May 22, 1928. 1,670,974

W. F. MAYER

DOUBLING MACHINE

Filed March 21, 1927 2 Sheets-Sheet 1

Fig. 1.

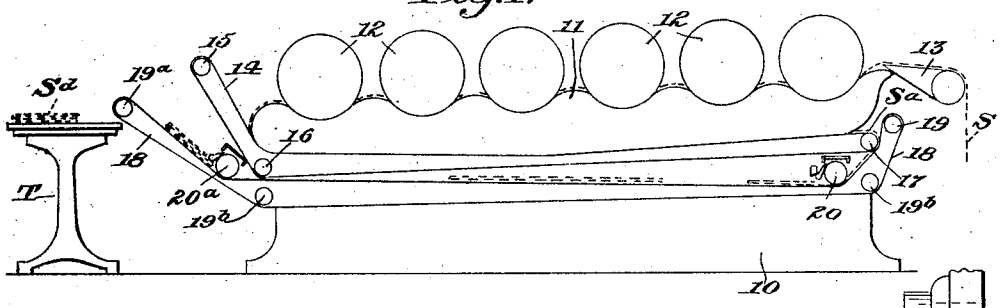


Fig. 2.

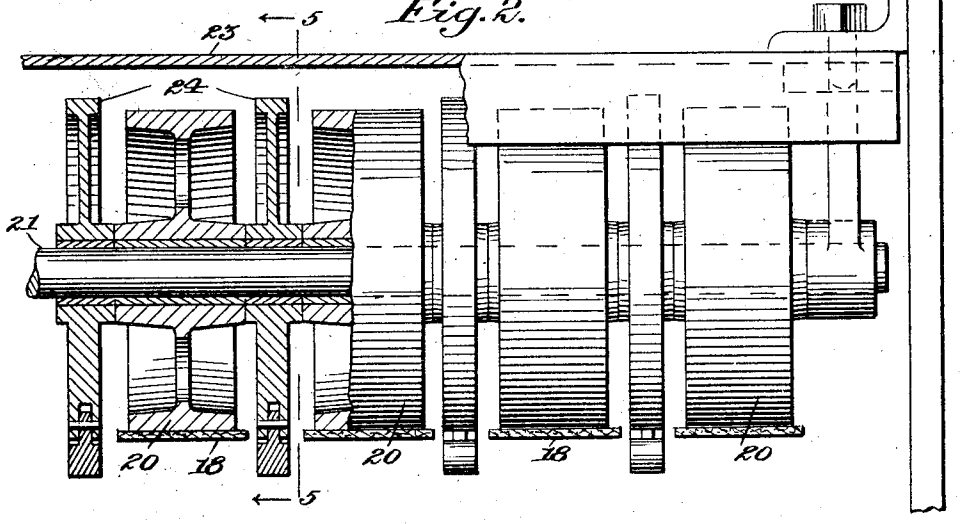
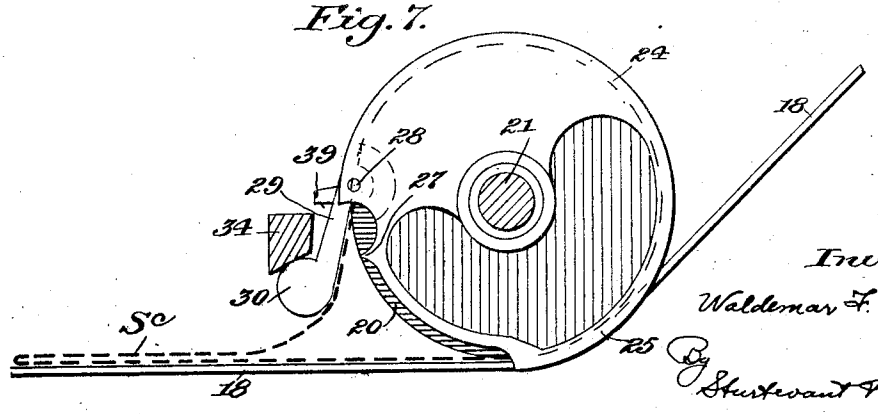


Fig. 7.



