March 2, 1937. M. APITZSCH ET AL 2,072,790

PAPER FOLDING MACHINE

Filed Oct. 16, 1935 5 Sheets-Sheet 1

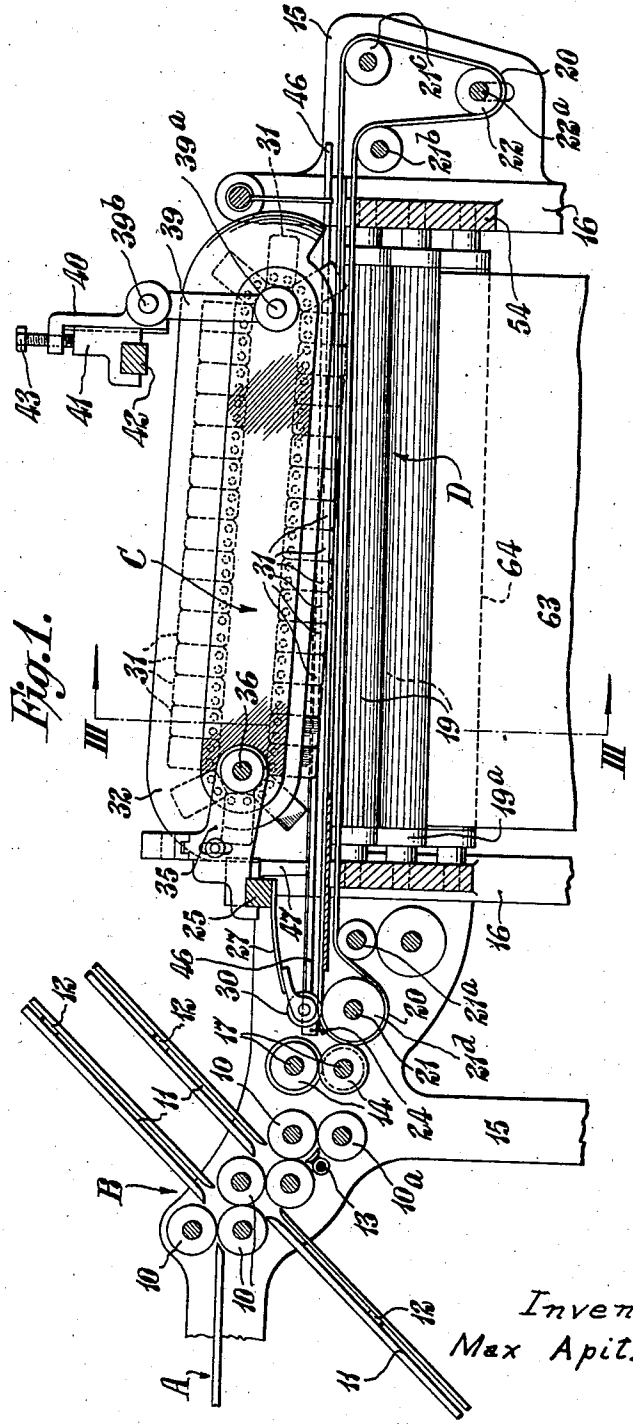

Fig. 1.

