Aug. 19, 1941. G. SPIESS 2,253,446

BUCKLING FOLDING MACHINE

Filed March 24, 1939 3 Sheets-Sheet 1

Fig. 2.

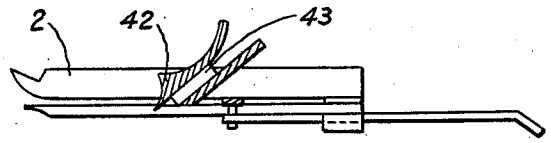

Fig. 1

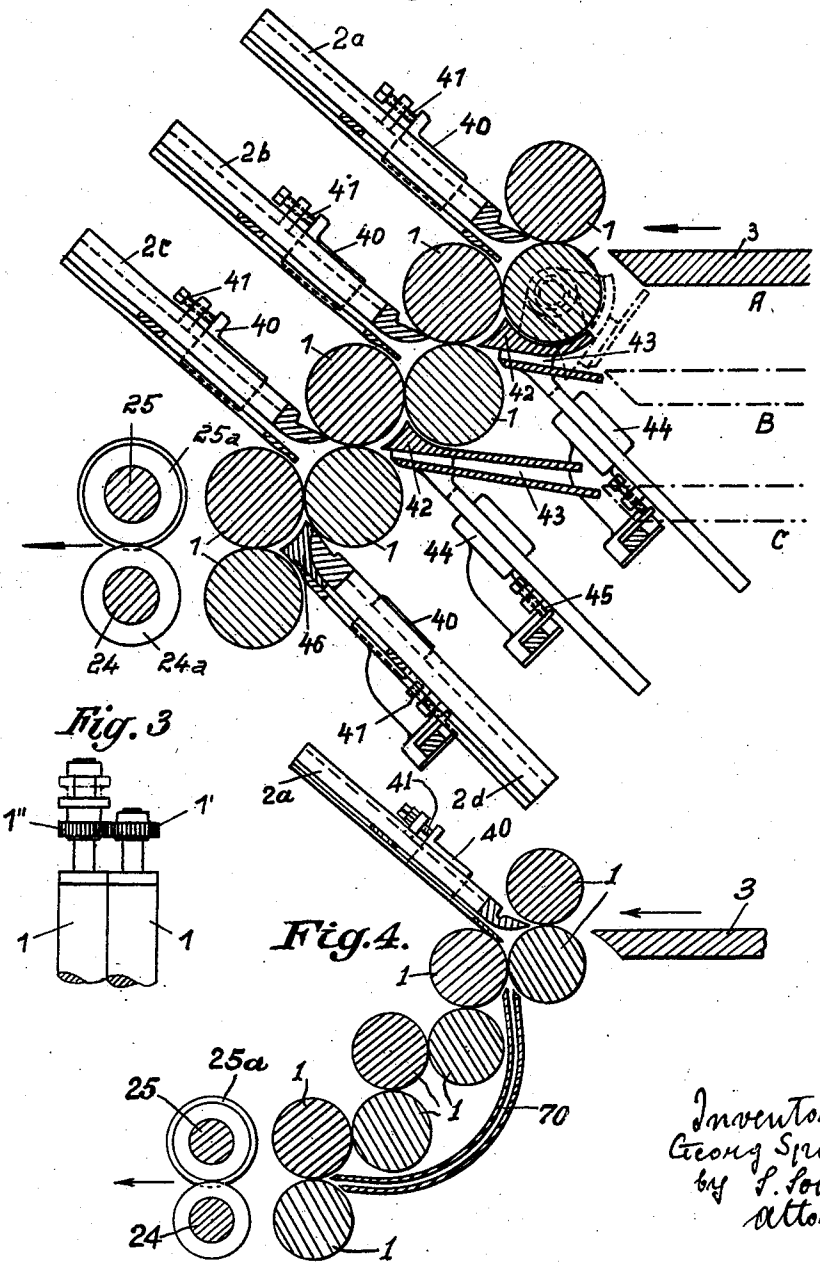

Fig. 3

Fig. 4.

