

April 16, 1935.

G. SPIESS

1,998,337

FOLDING MACHINE

Filed July 17, 1931

2 Sheets-Sheet 1

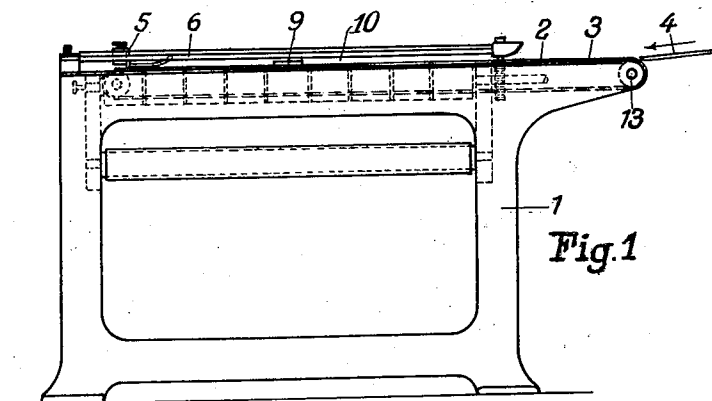


Fig. 1

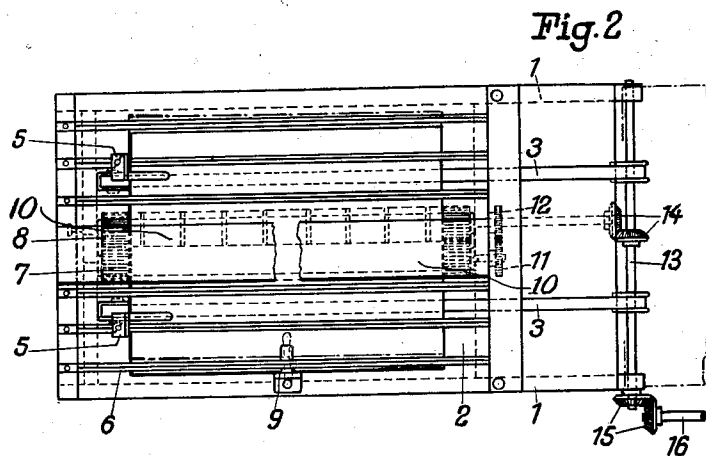


Fig. 2

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2 Sheets-Sheet 2

FIG. 3

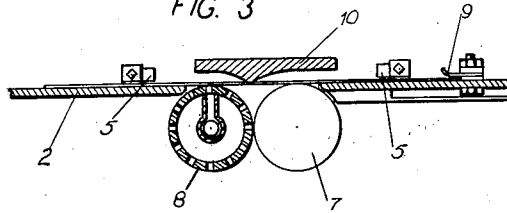


FIG. 4

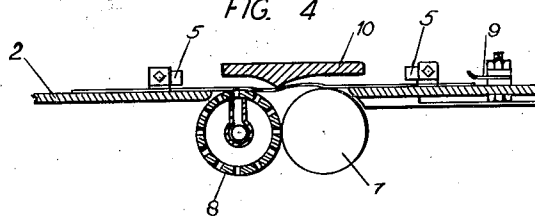


FIG. 5

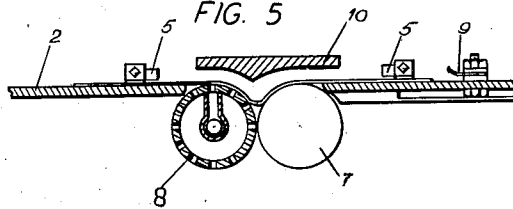


FIG. 6

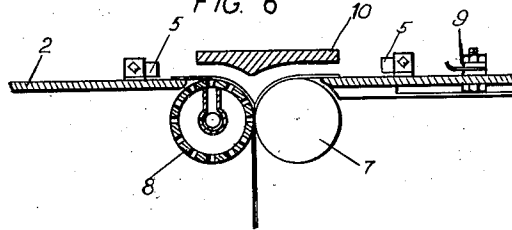
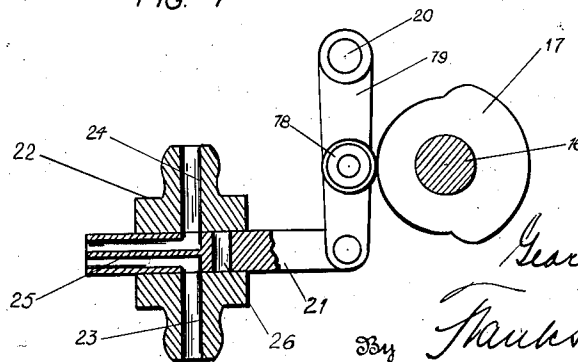


FIG. 7



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FOLDING MACHINE

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In Germany July 29, 1930

8 Claims. (Cl. 270—68)

The invention relates to folding machines, and more particularly to buckling folders.

