and 11b contain forms 12 which are longer than those of the strips 11c and 11d, the present invention provides two feeding devices 42 and 43. These feeding devices comprise cooperating feed rolls 44 between which the strips are gripped, and in the form of the invention herein shown, the feeding devices 42 and 43 have a common driver in the form of a segmental rack 45. This meshes with a gear 46 having a one way driving connection with the lower feed roll 44 shown in Fig. 2, and including a pawl 47 so that the oscillating movements of the rack 45 will be translated to intermittent one direction movements of the lower feed roll 44. This lower feed roll is geared to its companion roll and the latter has a gear 48 meshing with a gear 49 of the pair of feed rolls 44 constituting the feeding devices 42.

As will be seen, the gearing connection between the feeding devices 42 and 43 is such that the former has a greater peripheral speed than the latter and this difference in peripheral speed of the feeding devices depends upon the desired difference in length between the forms on the strips 11a—11b and 11c—11d. Obviously, the ratio of the gearing may be such that any desired difference in their peripheral speeds may be obtained according to the particular job to be done.

Of course, if desired, the roller feeding devices 42 and 43 may operate at the same angular speed in which case the length of throw may be controlled by increasing or decreasing the diameter of one set of rolls with respect to the other set of rolls. Also, within the scope of the present invention, it would be possible to provide a third or more sets of rolls of predetermined peripheral speed cooperating with the gear train for feed devices 42 and 43, to feed one or more strips a greater or shorter extent than the two previously described, thereafter to be folded by the wiper 35, to form a pack with three or more form lengths.

Within the scope of this invention, it would also be possible to provide a plurality of reciprocating paper carrying slides to advance selected strip in one direction various extents with respect to each other before forming the left-hand fold with the wiper 35.

Variations and modifications may be made within the scope of this invention and portions of the improvements may be used without others.

Having thus described the invention, what is claimed as new and for which it is desired to obtain Letters-Patent, is:—

1. A machine for folding a plurality of superposed strips of indefinite length to form a zig-zag folded pile, comprising means to form a right-hand fold; means to advance said strips, one or more, a greater extent than the others beyond said folding means and while said strips are held thereby; and separate means for producing left-hand folds.

2. A machine for folding superposed strips of indefinite length to form a zig-zag folded pile, comprising means to form a right-hand fold; intermittently operating feed means to advance

said strips a long and short extent with respect to each other beyond said folding means and while said strips are held thereby; and separate means for producing left-hand folds.

5 3. A machine for folding superposed strips of indefinite length to form a zig-zag folded pile comprising a straight edge; means to produce one fold of said strips on said straight edge; intermittently operating feed means to advance
10 said strips a long and short extent with respect to each other beyond said folding means and while said strips are held thereby; and means to produce another fold during the intervals between feeding operations.

15 4. A machine for folding superposed strips of indefinite length to form a zig-zag folded pile comprising means for producing a right-hand fold; feed means for said strips comprising co-
20 operating sets of rolls of high and low peripheral speed to advance a selected strip or strips a greater extent than the others beyond said folding means and while said strips are held thereby; and separate means for producing left-hand folds of both the long and short advanced strips.

25 5. A machine for folding superposed strips of indefinite length to form a zig-zag folded pile comprising means to fold all of said strips on a line; means to intermittently feed said strips a predetermined long and short distance with re-
30 spect to each other beyond said folding means and while said strips are held thereby; and other means to produce another fold in the long and short advanced strips.

6. A machine for folding superposed strips of
35 indefinite length to form a zig-zag folded pile comprising a ledger bar, located in the path of the strips and over which the web is adapted to travel; a gage plate adapted to cooperate with the ledger bar to hold the web in predetermined
40 position thereon and to determine the line of fold; intermittently operating feed means to advance one or more of the strips to form a long ticket; secondary feed means to advance one or more of the strips to form a short ticket; and
45 means to produce folds in said long and short tickets during intervals between feeding operations.

7. A machine for folding superposed strips of
50 indefinite length to form a zig-zag folded pile comprising a ledger bar, located in the path of

the strips and over which the strips are adapted to travel; a gage plate adapted to cooperate with the ledger bar to hold the strips in predetermined position thereon and to determine the line
80 of fold; a creaser bar adapted to fold said strips over said gage plate to produce a fold in the strips; feed means to advance one or more of the strips a predetermined extent and form a long loop; other feed means cooperating with
85 said first-named feed means to advance others of the strips a shorter predetermined extent and form a short loop; secondary folding means adapted to engage said long and short loops strips after the formation of the first fold to produce a long and short ticket or tickets in the strips with a fold opposite in direction to that produced by the creaser bar.

8. A machine for folding a plurality of superposed strips of indefinite length to form a zig-zag folded pile comprising means to form a
95 right-hand fold in the strips; feed means comprising a set of rolls adapted to advance one or more of the strips a short predetermined extent and other cooperating rolls adapted to advance one or more strips a greater extent than the
100 strips advanced by the first mentioned rolls beyond said folding means and while said strips are held thereby; and means to form a left-hand fold in both the short and long advanced strips.

9. A machine for folding a plurality of superposed strips of indefinite length to form a zig-zag folded pile, comprising means to form a
105 right-hand fold in the strips; feed rollers adapted to advance selected strips a long and short extent with respect to each other beyond said folding means and while said strips are held thereby; actuating means adapted to give an intermittent one directional movement to said feed rolls; and means to form a left-hand fold in
115 both the long and short advanced strips.

10. The herein described step in the method of making a manifold pack having a plurality of zig-zag folded superposed strips which consists in folding all of the strips in one direction at a
120 single junction, then advancing selected sheets a long and short extent with respect to each other beyond the first fold; and then folding all of the strips in another direction with more than one junction.

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