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BUCKLING FOLDING MACHINE

Filed March 24, 1939 3 Sheets-Sheet 2

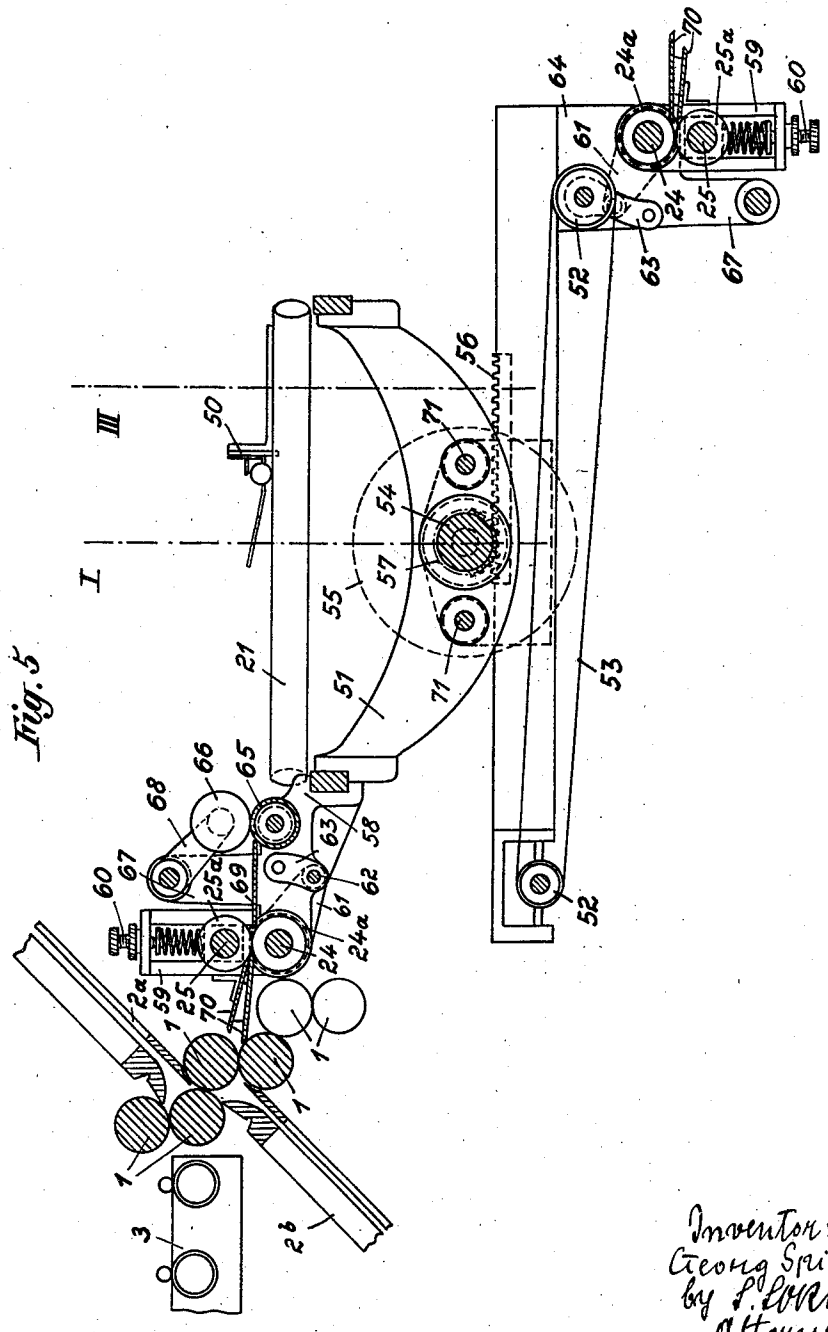

Fig. 5

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BUCKLING FOLDING MACHINE

Filed March 24, 1939 3 Sheets-Sheet 3

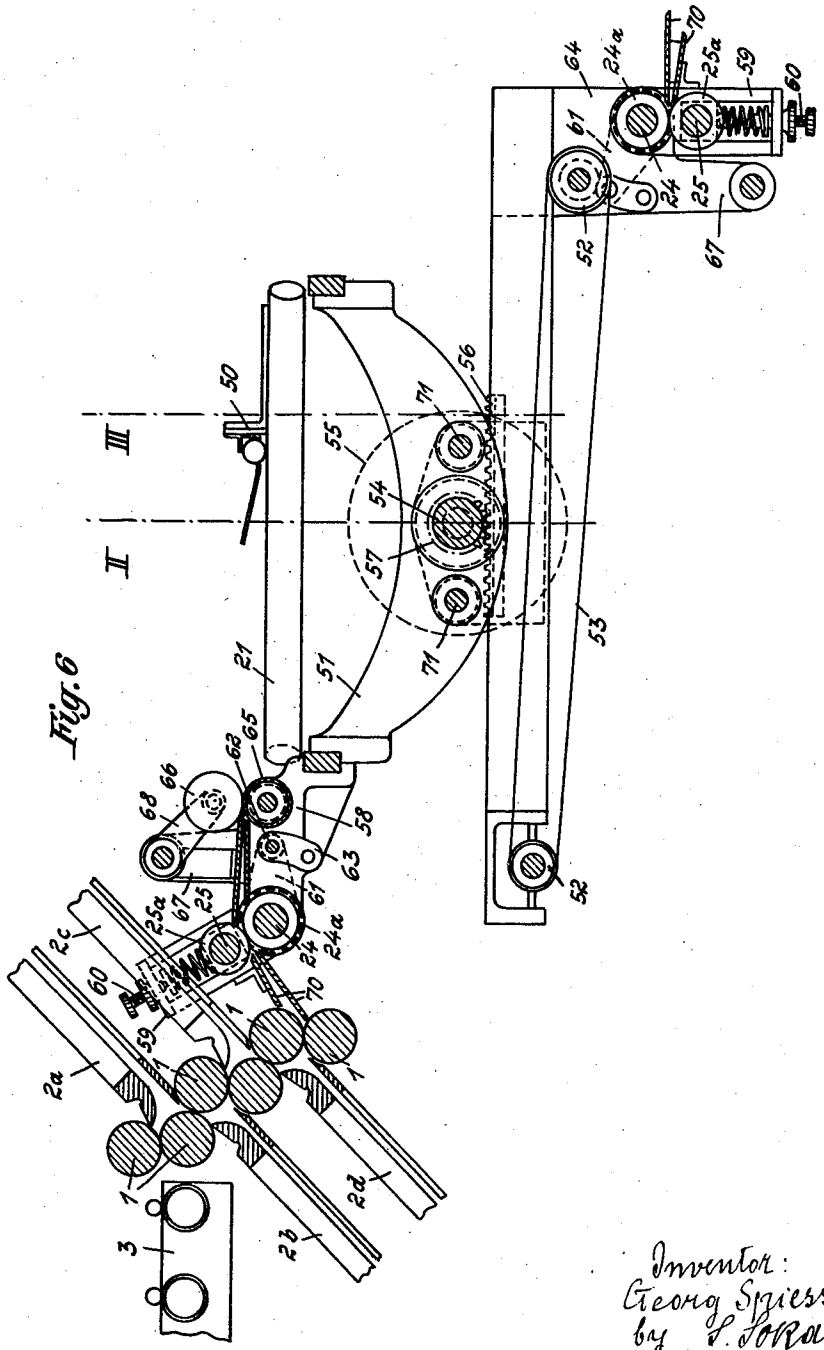

Fig. 6

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UNITED STATES PATENT OFFICE

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BUCKLING FOLDING MACHINE

Georg Spiess, Leipzig, Germany

Application March 24, 1939, Serial No. 263,921
In Germany March 28, 1938

4 Claims. (Cl. 270—68)

Applications have been filed in Germany on March 28, 1938, and July 5, 1938.