In the known folding machines, which operate on the buckling principle, the folding rollers are arranged transversely to the direction of entry or feed of the sheets. With simple uninterrupted sheet feeding the sheets are forwarded at high speed up to the registering stops and are buckled and folded immediately without stopping the feeding action of the feed rollers by the pushing action which operates always continuously in the same direction. The striking of the sheet on the stops which takes place is, however, a great disadvantage of the method of folding by buckling wherein folding rollers are arranged transversely to the direction of feed, inasmuch as the registration of the sheet is impaired as a consequence of the violent impact and inaccurate folding occurs. If a buckling folder operating in this way is to be combined with successive blade folders a further disadvantage arises inasmuch as the sheet feed must then be arranged perpendicularly to the feed of the blade folding machine, which is constructionally unfavourable and considerably increases the space required in order to render co-operative working possible. The construction of the first folder in the form of a knife folder has the disadvantage that the output is necessarily small as a result of the losses of time in the lateral registration of the sheets.

These drawbacks are eliminated by means of the present invention which is characterized in that the folding rollers of a folder operating intermittently according to the buckling method in a manner known per se in connection with buckling folders, are arranged with their axles lying in the direction of feed of the sheet in such manner that they push the sheet which is brought up to front stops against lateral stops and at the same time buckle it for the formation of a fold. By this means the advantage is attained that in every case, whether the sheets are fed singly (for example with short sizes) or in layers of any desired kind (for example with long sizes) the sheet led up to the registering stops comes to rest, the said sheet being in consequence of the pushing action of the feeding means gradually pressed gently up to the stops and being quite accurately registered. If now the buckling folder comprising, for example, a pair of folding rollers with a folding roller constructed in the form of a suction conveying roller, conveys the sheet transversely to the direction of feed, then, inasmuch as the path to be traversed up to the lateral stop is only very small (a few millimetres),

the folding crease will immediately be formed and the creasing will always take place exactly at the desired place, especially if the formation of the crease is assisted by the provision of a shaping batten. If the batten is suitably rounded off at the end at which the sheet enters and is of suitable cross sectional shape it will not disturb either the feed or the registering of the sheet. Guiding or controlling of the shaping batten, for instance, after the manner of a folding blade is not necessary.

The suction air is preferably shut off in known manner during the forwarding of the sheets to the front stops, during which operation the sheets slide longitudinally over the suction roller. The folding rollers may be intermittently driven or a special pair of feed rollers separated from the folding and feeding rollers may be provided, which said pair of rollers only forms and draws in the crease and thereupon goes back into a position of rest. By the provision of a tubular rotating slide valve of a kind known per se built into the axle of the suction folding roller, the suction air nozzle and consequently also the rows of suction holes provided on the peripheral surface of the suction roller are rendered capable of being shut off individually in succession from the ends of the roller to the interior, so as to adapt the operation to the size of sheet which is to be worked.

By means of a grid, plate or the like, which is arranged at a distance from the folding table (which latter corresponds to the folding channel of a folding pocket), the sheet is conveyed during the feeding operation and during the registering and folding in such manner that the formation of undulations and inaccurate folding are prevented. On the rods of the grid the registering stops are also adjustably mounted in known manner.

The arrangement of the folding mechanism according to the invention renders possible without further difficulty the co-operative working of a first folder constructed as set forth in step with succeeding blade folders and also renders possible the arrangement of the sheet stops in exact agreement with the arrangement of the similar stops employed in the printing of the sheets. The method of folding according to the invention is, particularly for large sheet sizes which necessitate an exact registration, of the greatest value and, in particular, renders possible for the first time the reliable working application of the buckling method for large sizes of sheets.