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Fig. 3.

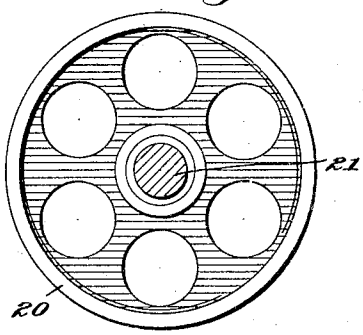


Fig. 4.

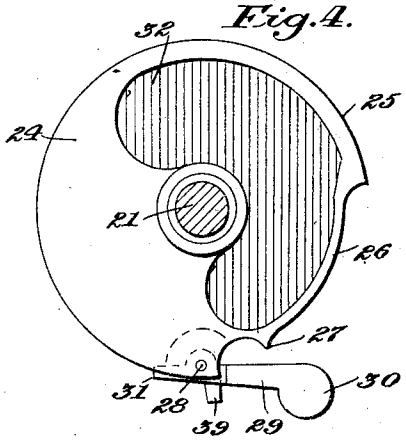


Fig. 5.

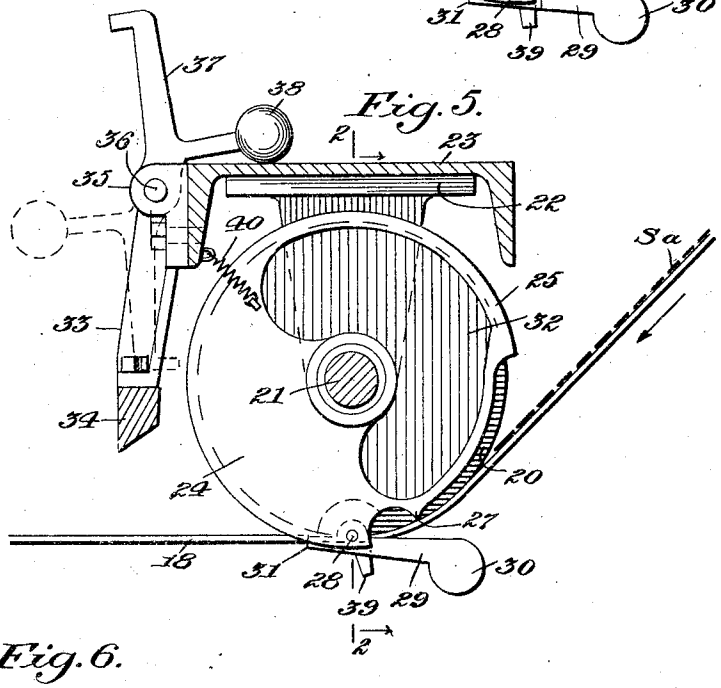
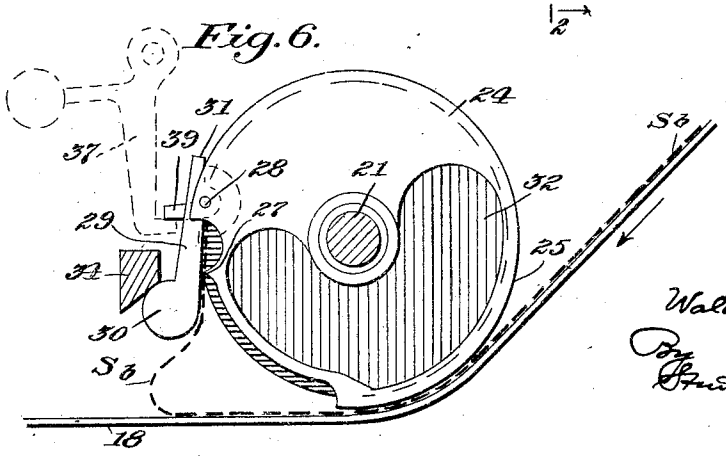


Fig. 6.



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1,670,974

UNITED STATES PATENT OFFICE.

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DOUBLING MACHINE.