This invention relates to a buckling folding machine having a plurality of successively arranged parallel folders and has for its principal object, in a machine of this kind, to bridge or pass over the space between a conveying device for the sheets (for example a forwarding or transverse feed table) and any particular folder so that the sheet can be introduced with certainty into any desired folder without having to traverse any previous folding rollers.

A further object of the invention is to ensure that the folded sheet can be led or diverted directly in front of any particular pair of push-out rollers of any folder of the roller system without having to traverse the rollers of the roller system subsequent to the respective folder or at least the majority thereof, the rollers not required for the particular folding operation in both cases being brought to a standstill in any suitable manner. The invention also aims at combining both the above-mentioned objects, that is to say, the provision, on a single folding machine, of the bridging or conveying device and the leading-out or diverting device in front of the push-out rollers.

According to this invention, therefore, in a buckling folding machine of the above kind, a bridge or guide path or plate is arranged either between a device feeding the sheet to any desired folder of the roller system and this folder or in front of any desired pair of push-out rollers of any folder of the roller system, which bridge acts as a change-over guide and conveying path or only as a conveying path for the sheets to be fed in or out.

The bridge or guide-path or plate can be switched out of operative position in any suitable manner, for example, it can be movable or swingable. The bridge can also be used in conjunction with a fold pocket or plate as an adjustable buckling stop for a fold to be produced, for which purpose the bridge can be swung or inserted in any suitable manner into the space or slot in the fold plate into which the sheet enters.

The guide path or bridge can, in accordance with the invention, be arranged, as desired either fixed, swingable or removable, between the push-out rollers of any desired folder from which the folded sheets are to be delivered and a suitable forwarding device for the said sheets. The said bridge can also form a part of the said forwarding device and may also be displaceable towards and away from the folding mechanism.

According to a further feature of the invention, the arrangement may be such that the guide path or bridge is carried swingable around the axis of a feeding roller, or of a rotating part of a device for cutting, scratching, grooving or perforating the folded sheets, connected directly or indirectly to the folding mechanism. Furthermore, the swinging axis of the guide path or bridge can be mounted in the frame of the folding machine or of the feeding device for the folded sheets.

In order that the invention may be fully understood I shall now describe some embodiments thereof by way of example by reference to the accompanying diagrammatic drawings, in which—

Fig. 1 is a sectional elevation of a buckling folding machine having eight rollers, by means of which six parallel folds can be obtained,

Fig. 2 shows one of the fold pockets or plates with the bridge or guide path, in accordance with this invention, extending therein and serving as a buckling stop,

Fig. 3 is a view of a disengageable gear for stopping two folding rollers,

Fig. 4 is a sectional elevation of a modified arrangement in which a guide path is inserted between the first folder and the forwarding device whereby the sheet does not have to pass through the intermediate rollers, and

Figs. 5 and 6 are sectional elevations of a buckling folding machine having a four-fold folding mechanism and a corner feed table and showing the mechanism in different working positions respectively.

Referring first to Fig. 1 of the drawings, in front of a feed table **3** for the sheets to be folded, which can be constructed as an inclined roller feed table, are mounted folding rollers **1** which co-operate with the fold pockets or plates **2***a*, **2***b*, **2***c* and **2***d* by means of which folded sheets, with a corresponding number of parallel folds or creases, can be produced. The fold plates **2***a*—**2***d* are, as shown in Fig. 1, displaceable in guides **40** mounted on the machine frame, which guides **40** are formed with stops against which bear adjusting screws **41** carried by the fold plates for the purpose of accurately adjusting the latter at the required distance from the folding rollers. In the case of the second and fourth folders, bridges **42** are provided instead of the fold pockets or plates. One portion of each bridge forms a change-over guide, the other part a guide path **43**. The bridges **42** can be swung out of position as is indicated in dot and dash lines in respect of the upper bridge **42** in Fig. 1. They are dis-

placeably mounted in guides 44 in a similar manner to the fold plates 2a—2d and are regulatable in their position of adjustment with respect to the folding rollers by adjusting screws 45. At the last folder the front inlet space of the fold pocket or plate 2d is closed by a change-over guide 46. The folding rollers are driven by means of a common driving mechanism in a known manner by interengaging pinions 1', 1'' (see Fig. 3). The pinion 1' is fixed on the axle of a folding roller 1, whereas the pinion 1'' is displaceably mounted on the axle of the other folding roller. If the sleeve is moved with the pinion 1' into the dotted line position shown in Fig. 3, then both the folding rollers 1 are brought to a standstill.