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PAPER FOLDING MACHINE

Filed Oct. 16, 1935 5 Sheets-Sheet 2

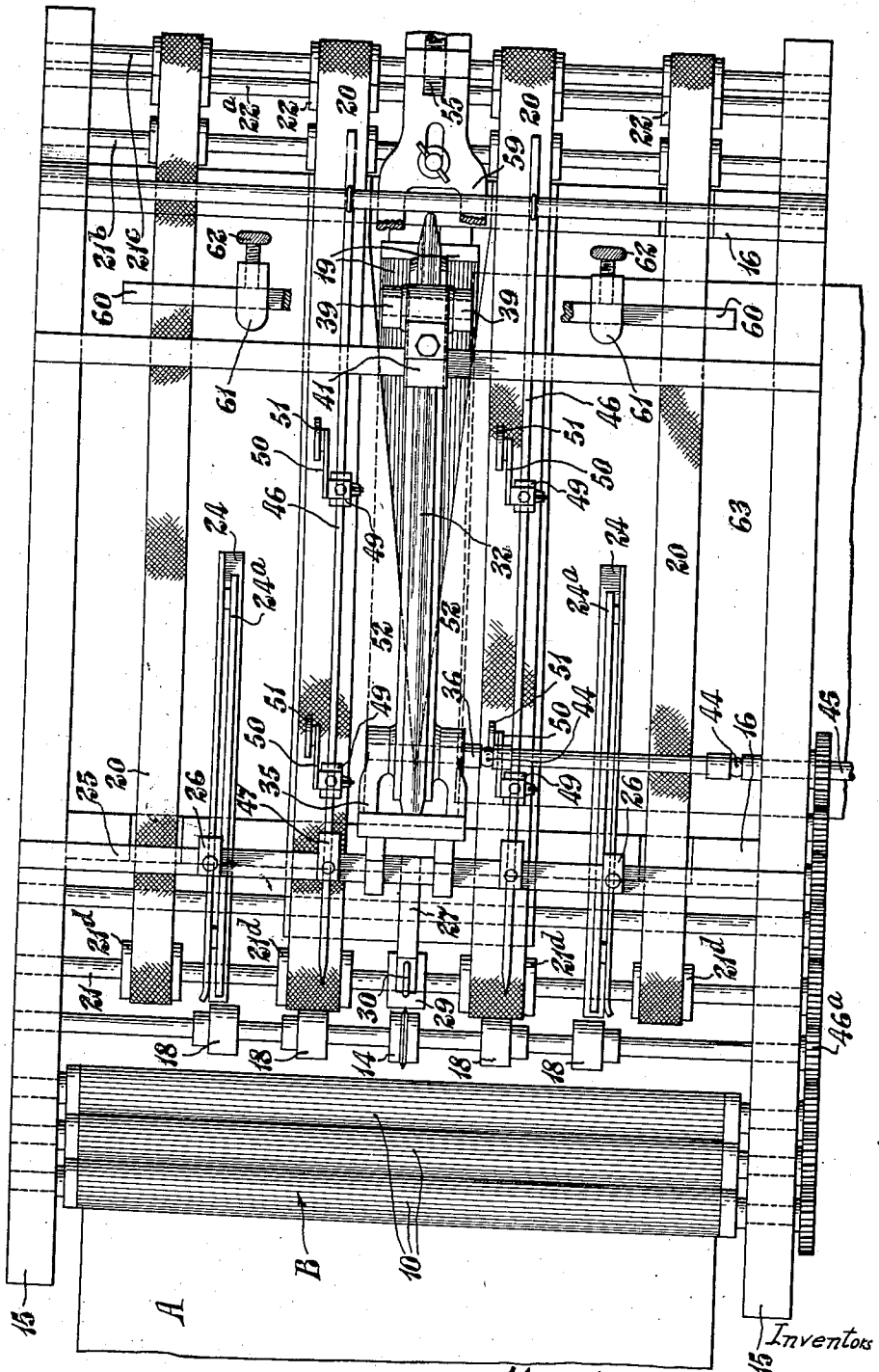

Fig. 2.

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March 2, 1937 M. APITZSCH ET AL 2,072,790

PAPER FOLDING MACHINE

Filed Oct. 16, 1935 5 Sheets-Sheet 3

Fig. 5.

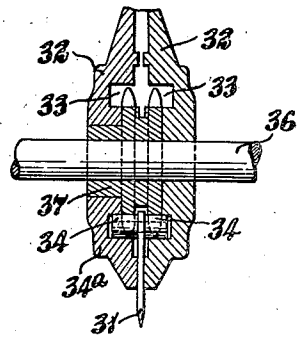


Fig. 4.

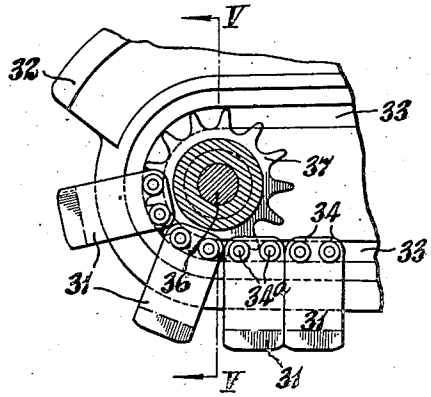


Fig. 6.