A preferred constructional form of a folder

according to the invention is illustrated by way of example in the accompanying drawings, in which all details not necessary for the comprehension of the invention have been omitted, and in which:

Figure 1 is a side elevation, partially diagrammatic, of the folder.

Figure 2 is a similar plan view thereof, partially broken away.

Figure 3 is a diagrammatic section showing the first step in the folding operation.

Figure 4 is a similar view showing the second step.

Figure 5 is a similar view showing the third step.

Figure 6 is a similar view showing the fourth step.

Figure 7 is a section of a control valve suitable for this purpose.

Referring to the drawings, the reference numeral 1 denotes the frame of the folder, the table 2 of which is equipped with conveying bands 3 and which receives the sheets fed up from a feeding device (only indicated but not fully shown on the drawings) in the direction of the arrow. The conveying belts or bands 3 bring the sheets up to the front stops 5, which are mounted on a grid 6 provided with guide rods and arranged at a small distance above the folding table 2. Between the conveying bands 3 and below the table 2 or a recess of the table as the case may be, a pair of folding rollers 7, 8 extending in the direction of feed of the sheets is arranged. The one folding roller 8 is constructed as a suction roller and is so arranged that it pushes forward the sheet directly gripped by it up to a lateral stop 9 arranged on the table and buckles the sheet during the period from the moment of striking the stop up to the formation of the crease. By means of the rod grid and a shaping batten 10 extending above the rollers in the direction of the gap of the rollers, and having a suitable cross section, the fold is led up to the gap of the folding rollers so that it is grasped by the rollers and drawn in. The folding rollers 7, 8 are in engagement with one another through the medium of toothed wheels 11, 12 and are driven by a driving shaft 13 through the medium of a pair of bevel wheels 14. The shaft 13 is driven by means of a pair of bevel wheels 15 from a shaft 16.

In order to provide for interrupting the action of the suction roll, it is preferred that some conventional or well known type of valve and means for actuating the same shall be used and, while no claim is made of novelty in such a valve and operating means, a valve and operating means suitable for this purpose has been shown in Figure 2. In this figure, the shaft 16 is shown as provided with a cam 17 which operates against a roller 18 mounted on a lever 19, one end of which is pivoted at 20. To the other end of this lever is pivoted a valve member 21 which works in a valve casing 22 provided with a nipple 24 for connection to the suction roller and a nipple 23 for connection to a suction pump.

The valve has passages 25 and 26 leading to the free air and the inner ends of these passages are movable into and out of registry one with the nipple 23 and the other with the nipple 24. When one of the passages 25 registers with the nipple 23, the other passage registers with the nipple 24, the pump does not affect the suction roller and air entering this roller through the uncovered ports releases the suction.

As shown in Figure 3 to 6 inclusive, the member 10 may have a suitable cross section, but this member may also be made from sheet metal bent according to requirement. It will be noted, however, that, under proper conditions of vacuum in the roller 8, the member may be omitted, although I preferably employ such a member. When used, the member 10 serves to bend the buckled portion of the sheet downwardly, it being understood that there will be a tendency for the sheet to buckle when forced against the fixed stop by the action of the suction roller. The suction of the roller, as controlled by the valve, lasts only until the buckled portion of the sheet is drawn in between the two folding rollers and may be interrupted after that to start again for every folding action. But the sucking effect need not necessarily be interrupted, and the next following sheet may be fed against the front registering stops while the preceding sheet is being folded. The sheets are then folded with each nested in the preceding. The sheets, for this latter manner of folding can be fed into the machine with the forward portion of each overlapping the rear portion of the preceding sheet.

I claim as my invention:

1. A sheet folding device including a table having a slot extending longitudinally thereof, feeder means to deliver sheets from one end of the table towards the other, stops adjacent the end of the table remote from the feeder means, a lateral stop at one side of the table, a pair of folding rolls extending longitudinally of the table below the slot in substantial contact with each other, and means to rotate said rolls in a direction such that their upper parts turn toward each other, the roll remote from the lateral stop being perforated and constituting a suction roll whereby to force the sheets against said lateral stop.

