June 18, 1940. G. SPIESS 2,205,127

FOLDING MACHINE

Filed Nov. 28, 1938 3 Sheets-Sheet 1

Fig. 1

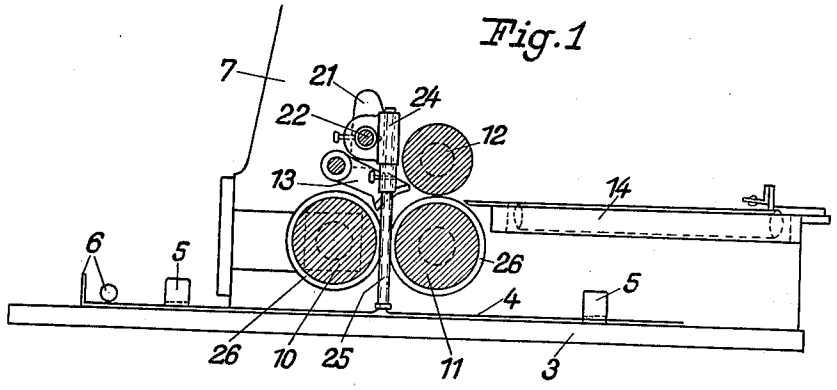


Fig. 2

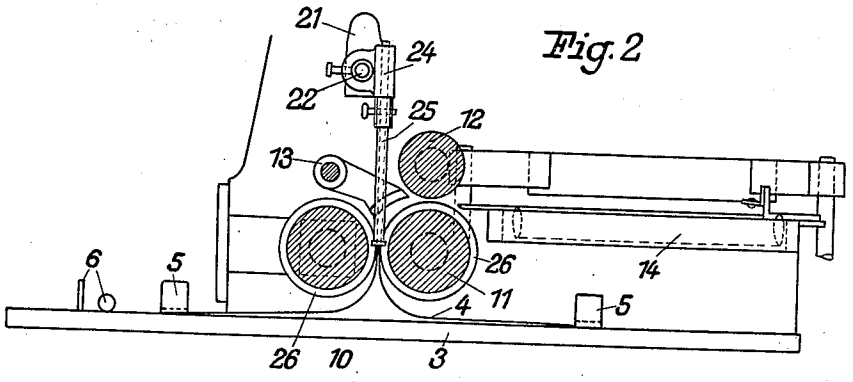
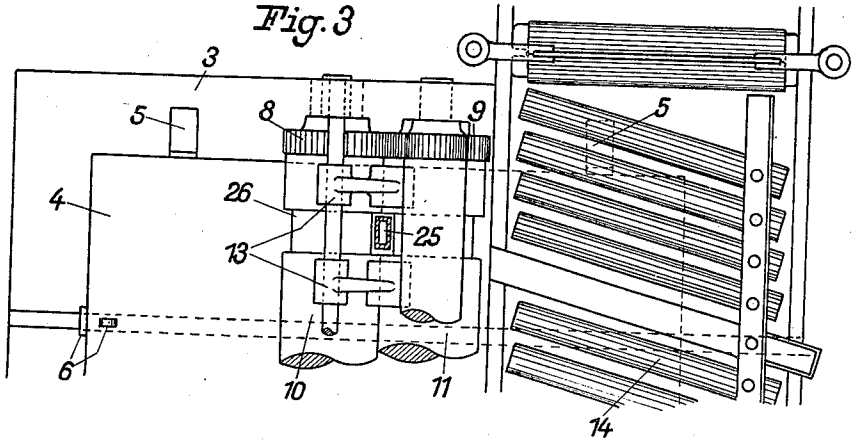