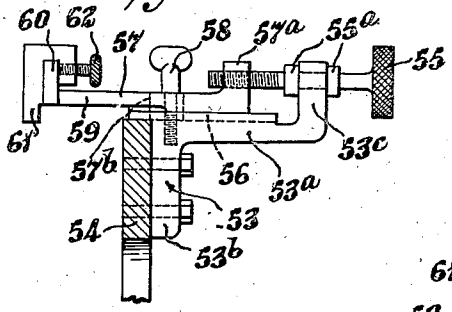


Fig. 7.

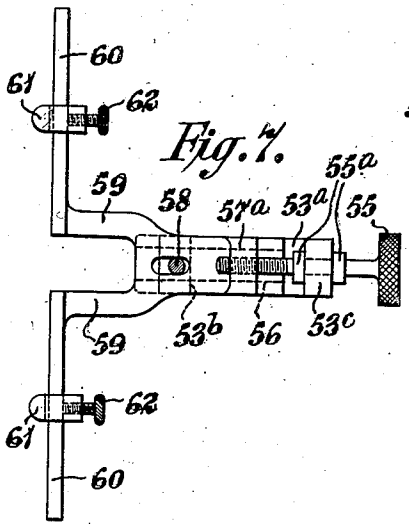
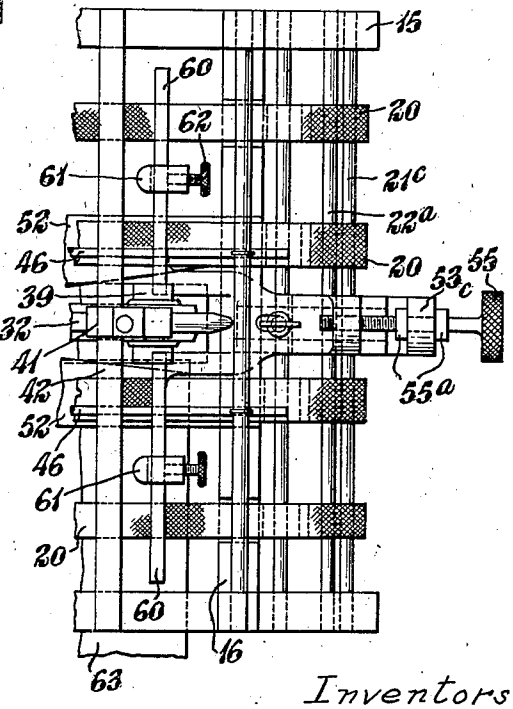


Fig. 2a



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PAPER FOLDING MACHINE

Filed Oct. 16, 1935 5 Sheets-Sheet 4

Fig. 3.