Application filed March 21, 1927. Serial No. 177,107.

This invention relates to improvements in doubling mechanisms for sheet materials, and is more particularly of the type in which a proportionate doubling is accomplished, regardless of the length of the sheet which is inserted in the particular machine.

Machines have heretofore been proposed for doubling sheets in which devices were provided for measuring the sheet and thereafter operating upon the sheet at a predetermined line of fold to effect a preliminary folding for delivery to a removing device, in which the line of fold was determined prior to the doubling of the sheet. Such devices were limited in their capacity, both as regards the length of the sheet which might be treated, and as regards the number of pieces which might be handled in the machine at one and the same time, and required special and careful attention of the feeding operator to prevent confusion when two articles were inserted simultaneously, since with such mis-feeding, opposite lateral edges of an article might be handled differently by the machine; or in some instances the folding mechanisms would make an abortive operation.

In distinction from such prior devices, the present machine produces a doubling of the sheet which is dependent solely upon its length and involves no preliminary measuring operation; and in fact, no "line of fold" is determined by the machine prior to the initiation of the doubling operation itself. The machine is characterized by its extreme simplicity and by its combination of independent units, each of which is capable of individual operation upon the sheet, so that the sheet itself determines the number of such elements which are brought into operation, so that simultaneously or successively fed articles of differing dimensions are properly and accurately doubled upon themselves. A particular and characteristic feature of the design of the machine is that the article establishes its own doubling, and not an auxillary mechanism for measuring.

With these and other objects in view, as will appear in the course of the following specification and claims, one illustration of construction of the invention as applied to a doubling machine for laundry articles, which may be combined with an ironing device whereby floor space is conserved, is illustrated on the accompanying drawings, in which:

Figure 1 is a side elevation showing diagrammatically the position and operative relation of the several parts.

Fig. 2 is a sectional view substantially on line 2—2 of Fig. 5, with a part in section through the gripping devices for clarity of disclosure.

Fig. 3 is a face view of a tape roller.

Fig. 4 is a face view of a gripper and rocker assembly.

Fig. 5 is a section on line 5—5 of Fig. 2, diagrammatically showing a sheet about to come in contact with the rocker and gripper.

Fig. 6 is a similar view, with parts omitted, with the sheet engaged with the gripper and the rocker in oscillated position.

Fig. 7 is a similar view in which the gripper is just disengaging the sheet, which is in the doubled position.

According to the illustrated form of this invention, a sheet is carried forward by a continuously traveling device. The advancing edge of the sheet is caused to become engaged with and be retained by a gripper device which withdraws it from cooperation with the traveling device while the rest of the sheet continues in its movement. When the rear edge of the sheet passes the gripping device, the latter is automatically released, so that the front edge of the sheet is dropped down in registry or substantial registry with the rear edge, and the sheet in this doubled condition is permitted to continue in its uniform movement with the travelling devices.

On the drawings, a frame or base 10 is provided at its upper surface with a heated ironing shoe 11 which cooperates with a series of padded ironing rollers 12 to iron the articles which are to be later folded.

For this purpose, a feeding table 13 is provided over which a sheet S may be laid and guided by the feeding operator beneath the face of the ironing rolls 12; after passing all of which rollers 12, it is delivered onto a traveling belt 14, which passes over suitable guide rollers 15, 16 and 17 back to the feeding end of the machine. It will be understood that this traveling belt is usually composed of the customary one piece canvas. The sheet in its movement to the feeding end of the machine is drawn across the bottom of the shoe 11. When the sheet has been brought by the belt 14 to the roller 12, it is delivered from the belt 14 onto a further traveling device 18 which in the illustrated example is composed of a series of traveling tapes spaced laterally apart and passes over the respective guide rollers 19, 19^a, 19^b and 19^c. The sheet on this traveling device 18 is brought beneath a series of tape rollers 20, in number equal to the number of tapes, and preferably slightly narrower than these tapes, so that contact of the article with the rollers is avoided. These rollers are each individually mounted for loose rotation upon a transverse shaft 21 which is supported by brackets 22 extending downwardly from the cross frame 23 of the machine. It is preferred to employ antifriction bushings between the rollers of the shaft to assist in their movement.