Fig. 3



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FOLDING MACHINE

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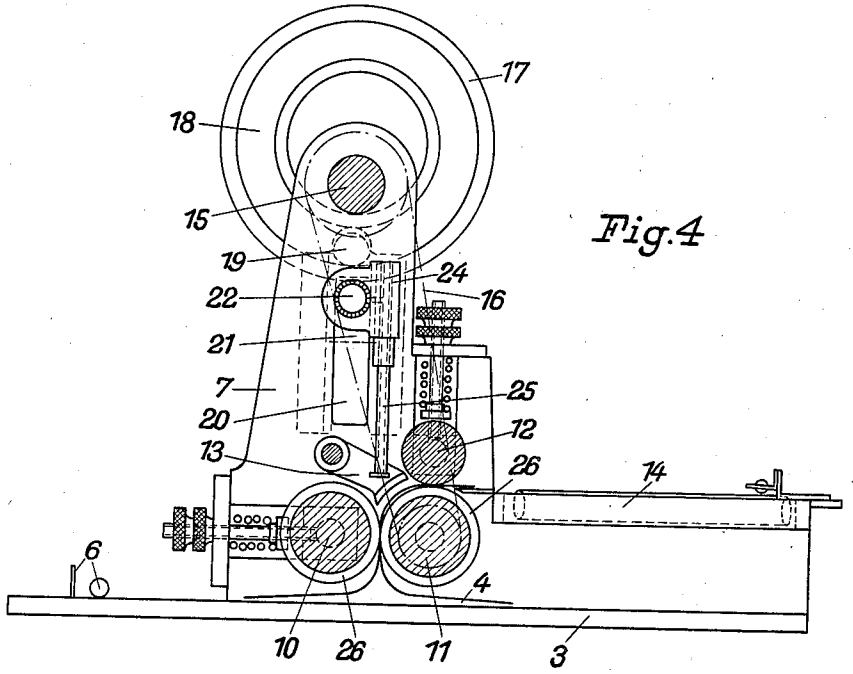
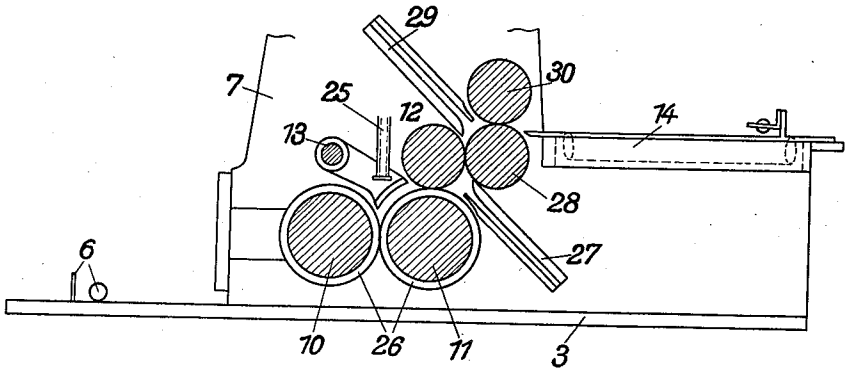