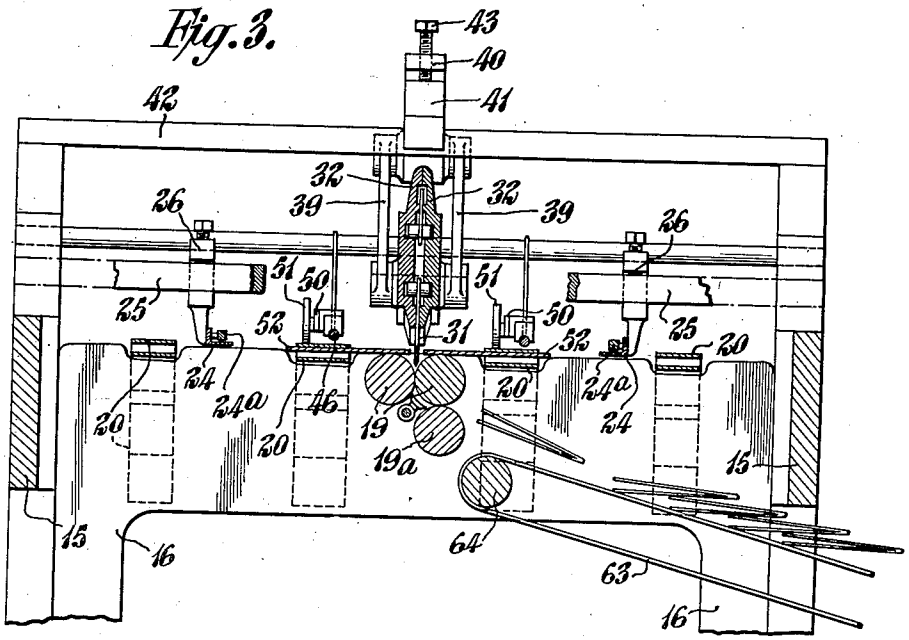
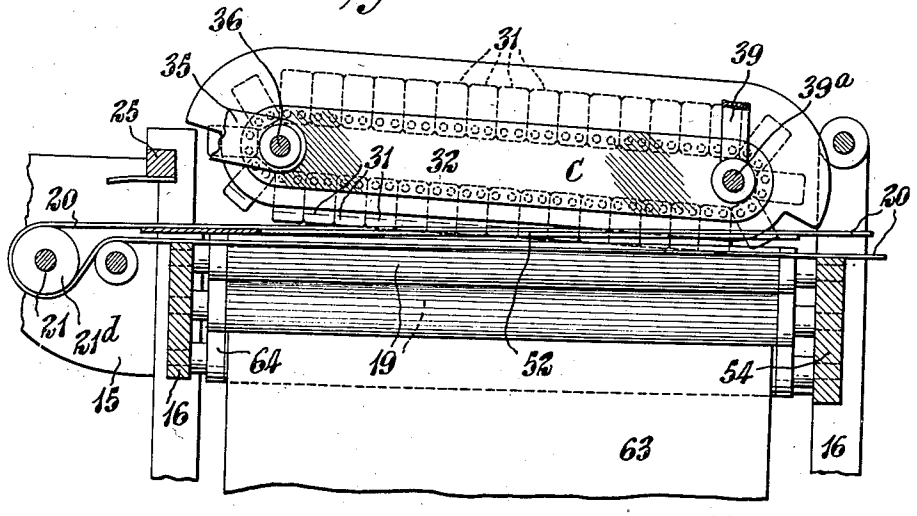


Fig. 8.



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PAPER FOLDING MACHINE

Filed Oct. 16, 1935 5 Sheets-Sheet 5

Fig. 9.

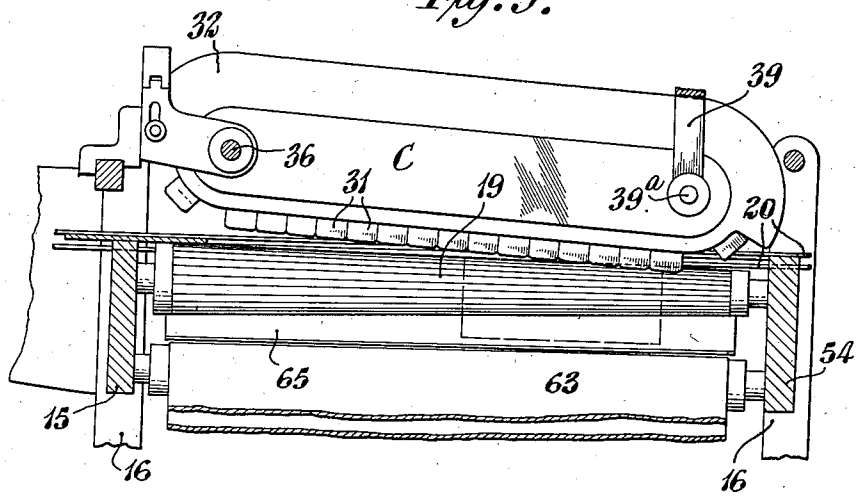
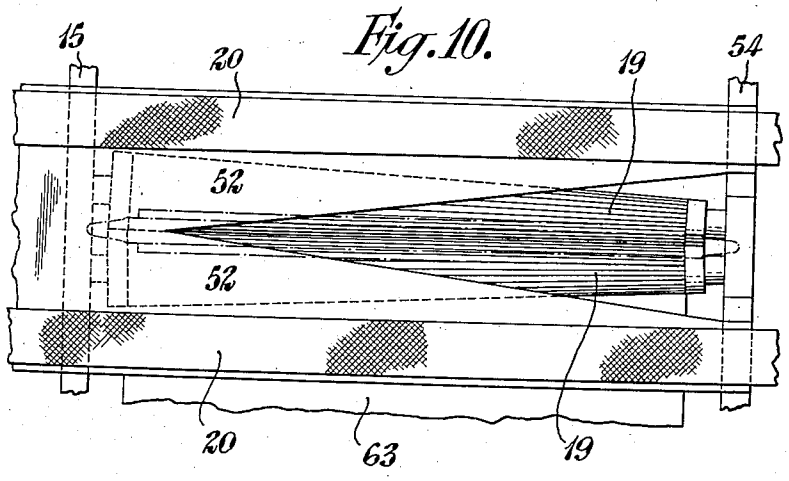