The traveling tapes comprising the traveling device 18 are spaced apart, so that the rockers 24 may be individually presented between pairs of the tapes, as represented in Fig. 2. Each of these rockers is provided with an extended portion 25 which is of greater radius than the radius of the tape rollers 20, and therefore extends beyond the lower surface of the respective tape roller, and comes forcibly into contact with the article to be doubled, under the conditions set forth hereinafter. Adjacent this extended portion 25 is a rebate portion 26 which is cut away to a radius which is less than the radius of the periphery of the tape rollers 20, so that when this portion of the rocker 24 is lowermost, an article traveling upon the successive tapes 18 and gripped between such tapes and the respective tape rollers 20, does not come in contact with this rocker member 24. Near the remote end of the rebate portion 26, with regard to the direction of travel of the article to be doubled, a spur 27 is provided on the rocker. At the extreme end of the rebate portion 26 of the rocker 24 is pivotally mounted by the pin 28, a gripper finger 29, which has a counterweight 30 and an extending portion 31 beyond the pivot to serve as a stop against excessive movement. A portion of the rocker is cut away as at 32, so that this rocker may move freely under the action of gravity upon its remaining structure to the normal position in Fig. 4, in which the gripper finger 29 is lowermost, and presents an open throat or mouth between itself and the spur 27 for the reception of a sheet to be doubled. These rockers are journaled upon the same shaft 21 as the tape rollers 20, and are likewise individually free to rock loosely thereupon.

The cross member 23 of the machine frame carries a plurality of downwardly extending bracket arms 33 which support at their bottom a gripper bar 34 which cooperates with and closes each gripper finger 29 upon the spur 27, as will be described more fully hereinafter. Outstanding individual ears 35 are provided on the cross member 23 for pivotally supporting by the respective pin 36 a plurality of lock fingers 37 in number equal to the number of rockers 24. Each of these fingers 37 is provided with a counterweight 38 which in the position shown in dotted lines in Fig. 5, causes the lower end of the lock finger 37 to move counter-clockwise and into engagement with the locking lug 39 located on the periphery of the rocker 27, and thereby engage the same to hold this rocker against a counter-clockwise return movement from the position shown in Figs. 6 and 7 into that shown in Fig. 4. When, however, the lock finger 37 and its counterweight 38 are swung about into the position shown in full lines in Fig. 5, the rocker 24 is free to return under the action of gravity into the position shown in Fig. 4.

In order to assist the rocker 24 in its return movement, springs 40 may be provided for respective and individual engagement between the several rockers 24 and loops on the cross member 23. It will be understood, however, that the use of these springs is not essential, since gravity has been found sufficient in practice.

A similar device employing the tape rollers 20^a may likewise be provided at the delivery end of the machine. The parts are identical with those already described, and further detailing is not necessary for the comprehension of their arrangement and employment. It will of course be understood that the upward angle afforded to the belt 18 between the rollers 20^a and the roller 19^a is low enough so that the sheet is retained upon the tapes by gravity and adhesion without slippage.

The method of operation of the device is as follows: As a sheet S is delivered beneath the first of the ironing rolls 12, it is sufficiently engaged and carried forward beneath these rollers and in contact with the ironing shoe 11, whereby the smoothing and ironing of the sheet occurs, with a return by means of the belt 14 to the belt 18. The sheet S^a in Fig. 1 is represented as having come in contact with the belt 18 and having passed for a portion of its length beneath