Fig. 4

Fig. 8

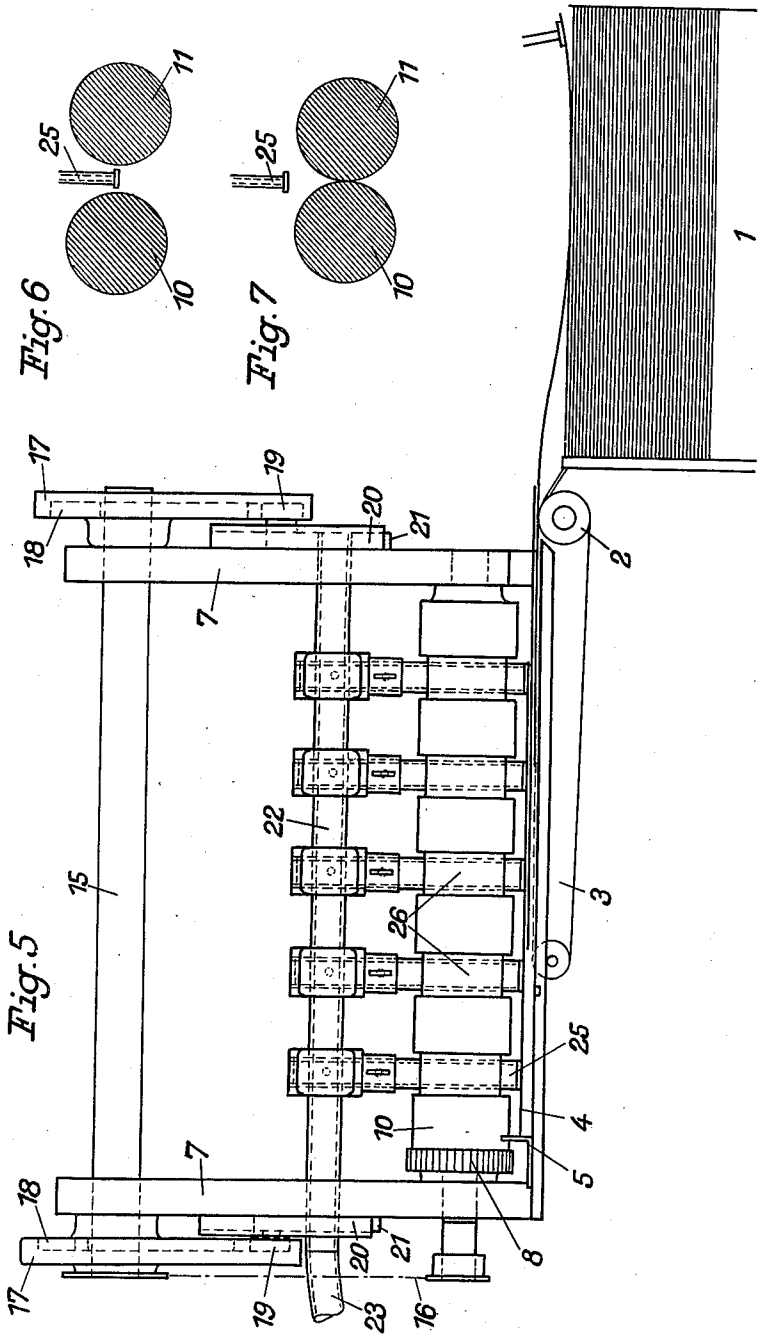


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FOLDING MACHINE

Filed Nov. 28, 1938 3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

2,205,127

FOLDING MACHINE

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Application November 28, 1938, Serial No. 242,799
In Germany November 29, 1937

8 Claims. (Cl. 270—69)

This invention relates to an improved method of folding sheets fed singly or in overlapped relation.

In folding machines it is known to carry out the folding operation by means of draw-in rollers or draw-in segments furnished with suction air nozzles or by means of two suction rods which are positively moved towards one another. However, with these folding means and especially with the rotating suction rollers, it is not always possible for the sheet to be folded to be seized simultaneously by the two suction rollers so that either one or other of the suction rollers seizes the sheet first, whereby an inaccurate fold results which is correspondingly multiplied depending on the number of subsequent folding operations carried out.

The principal object of this invention is to avoid the above disadvantages and to provide a method of folding sheets fed singly or overlapped, which ensures an accurate fold being obtained and at the same time enables the folding machine, to be so constructed as to allow of easy inspection and attendance.

According to this invention, I provide a method of folding sheets fed singly or in overlapped relation, wherein the sheet is seized in the fold line on its upper or under side by a rectilineally or approximately rectilineally or curve like moved suction member, and is positively fed into the folding apparatus.

The suction member may consist of a suction rod with any desired number of suction openings therein, or also of a series of adjacently arranged suckers, or suction lifters, the individual suckers advantageously carrying out their movement between the rollers of the folder. For example, one or both of the folding roller pairs may be suitably recessed, or grooved to allow of the passage therepast of the individual suckers, or the rollers may be made relatively displaceable, for example both rollers or only one roller may be swingably mounted.

According as to whether the folding rollers are arranged above or below the plane of the sheet, the suction member which may be controlled mechanically, automatically by air or in any other suitable manner seizes the sheet either on its upper or its under surface.

In order that the invention may be fully understood, I shall now describe some embodiments of a folding machine suitable for use in carrying out my improved method, by way of example, by reference to the accompanying diagrammatic drawings, in which all parts not necessary for a clear understanding of the invention are omitted and in which:

Figs. 1 and 2 are fragmentary front elevations of the folding machine showing the suction members in two working positions.

Fig. 3 is a partial plan view thereof.