Fig. 10.



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Patented Mar. 2, 1937 2,072,790

UNITED STATES PATENT OFFICE

2,072,790

PAPER FOLDING MACHINE

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Application October 16, 1935, Serial No. 45,322
In Germany January 31, 1935

25 Claims. (Cl. 270—62)

This invention relates to improvements in machines for folding paper or like sheets enabling the sheets in their passage through the machine to be folded and if desired also cross folded with great accuracy without the use of any timed mechanism such as the customary folding knife or like device. It is concerned more particularly with a method of folding as described in the specification of U. S. Patent No. 1,961,000, according to which the sheets to be folded are fed over a pair of inversely rotating fold rolls and are brought into contact with a guide associated with the fold rolls with its folding edge so shaped that the sheets are progressively pressed between the rolls, and on being seized by the latter are folded thereby along the line of contact of the edge of the fold guide with the sheet. The means particularly described and claimed in the prior patent specification for carrying the method into effect involve the use of a stationary fold guide.

Now the object of the present invention is to carry said method into effect by the provision of means modified to enable a moving fold guide or like member to be employed with satisfactory results. To this end according to the invention a movable guide provided to co-operate with the fold rolls is employed to cause a sheet in its passage over the rolls to be directed into the bite of the rolls while moving along a path inclined to the longitudinal axes of the rolls.

By virtue of this arrangement the edge of the fold guide on meeting the sheet travels therewith while guiding the sheet between the fold rolls with a gradually progressive pressure, so reducing drag upon the sheets and entirely obviating such drag if the fold guide is set to travel at the same speed as the sheet. Moreover by performing the folding of the sheets in this manner, distortion of the work is avoided, with the additional advantage over the known timed knife folding methods in that squeezing or secondary folds do not occur or occur only to a much smaller extent, while at the opposite point of the line of folding the pulling apart of the fold is substantially obviated.

One practical embodiment of the invention will now be described with reference to the accompanying drawings in which

Fig. 1 is an elevational view of a sheet folding machine showing, in part section, a buckle fold section for imparting parallel folds to the work, and a cross fold section constructed according to the present invention for cross folding the sheets fed thereto, from the preceding buckle fold set,

Fig. 2 is a plan view of the arrangement shown in Fig. 1, partly broken away to avoid a confusion of the parts,

Fig. 2*a* is a fragmentary plan view showing the mounting of the adjustable head-stop,

Fig. 3 is a sectional end elevation taken on line III—III of Fig. 1,

Fig. 4 is a detail view of the sprocket drive, guideways and runways for the guide members, drawn to a larger scale,

Fig. 5 is a sectional elevation taken on line V—V of Fig. 4,

Fig. 6 is a detail view of the adjustable head-stop for the sheets, also drawn to a larger scale,

Fig. 7 is a plan view of the detail shown in Fig. 6,

Fig. 8 is a fragmentary elevational view showing an alternative arrangement of the folding device of this invention;

Fig. 9 is a fragmentary elevational view showing an alternative arrangement of the cross-fold rolls, and

Fig. 10 is a plan view of the fold rolls shown in Fig. 9.