In Figs. 5 and 6 is illustrated a transverse feed table 21 of the known inclined roller type. It is furnished with an adjustable guide rail 50 which is provided with previously arranged suitably controllable pressure means and is mounted on a swingable yoke 51 which carries on its underside a longitudinal feed table constituting a parallel delivering device which consists of an endless band 53 guided over rollers 52 by means of a suitable driving mechanism. The yoke 51 is rotatable on a shaft 54 on which are fixedly arranged a handwheel 55 and a pinion 57 engaging a stationary rack 56 by means of which the said yoke 51 can be displaced towards and away from the four-fold folding mechanism. In a projection 58 of the yoke 51 is rotatably mounted a shaft 24 around which is swingable a double-armed structure, the upper arm 59 of which constitutes a bearing for a shaft 25 and includes a pressure spring and a tensioning screw 60. The other arm 61 of this double-armed structure is provided with a hole through which can be inserted a pin 62 for which two holes are provided in an arcuate member 63 of the extension 58 for the purpose of positioning the lever arm 59, in the two positions shown in Figs. 5 and 6 respectively. A similar arrangement is present on an extension 64 of the longitudinal feed table 53. On the shafts 24 and 25 are arranged forwarding rollers and discs 24a, 25a for cutting, grooving, marking or perforating the folded sheets. Similar forwarding rollers 65 and 66 are also arranged in the projection 58 or a frame 67 by means of a swinging lever 68. Between the rolls 24a and 65 is inserted a guide path or plate 69 for the folded sheets and a guide path or plate 70 is rigidly connected with the bearing arm 59. For securing the swinging yoke 51 in its operative position, pins or bolts 71 are employed.

If a sheet is conveyed from the feeding device 3 in Fig. 1 in the direction of the arrow, to the roller system, the said sheet leaves the last roller pair with three parallel creases or folds and is cut into any desired number of parts, perforated, grooved or otherwise worked in front of the said roller pair at right angles to the folds and is forwarded in the direction of the arrow by rollers mounted on the shafts 24 and 25.

If the feed device 3 (Fig. 1) is brought from its position A into a position B, shown in broken lines, then the forwarded sheet runs into a guide path 43 of the upper bridge 42 and leaves the roller system in front of the last roller pair as a twice folded sheet. The first roller pair of the roller system is rendered stationary by actuation of the disengaging device 1'' (shown in Fig. 3).

In the further position C of the feed device 3, the sheet to be folded is fed into the suitably longer guide path 43 of the lower bridge 42 and receives, in the buckling folding machine, only one fold or crease. In this case, the first four rollers are preferably put out of operation.

Contrary to the arrangement shown in Fig. 1, the mechanism can also be so constructed that, in the positions A, B and C, separate fixed or movable feed devices 3 can be arranged which either remain in their working position or are displaced therefrom when not required for use.

In the working position of the parts shown in Fig. 5, the folded sheets leave the two folders 1, 2a and 1, 2b with two parallel folds or creases. Each sheet then arrives, by passing over the guide path or plate 70, between the device 24, 25, 24a, 25a to be forwarded and simultaneously cut, perforated or the like and, finally, arrives, after this operation, at the forwarding rollers 65, 66 on the transverse feed table 21 by which it is fed along the guide rail 50 towards a cross folder, not shown in the drawing. If, however, the folded sheets are to be delivered directly in front of the forwarding rollers 65, 66, then the yoke 51 must be turned through an angle of 180° to a position in which the longitudinal forwarding table or the parallel deliverer 53 is connected, by means of the forwarding members mounted on its extension 64, to the multiple folding mechanism, whilst the transverse feed table 21 is swung downwardly into its inoperative position.