Figs. 4 and 5 are a front and a side elevation respectively showing the drive for the suction members.

Figs. 6 and 7 are detail views showing, in two working positions, a modified construction of the folding rollers and

Fig. 8 is a similar view to Fig. 1 but showing a modified arrangement suitable for three parallel foldings of the sheet.

Referring first to Figures 1–5 of the drawings; the individual sheets are withdrawn from a sheet pile 1 (Fig. 5) in the known manner by a sheet feeder 2 and moved in overlapped layering by the forwarding bands of the sheet feeder to a table plate 3 and are moved forward over the latter until the front edge of the uppermost sheet 4 lies adjacent adjustable guides 5 serving for its front registration, whilst at the same time its lateral registration is effected by a known adjustable side registering device 6.

In the frame 7 of the folding machine are rotatably carried two draw-in rollers 10 and 11, driven uniformly by pinions 8, 9 (Fig. 3) from the main shaft of the machine, a driven guide roller 12 and a change-over guide 13. The draw-in roller 11 and the guide roller 12 are located adjacent a per se known corner feeding table 14 which forwards the sheet first folded by the first folding mechanism comprising the rollers 10—12 towards one or more transverse folding mechanisms. In the upper part of the machine frame 7 is carried a shaft 15 (Figs. 4 and 5) which is rotated by a chain drive 16 from the shaft of the draw-in roller 11, and carries at each end an eccentric 17, in a groove 18 of which runs a roller 19 carried by a bearing member 21 displaceably mounted in a vertical guide 20. The two bearing members 21 are connected together by a hollow shaft 22 to which is connected a flexible conduit 23 (Fig. 5) of a suction air pump. On the hollow shaft 22 are arranged, as shown in Fig. 5, five suitably spaced carriers 24 in which are mounted hollow suction lifters 25 connected to the hollow shaft 22. The suction lifters 25 furnished with as many suction openings as desired and forming together a suction member adapted to be reciprocated rectilineally on the rotation of the eccentrics 17, can be moved between the two draw-in rollers 10, 11, grooves 26 being formed in

these rollers for this purpose. If desired, these grooves can be provided only in one of the said rollers.

The method of working of the described arrangement is as follows:

When the upper sheet 4, removed and forwarded by the sheet feeder 2 from the sheet pile 1 in staggered or overlapping relation, has received its forward and side registration and thus has taken up its correct position for the register-accurate folding on the table plate 3, the suction members 25 are lowered by the rotating eccentrics 17 on to the uppermost sheet 4. Air now being admitted to the member 25, this sheet is now seized by the latter accurately in the fold line and on the subsequent raising of the said suction member 25 as shown in Fig. 2, effected by the further rotation of the eccentrics 17, is fed to the two folding rollers 10, 11. As soon as the latter grip the sheet 4 between them, the suction air in the hollow shaft 22 is shut off and the suction member 25 goes idly into its highest position shown in Fig. 4 and returns from there again into its lower working position for a further sheet feeding operation. In the meantime the constantly rotating rollers 10, 11 have folded register-accurately in the fold line the sheet 4 gripped by it which sheet is guided by the change-over guides 13 between the rollers 11, 12 and by the latter to the corner feeding table 14 with the known inclined rollers together with guide rule and pressure means. Which table forwards the sheet towards a subsequent blade or buckling folder.

In modifying the above-described roller construction, as shown in Figs. 6 and 7, for the passage of the suction member 25 between the folding roller pair, the rollers 10, 11 thereof are displaceable relatively to one another in the horizontal plane. On the downstroke of the suction member 25 the rollers 10, 11 are separated from one another (Fig. 6) and return from this separated position into their contacting position shown in Fig. 7 on the raising of the suction member 25. The separating movements of the rollers 10, 11 are carried out in unison with the up and down movement of the suction member 25. If desired one roller of the folding roller pair 10, 11 can be held stationarily, and the other roller caused to swing away from it for the passage of the suction member 25.