the tape rollers 20. During this passage, the sheet S^a (Fig. 5) in contact with the belt 18, first passes into contact with the tape roller 20, but without any engagement with the rocker 24. As the sheet is gripped between two or more of the tapes 18 and their respective rollers 20, it is positively carried forward and brought into contact with the end of the rebate portion, near the pivot 28 of the gripper finger 29, and during the continued movement of the tapes 18, the front edge of the sheet is caused to actuate the respective rockers 24 for its entire width, and during this actuation, only the rockers are actuated which are actually engaged by the sheet itself. In this way, the sheet determines the doubling devices which are to act upon it, without any preliminary measuring. The rocker 24 is thus caused to move in a clockwise direction until the extended portion 25 is presented against the article lying upon the tapes 18, whereby a friction relationship is established between these, and a further rocking of the rocker 24 in a clockwise direction is occasioned, until finally the gripper finger 29 is brought into contact with the gripper bar 34, so that this finger is forced to rock in a counter-clockwise direction about its respective pivot pin 28 and to grip the front edge of the sheet between its own inner surface and the spur 27. The friction between the article on the tapes 18 and the extended portion 25 of the rocker 24 is sufficient to maintain the rocker in this gripping position, so that the front edge of the sheet after having thus been withdrawn from being carried forward with the tapes 18, is held in such gripped engagement through this friction, while the remainder of the sheet is moved successively forward past the rocker 24 by the traveling tapes 18.

This progression of the sheet continues, and as each successive transverse line thereof reaches a predetermined distance from the gripper fingers and rockers, it is retained against further movement with the tapes 18 by the pull along the line of the article itself. Finally, the rear edge of the sheet (Fig. 7) passes the end of the extended portion 25, and there no longer is a frictional engagement between these two. The rocker 24 and its gripper finger 29 are now free to rock downward in a counter clockwise direction, whereby the gripper finger is released from the action of the gripper bar 34 and immediately disengages the front edge of the sheet, which falls down upon the rear edge of the sheet, and in substantial alinement therewith. The lower edges of the gripper finger 29 and the counterweight 30 are preferably rounded so that they smooth and pull out the front edge of the sheet into its intended position. The rocker 24 and its gripper finger 29 continue in their movement until they regain the normal position shown in Fig. 4, ready for reception of the new sheet. It will be noted that this requires a very short space of time, so that sheets and other articles may be fed in rapid succession into the ironing and doubling machine.

The sheet now lies in doubled position as shown by S^c in Fig. 7, the upper portion of it having been retained by the doubling device, but the lower portion of which having been permitted throughout a movement at the uniform speed of the traveling tapes 18.

The once-doubled sheet lying upon the tapes 18 may now pass along with these tapes into relation with similar doubling devices located coaxially with the tape rollers 20^a, whereby a second doubling operation is accomplished, so that the sheets are delivered with a twice-doubled or quarter-fold S^d to the receiving operator at the delivery table T.

It will be noted that the length of the sheet which may be handled by the rockers and grippers and their associate parts, may exceed the length of the base 10, and may approach twice this length. It is further aparent that each article selects its own doubling devices, without the necessity of the operator adjusting these doubling devices to take the particular width of article which is being delivered. The operators may, for example, insert a full width sheet, followed by a three-quarter width sheet, along with the positioning of four or five towels and handkerchiefs, all of these articles being of different lengths and widths, without any confusion arising in the machine, so long as the articles are spaced apart laterally and in the direction of the lengths of the tapes.

It is customary in laundry work to arrange that the two edges are brought into very close registry with each other, which is accomplished in the present machine by constructing it so that the length of the draped portion extending from the front edge of the sheet to its contact with the rest of the sheet is equal to the length of the rear portion of the sheet from the corner at the end of the extended portion 25 to the point at which this drape encounters the rest of the sheet. If it be desired to fold articles with a slight space between these edges, this may be accomplished and regulated in a predeterminable manner by a change of the position of the gripper bar 34, with regard to the axis of shaft 21, or by a redesign of the shape of the rocker 24 as regards the engaging point for the front edge of the sheet, and the length of the rebate portion 26; or in other ways readily apparent to a skilled mechanic.