Referring more particularly to Fig. 1 the sheet folding machine shown in the drawings comprises a sheet feed table A, buckle fold section B, the cross fold section C and a delivery conveyor D. The table A is indicated as a work support upon which the sheets to be parallel folded are progressed to the first fold set of the buckle fold section B. The fold section B does not form a specific part of the construction according to the present invention and therefore is merely diagrammatically indicated as comprising fold rolls 10 with which are associated in well known manner the buckle plates 11, buckling stops 12 and sheet deflector 13. Scoring discs 14 are interposed between the delivery roll 10*a* of the third buckle fold set and the cross fold section C. The discs 14 are arranged transversely to score the parallel folded sheets along the line of the proposed cross fold as the parallel folded sheets are fed to the cross fold section C.

Referring to Figs. 1, 2, and 3, the framework of the machine includes side frames 15 and transverse frame plates 16. The rolls 10 are journalled in the side frames 15 while the buckle plates 11 are supported by suitable brackets (not shown) also secured to the said frames. Shafts 17, journalled in the frames 15, serve to carry the scoring discs 14 and also have mounted thereon pairs of rolls 18 which co-operate to feed the parallel folded sheets to the cross fold section C.

Rolls 19, journalled in the cross frame members 16 are set between the side frames 15 and at right angles to the fold rolls 10 to constitute the folding means of the fold section C.

The rolls 19 are set level with the roll 10*a*, and the sheets to be cross folded are conveyed thereto by continuous conveyor tapes 20. Shafts 21, 21*a*, 21*b*, and 21*c* extending parallel with the shaft 17 and also journalled in side frames 15 to either end of the rolls 19, are provided with pul-

leys 21d around which pass the continuous conveyor tapes 20. A roll 22, carried by a shaft 22a which may engage in guide slots in the frames 15, rests in the bights of the tapes 20 as shown in Fig. 1 to tension the tapes in usual manner. The tapes 20 are driven from a friction disc 23 mounted upon a drive shaft 23a. Alternatively any or all of the shafts 21—21c may be driven to effect the drive of the conveyor tapes. Side guides 24 are associated with the conveyor tapes 20 to guide the sheets along the correct path of travel. To this end the side guides 24 comprise members of L-shaped cross section extending parallel with the tapes 20 and suspended from a cross bar 25 by clamps 26 so as to be laterally adjustable transversely of the conveyor tapes. Retaining strips 24a are associated with the side guides 24 to retain therein the edges of the guided sheets. The cross bar 25 is secured at its extremities to the side frames 15 and also has attached thereto a blade spring 27 which extends towards the scoring discs 14 and bends downward to terminate immediately above a roll 29 which is carried by the shaft 21 and aligned with the scoring discs 14. A runner or follower disc 30 carried in a bearing bracket secured to the free end of the blade spring 27 is set above the roll 29 to bear upon the sheets passing to the tapes and is aligned with the scoring discs 14 so as to enter the grooves scored in the sheets, thereby to afford additional guidance to the latter in their passage to the cross fold section.

As shown in Figs. 2 and 3, rods 46 are suspended from the cross bar 25 by adjustable clamping brackets 47 so as to extend longitudinally of the inner conveyor tapes 20. The rods 46 are laterally adjustable along the cross bar 25 and serve to carry brackets 49. Arms 50 secured to the brackets 49 and extending parallel with the tapes 20 have discs or runners 51 mounted at their free extremities to engage the sheets and press the latter into engagement with the tapes 20. Plates 52 set beneath the upper stretches of the inner conveyor tapes 20 and extending longitudinally thereof provide a bearing surface whereby the tapes are supported in firm contact with the work conveyed thereby. The inner edges of the plates 52 closely abut beneath the left hand portions of the tapes 20 but are flared outward towards the right hand extremity of the tapes to provide a wedge shaped gap between said plates through which the sheets pass when engaged by the rolls 19.