2. A sheet folding device including a table having a slot extending longitudinally thereof, feeder means to deliver sheets from one end of the table towards the other, stops adjacent the end of the table remote from the feeder means, a lateral stop at one side of the table, a pair of folding rolls extending longitudinally of the table below the slot in substantial contact with each other, means to rotate said rolls in a direction such that their upper parts turn toward each other, the roll remote from the lateral stop being perforated and constituting a suction roll whereby to force the sheets against said lateral stop, and conveying bands leading from the feeder means to the opposite end of the table.

3. A sheet folding device including a table having a slot extending longitudinally thereof, feeder means to deliver sheets from one end of the table towards the other, stops adjacent the end of the table remote from the feeder means, a lateral stop at one side of the table, a pair of folding rolls extending longitudinally of the table below the slot in substantial contact with each other, means to rotate said rolls in a direction such that their upper parts turn toward each other, the roll remote from the lateral stop being perforated and constituting a suction roll whereby to force the sheets against said lateral stop, grid bars extending longitudinally over said table and supporting said stops for adjustment therealong, and means to secure said stops in adjusted positions on said grid bars.

4. A sheet folding device including a table having a slot extending longitudinally thereof, feeder means to deliver sheets from one end of the table towards the other, stops adjacent the end of the

table remote from the feeder means, a lateral stop at one side of the table, a pair of folding rolls extending longitudinally of the table below the slot in substantial contact with each other, means to rotate said rolls in a direction such that their upper parts turn toward each other, the roll remote from the lateral stop being perforated and constituting a suction roll whereby to force the sheets against said lateral stop, conveying bands leading from the feeder means to the opposite end of the table, grid bars extending longitudinally over said table and supporting said stops for adjustment therealong and means to secure said stops in adjusted positions on said grid bars.

5. A sheet folding device including a table having a slot extending longitudinally thereof, feeder means to deliver sheets from one end of the table towards the other, stops adjacent the end of the table remote from the feeder means, a lateral stop at one side of the table, a pair of folding rolls extending longitudinally of the table below the slot in substantial contact with each other, means to rotate said rolls in a direction such that their upper parts turn toward each other, the roll remote from the lateral stop being perforated and constituting a suction roll whereby to force the sheets against said lateral stop, and a shaping batten extending longitudinally over said slot and arranged to buckle the sheets downwardly as they are forced against the lateral stop.

6. A sheet folding device including a table having a slot extending longitudinally thereof, feeder means to deliver sheets from one end of the table towards the other, stops adjacent the end of the table remote from the feeder means, a lateral stop at one side of the table, a pair of folding rolls extending longitudinally of the table below the slot in substantial contact with each other, means to rotate said rolls in a direction such that their upper parts turn toward each other, the roll remote from the lateral stop being perforated and constituting a suction roll whereby to force the sheets against said lateral stop, conveying bands leading from the feeder means to the opposite end of the table, and a shaping batten ex-

tending longitudinally over said slot and arranged to buckle the sheets downwardly as they are forced against the lateral stop.

7. A sheet folding device including a table having a slot extending longitudinally thereof, feeder means to deliver sheets from one end of the table towards the other, stops adjacent the end of the table remote from the feeder means, a lateral stop at one side of the table, a pair of folding rolls extending longitudinally of the table below the slot in substantial contact with each other, means to rotate said rolls in a direction such that their upper parts turn toward each other, the roll remote from the lateral stop being perforated and constituting a suction roll whereby to force the sheets against said lateral stop, grid bars extending longitudinally over said table and supporting said stops for adjustment therealong, means to secure said stops in adjusted positions on said grid bars, and a shaping batten extending longitudinally over said slot and arranged to buckle the sheets downwardly as they are forced against the lateral stop.

8. A sheet folding device including a table having a slot extending longitudinally thereof, feeder means to deliver sheets from one end of the table towards the other, stops adjacent the end of the table remote from the feeder means, a lateral stop at one side of the table, a pair of folding rolls extending longitudinally of the table below the slot in substantial contact with each other, means to rotate said rolls in a direction such that their upper parts turn toward each other, the roll remote from the lateral stop being perforated and constituting a suction roll whereby to force the sheets against said lateral stop, conveying bands leading from the feeder means to the opposite end of the table, grid bars extending longitudinally over said table and supporting said stops for adjustment therealong, means to secure said stops in adjusted positions on said grid bars, and a shaping batten extending longitudinally over said slot and arranged to buckle the sheets downwardly as they are forced against the lateral stop.

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