On the conversion of the buckling folding machine from the form shown in Fig. 5 to the production of folded sheets with four parallel folds according to Fig. 6, the axis or shaft 54 of the swingable yoke 51 is displaced by means of the handwheel 55 and the pinion 57 rotated thereby from its former position on the line I (Fig. 5) into the position on the line III (Fig. 5) whereby the transverse feed table 21 is moved so far from the four-fold folding mechanism that the fold pockets or plates 2c and 2d can be inserted and, moreover, in front of the fourth folder 1, 2d the bearing arm 59 and the guide plate or path 70, rigidly connected with it, can, after withdrawal of the pin 63, be swung around the shaft 24 into the position shown in Fig. 6. The bearing arm 59 together with the guide plate or path 70 is maintained in this position by the insertion of the pin 62 into the upper hole of the arcuate member 63. Now, on turning the handwheel 55 in the reverse direction, the shaft 54 of the yoke 51 will be moved into the position corresponding to the line II in Fig. 6, whereby the transverse feed table 21 and the parts present on the projection 58 thereof will again approach the folding mechanism and enable the displaced guide path or plate 70 to convey the folded sheets, which have now received four folds, out of the folding mechanism 1, 2d.

In Fig. 4, a sheet forwarded by the feed device 3 is provided with a fold or crease by passage through the first folding mechanism 1, 2a. Adjacent the lower pair of push-out rollers 1 of this folding unit is located a guide path 70 by which the singly folded sheet is brought directly through the last rollers of the roller system 1 to the forwarding device on the shafts 24, 25. If the forwarding device is suitably arranged, the singly folded sheet can arrive directly at the forwarding device through the guide path 70 in which, if necessary, forwarding rollers can be provided for the purpose of positively forwarding the sheets, with avoidance and stopping of all the folding rollers not required. By the introduction of suitably formed guide paths 70, a sheet, provided with

any desired number of folds can be taken from the push-out rollers of any folding unit.

I claim:

1. A buckling folding machine comprising the subcombination of: a plurality of successively arranged parallel buckling folding units, each of said units comprising draw-in and push-out rollers and a cooperating buckle fold-plate and through which sheets to be folded are fed; means for feeding sheets to any one of said folding units; a cutting, grooving or perforating device located in front of said folding units in the direction of feed of the sheets and a swingable guide plate located between said sheet cutting, grooving or perforating device and the push-out rollers of one of said folding units, said guide plate being mounted on said device.

2. A buckling folding machine comprising the subcombination of: a plurality of successively arranged parallel buckling folding units; means for feeding sheets to any one of said folding units; a displaceable sheet forwarding device located in front of, and in spaced relation with respect to, said folding units; a cutting, grooving or perforating device pivotally mounted on said forwarding device between said folding units and said forwarding device; a guide plate carried by said cutting, grooving or perforating device and bridging the space between a folding unit and said cutting device; means for swinging said cutting device and said guide plate and means for displacing said forwarding device towards and away from said folding units whereby said guide plate may be adjusted adjacent any one of said folding units for the purpose specified.

3. A buckling folding machine comprising the subcombination of: a plurality of successively arranged parallel buckling folding units; each of said units comprising draw-in and push-out rollers and a cooperating fold plate; a sheet feeding device associated with said folding units for feeding sheets to any one of said folding units; means for rotating said rollers; a bridge piece forming a guide path interposed between said feeding device and one of said folding units and means for stopping rotation of the rollers of the folding units which are not being used.

4. A buckling folding machine comprising the subcombination of: a plurality of successively arranged parallel buckling folding units, each comprising draw-in and push-out rollers and a cooperating buckle fold-plate; means for feeding sheets to any one of said folding units; means for rotating said rollers; a bridge-piece forming a guide path located adjacent the exit side of the push-out rollers of one of said folding units for the purpose specified and means for stopping the rotation of the rollers of the subsequent folding units which are not required for use.

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