The travelling fold guide whereby the sheets are pressed between the fold rolls 19 is constituted by a series of elements such as the blade-shaped members 31 shown in the drawings, which are constrained to move along a closed path in a vertical plane passing through the bite of the fold rolls. The individual elements or blades 31 may be mounted in spaced or abutting relationship upon a carrier belt or chain or, as shown in the drawings, are freely mounted in abutting relationship in a continuous guideway. With this object in view a rigid structure comprising a pair of vertically disposed housing plates 32 are mounted above the rolls 19 so as to extend longitudinally thereof and at an inclination to the horizontal. The plates 32 have their inner, opposed faces suitably fashioned to form a continuous channel 33 which is T-shaped in cross section. The tail of the T-channel comprises the guideway to receive and constrain the blades 31, while the cross piece of the T channel receives, and forms a runway for rollers 34 rotatably mounted upon pins 34a which project outwardly on either side from, and at right angles to the blades, adjacent the bases thereof (see Figs. 1, 3, 4, and 5). The fold guide blades 31 thus freely travel along the guideway 33 and are shunted along by mutual contact between the blades, the initial movement of which is achieved as hereinafter described.

The plates 32 are supported at the left hand extremity thereof (as viewed in Figs. 1 and 2) by bearing brackets 35 which are rigidly secured to the cross bar 25 so as to be laterally adjustable thereon and are bossed at their lower extremities to provide bearings for a transverse stub shaft 36. The shaft 36 passes through the plates 32 to support the latter and carries a double sprocket wheel 37 which is adapted to rotate in a suitable clearance formed between the plates 32. The sprocket wheel 37 is secured to the shaft 36 and is rotated thereby as hereinafter described. The right hand extremities of the plates 32 rest upon a gudgeon pin 39a which is rotatably mounted in the lower bossed extremities of a pair of spaced, upwardly-extending links 39. The upper extremities of the links 39 are secured by a pin 39b to a slide 40. A grooved bracket 41, rigidly secured to a cross bar 42 and laterally adjustable thereon, slidably supports the slide 40 while the relative position of the members 40, 41 is determined by a set screw 43 which passes through a threaded hole in the lug of the slide 40 to engage the bracket 41. Thus, the right hand end of the plate 32 can be raised or lowered about the axis of the shaft 36 to adjust the depth of the downward movement of the guide blades 31 and the inclination of the path of travel thereof relatively to the longitudinal axes of the fold rolls 19 and it will be obvious that if desired the left hand mounting of the housing plates 32 may similarly be adjustable. Moreover, by suitably displacing the brackets 35 and 41 along their respective cross bars the position of the fold guide is also laterally adjustable relatively to the fold rolls.

Referring more particularly to Figs. 1 and 4, the continuous guideway 33 is shown to comprise upper and lower T-section slots spaced apart and joined at their extremities by semi-circular slots of similar cross-section having their radial centres upon the axes of the sprocket wheel 37 and pin 39a respectively. Each guide blade 31 is provided with two pairs of rollers 34 which are arranged so that, with the blades closely abutting, the rollers 34 are equally spaced apart in the manner of the rollers of a sprocket chain. The teeth of the sprocket wheel 37 enter between the rollers of the blades which enter the left hand curved extremity of the guideway 33 so that in the rotation of the wheel 37 each roller engaged by the teeth receives a driving thrust to urge the blades along the guideway as a collective body. As shown in Figs. 1, 3, 4, and 5, the guide blades 31 when moving along the lower stretch of the path on guideway 33 project downwardly beyond the lower edges of the plates 32 in such manner that the lower edges of the projecting blades form a continuous edge which is inclined to the longitudinal axes of the rolls 19 and when approaching the right hand end of the latter passes into the space immediately above the contacting rolls. The sprocket shaft 36 is driven from a gear shaft 45 through the intermediary of universal couplings 44 (Fig. 2) while the shafts 45, 23a, and 17 are driven, at equal speed, by the gear train 46.