If it be desired to employ the ironing machine by itself, without any doubling of the

delivered articles, this may be accomplished by manually rocking the individual rockers 24 in a clockwise direction and engaging the locking fingers 37 with the respective locking lugs 39; the articles then pass beneath the rockers 24, without having encountered the gripper fingers 29, and thus without any retention of the front edge. It is apparent that this may be accomplished for any one or more of such fingers, so that sheets for example may be moved through at one side of the machine, with a quarter fold, while towels at another portion of the machine are moved through with only a half fold, and finally handerchiefs may pass through in another line without fold at all. This result is accomplished by the locking out of a certain number of the rockers 24 associated with the tape rollers 20, and with a locking out of a smaller number of the rockers associated with the tape rollers 20^a, for example.

It will be seen throughout that the mechanism is not limited to the specific embodiment shown, but that it may be modified and changed in many ways without departing from the spirit of the invention as expressed in the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a sheet doubling machine, continuously traveling means for carrying forward portions of a sheet which contact therewith, and a device operated by the sheet to engage and retain the front edge thereof, said device being operated to release the said front edge at the passage of the rear edge of the sheet from said device.

2. In a sheet doubling machine, continuously traveling means for carrying forward portions of a sheet which contact therewith, and means to coact with the sheet to withdraw the front edge of the sheet from contact with the said traveling means and to hold it against movement while the rear edge of the sheet continues to move forward, said coacting means releasing said front edge when said rear edge passes said coacting means.

3. In a sheet doubling machine, continuously traveling means for carrying forward portions of a sheet which contact therewith, and a plurality of individual devices spaced across the width of said traveling means and operated by the engagement therewith of a respective sheet carried by said traveling means to individually engage and retain the front edge thereof, said devices upon such individual engagement being individually held by the passing sheet to retain said front edge until the rear edge has passed said respective device and thereupon individually releasing the front edge of the respective sheet, whereby a plurality of sheets of different widths and lengths may be simultaneously and successively supplied to the machine in any spaced order and be individually doubled thereby.

4. In a sheet doubling machine, continuously traveling means for carrying forward portions of a sheet which contact therewith, and a hold-back device for the front portion of the sheet, said device including means to grip and retain the front edge of the sheet, and means operated by the sheet to actuate such retaining means and operative upon the passage of the rear edge of the sheet to release said retaining means to free said sheet therefrom.

5. In a sheet doubling machine, continuously traveling means for carrying forward portions of a sheet which contact therewith, and a hold-back device for the front portion of the sheet, said device including means to grip and retain the front edge of the sheet while permitting the rear edge of the sheet to continue its movement, the successive portions of said sheet being held back against movement by the pull along said sheet as the respective portion attains a predetermined distance from said gripping means, and means associated with gripping means to release the same when the rear edge of said sheet reaches a predetermined position with regard to said gripping means.

6. In a sheet doubling machine, a plurality of continuously moving tape to carry forward the portions of the sheet contacting therewith; a first doubling mechanism including a plurality of independent grippers to individually engage and retain the front edge of the sheet and independent means for each gripper contacting the sheet during its passage to hold said grippers engaged with the sheet and to release the same upon the passage of the rear edge of the sheet; a second doubling mechanism including a second plurality of individual grippers to individually engage and retain the doubled edge of the advancing sheet as it comes from said first mechanism, and independent means for said second grippers contacting the sheet during its passage to hold said grippers engaged with the sheet and to release the same upon the passage of the free rear edges of the once-doubled sheet, and individual members for each of said second grippers to hold the respective gripper from engaging the doubled edge of the sheet.

7. In a sheet doubling machine, continuously traveling means for carrying forward portions of a sheet which contact therewith, and devices operated by the sheet to engage and retain the front edge thereof, said devices including a gripper moved by the front edge of the sheet and a maintaining member connected to said gripper and brought by the movement of the latter into contact with the sheet to coact therewith to move said gripper

to engage and retain the front edge of said sheet, said maintaining member being adapted to move upon the passage of the rear edge of the sheet to release said gripper from said sheet.