Referring now to Fig. 8, there is shown connected to the first folder 10, 11 in front of the roller 12, two further folding mechanisms for effecting two further parallel foldings of the sheet apart from the first sheet folding operation described above. For this purpose the already once folded sheet, on its passage through the roller pair 10, 12, arrives into a folding pocket 27 of known kind, passes from the latter in the known manner between the folding rollers 12, 28 completing the second folding mechanism, from this into another folding pocket 29 and from the latter through folding rollers 28, 30 forming, in conjunction with a folding pocket 29, the third folding mechanism. From this third folding mechanism the sheets provided now with three parallel folds are fed to the corner feed table 14, which takes over their feeding and passes them towards one or more blade or buckling folding mechanisms for, for example, transverse folding. If desired, by the introduction of known guides, one or other of the folding mechanisms may be switched out of operation depending on the degree of folding required.

I claim:

1. In a sheet folding machine, a table, a pair of folding rolls located above said table in horizontal side-by-side relation, a suction device movable vertically between said rollers and extending in its downward movement into suction engagement with a sheet on the table, and actuating mechanism for said suction device and rolls.

2. In a sheet folding machine, a table, a pair of folding rolls located above said table in horizontal side-by-side relation, a suction device movable vertically between said rollers and extending in its downward movement into suction engagement with a sheet on the table, actuating mechanism for said suction device and rolls, a guide roller on the top of one of said rolls, means to deflect the sheet passing from the roll toward the contacting portions of the guide roller and the roll whereon it rests, and a table receiving the sheet after its passage from the guide roller.

3. In a sheet folding machine, a table, a pair of folding rolls located above said table in horizontal side-by-side relation, a suction device movable vertically between said rollers and extending in its downward movement into suction engagement with a sheet on the table, said rolls being grooved to permit passage of said suction device, and actuating mechanism for said suction device and rolls.

4. In a sheet folding machine, a table, a pair of folding rolls located above said table in horizontal side-by-side relation, a suction device movable vertically between said rollers and extending in its downward movement into suction engagement with a sheet on the table, said rolls being grooved to permit passage of said suction device, actuating mechanism for said suction device and rolls, a guide roller on the top of one of said rolls, means to deflect the sheet passing from the roll toward the contacting portions of the guide roller and the roll whereon it rests, and a table receiving the sheet after its passage from the guide roller.

5. In a sheet folding machine, a table, a pair of folding rolls located above said table in horizontal side-by-side relation, a suction device movable vertically between said rollers and extending in its downward movement into suction engagement with a sheet on the table, actuating mechanism for said suction device and rolls, and including a drive shaft carrying a driven eccentric for raising and lowering the suction device and an operative connection between said drive shaft and rolls.

6. In a sheet folding machine, a table, a pair of folding rolls located above said table in horizontal side-by-side relation, a suction device movable vertically between said rollers and extending in its downward movement into suction engagement with a sheet on the table, actuating mechanism for said suction device and rolls, including a drive shaft carrying a driven eccentric for raising and lowering the suction device and an operative connection between said drive shaft and rolls, a guide roller on the top of one of said rolls, means to deflect the sheet passing from the roll toward the contacting portions of the guide roller and the roll whereon it rests, and a table receiving the sheet after its passage from the guide roller.

7. In a sheet folding machine, a table, a pair of folding rolls located above said table, in horizontal side-by-side relation, a suction device movable vertically between said rollers and ex-

tending in its downward movement into suction engagement with a sheet on the table, said rolls being grooved to permit passage of said suction device, actuating mechanism for said suction device and rolls, including a drive shaft carrying a driven eccentric for raising and lowering the suction device and an operative connection between said drive shaft and rolls.

8. In a sheet folding machine, a table, a pair of folding rolls located above said table in horizontal side-by-side relation, a suction device movable vertically between said rollers and extending in its downward movement into suction engagement with a sheet on the table, said rolls being grooved to permit passage of said suction device, actuating mechanism for said suction device and rolls, including a drive shaft carrying a driven eccentric for raising and lowering the suction device, and an operative connection between said drive shaft and rolls, a guide roller on the top of one of said rolls, means to deflect the sheet passing from the roll toward the contacting portions of the guide roller and the roll whereon it rests, and a table receiving the sheet after its passage from the guide roller.

GEORG SPIESS.