8. In a sheet doubling machine, continuously traveling means to carry forward portions of a sheet which contact therewith, a rocker member arranged adjacent said traveling means and having a rebate portion to permit the passage of the front edge of the sheet between the traveling means and such rebate portion, and an extended portion; a gripper carried on said rocker to be contacted and moved by the sheet after passing said rebate portion whereby to cause an initial rocking movement of said rocker, said initial movement causing said rocker to present said extended portion into contact with the sheet so that thereafter said sheet moves said extended portion to effect a further rocking movement of said rocker, and a fixed maintaining bar, said further movement presenting said gripper against said bar so that the gripper retains the front edge of the sheet, said sheet thereafter sliding past said extended portion and frictionally retaining said rocker in its moved position, said rocker being returned after the passage of the rear edge of the sheet from beneath said extended portion whereby to release said gripper from the sheet and to restore said rocker for reception of a new sheet.

9. In a sheet doubling machine, continuously traveling means to carry forward portions of a sheet which contact therewith, a gripper and a gripper bar, a rocker carrying said gripper and adapted in one position to present said gripper for engagement with the front edge of said sheet and being operated upon contact with a sheet carried by said traveling means to move with said gripper and sheet to cause said gripper bar to close said gripper upon said sheet and thereafter being held by the sheet in its passage to maintain said gripper closed upon the sheet, said rocker being adapted to operate upon disengagement from the sheet by the passage of the rear edge thereof from beneath it to move said gripper from said gripper bar and thereby release said front edge.

10. In a sheet treating and doubling machine, continuously traveling means for carrying forward portions of a sheet which contact therewith, a plurality of independent devices each adapted in one position operated by contact of the sheet therewith to engage and move the front edge thereof, and in another position to permit the sheet to move forward therebeneath, each of said devices being operated in its movement by said sheet to grip and retain the front edge of the sheet and after the passage of the rear edge of the sheet from the device to release said front edge, and means whereby one of said devices may be moved initially to said other position and retained therein out of engagement with the front edge of the sheet so that the machine will accomplish no doubling opposite such device.

11. In a sheet folding mechanism for sheets of different sizes, a plurality of tapes to advance the sheets continuously in separated relation, independent grippers located between said tapes to be engaged and operated by the front edges of the respective sheets, each of said grippers holding back the respective portion of the front edge while the remainder of the respective sheet continues to move past, and means to release each of said grippers at the passage of the rear edge of its respective sheet, whereby said grippers independently and automatically coact with simultaneously and successively fed sheets of different widths and lengths to produce predetermined doubling thereof.

12. In a sheet doubling machine, a plurality of continuously traveling tapes to carry forward portions of a sheet which contacts therewith, a fixed gripper bar, a plurality of guide rollers for said tapes and adapted to press a sheet on said tapes thereagainst, a plurality of rockers, a common fixed shaft to support said rollers and rockers so that each rocker may move independently of all other rockers and said rollers, said rollers and rockers being arranged in alternate order so said rockers come opposite the intervals between said tapes, a gripper on each of said rockers, each of said rockers having a rebate portion at its periphery adjacent said gripper, cut-away at a radius less than the roller radius, and being adapted in the sheet receiving position to present such portion opposite the tapes so that a sheet on said tapes may pass said cut-away portion and contact said rocker within said gripper whereby to initially move the rocker, said rocker also having an extended portion of radius greater than the roller radius adapted to be brought by said initial movement into contact with the body of the sheet to be moved thereby, said rocker during such further movement presenting said gripper to said gripper bar to close the gripper upon the front edge of the sheet to retain the same, and means associated with said rocker to return the same with the gripper to the sheet receiving portion as soon as the rear edge of the sheet passes said extended portion, said gripper during such return movement releasing said front edge.

13. In a sheet doubling machine, a sheet conveying means and a device operated by the sheet to engage and retain the front edge of said sheet, said device including means to operate it to release the said front edge at

the passage of the rear edge of the sheet from said device.

14. In a sheet doubling machine, means for carrying a sheet forward, and a hold-back device for the front portion of the sheet, said device including means to grip and retain the front edge of the sheet, and means operated by the sheet to actuate such retaining means and operative upon the passage of the rear edge of the sheet to release said retaining means to free said sheet therefrom.

In testimony whereof I affix my signature.

WALDEMAR F. MAYER.