To facilitate the precise registration of each

sheet at the moment when its downward movement between the fold rolls 19 is initiated, an adjustable head stop is located to the right hand end of the rolls 19 (as viewed in Figs. 1 and 2) immediately above the sheet carrying stretches of the conveyor tapes 20. For this purpose, an angle bracket 53 (Figs. 2a, 6, and 7) is mounted upon a cross bar 54 forming part of one transverse frame member 16 (Fig. 2). The angle bracket comprises a horizontal body 53a, a tail piece 53b extending downwardly therefrom for clamping to the cross bar 54 and an upwardly extending flange 53c which is drilled to form a guide for an adjusting screw 53. As shown in Figs. 6 and 7 the bracket body 53a is provided with a longitudinal groove 56 in which slides a carrier 57 having an upwardly projecting lug 57a which is drilled and tapped to receive the threaded portion of the screw 55. Collars 55a pinned to the screw 55 to each side of the flange 53c restrain the screw from longitudinal movement so that in the rotation thereof the carrier 57 is displaced in the groove 56. A shouldered set screw 38 passes through a slot 57b formed in the carrier 57 to engage the threads of a hole tapped in the bracket 53. When screwed downwards the screw 58 serves to clamp the carrier 57 in the adjusted position. The outwardly projecting extremity of the carrier is bifurcated to form arms 59 which embrace the right hand extremities of the plates 32 and serve to support rails 60 which extend outwardly at right angles to the arms 59. Adjustable lay stops comprising U-shaped members 61 are adapted to embrace the rails 60 and are adjustably clamped thereto by set screws 62. The work engaging faces of the lay stops 61 are fashioned so as to offer a minimum of surface to contact with the work engaged thereby and are suitably arranged by lateral adjustment along the rails 60 to engage the leading edges of the folded sheets at points adjacent the lateral edges of the latter. Extremely fine adjustment of the stops longitudinally of the rolls 19 is effected by rotation of the screw 55.

In an alternative arrangement of the cross fold section C as shown in Fig. 8, the conveyor tapes 20 are slightly inclined to the longitudinal axes of the rolls 19. The tapes are inclined in the opposite direction to the inclination of the fold guides 31 and thus rise upwardly from the rolls 19 in approaching the stops or lays 61. By this arrangement any possible overrun of the sheets relative to the tapes is damped so that the sheets are smoothly halted when in contact with the lay stops. Furthermore by this arrangement of the tapes, the V-fold of the depressed sheet, at its point of engagement in the bite of the rolls is somewhat deeper than in the first described construction which is an advantage in folding certain kinds of paper since the rolls 19 are presented with a maximum surface of paper with which initially to engage.

A travelling belt conveyor 63 positioned adjacent the cross fold section serves to discharge the work which is deposited thereon from the rolls 19, 19a. The discharge conveyor 63 extends outwardly from the machine at right angles to the rolls of the cross fold section and to this end is mounted upon rollers 64 one of which, as shown in the drawings, is journalled in the cross frame members 16.

The operation of the above described constructional embodiment of the invention in producing a 32-page book signature or pamphlet from a single sheet of paper is as follows.

The sheet is laid upon the table A and progressed towards the bite of the leading pair of buckle fold rollers 10. The sheets may be fed to, and along the table A either by hand or, in the case of a fully automatic machine by a mechanical sheet feeding device which is not shown in the drawings. In passing through the buckle fold section B, three parallel folds are imparted to the sheet which then is fed by rolls 10, 10a to the feed rolls 18 and scoring discs 14. As the feed rolls 18 progress the sheets to the conveyor tapes 20 the groove scored along the folded sheet by the discs 14 is entered by the runner disc 30 while the lateral edges of the folded sheet engage the side guides 24. The sheet, pressed upon the conveyor tapes 20 by the runners 51, are conveyed above the rolls 19 in a path parallel with the longitudinal axes thereof while the guide blades 31 are moved downwards in a path inclined to the rolls to meet and engage the sheet. Since the guide blades are travelling at a speed substantially the same as the speed of the travel of the sheet, and the angle of inclination of the moving line of guide blades to the surface of the sheet is comparatively small the relative displacement of the sheet and contacting guide blades is negligible so that the sheet is progressively pressed between the rollers by the downwardly moving guide blades with a minimum of friction or distortion of the work. When the depressed point of the head of the signature reaches the bite of the cross fold rolls 19 which coincides with the registration of the leading edge of the signature with the lay stops 61, the rolls seize the depressed portion of the work and cross fold the entire signature in drawing it through the rolls. The signature folded in the manner above described passes through the rolls with its edges at an angle to the axes of the rolls and when folded is deposited upon the discharge conveyor 63 as shown in Fig. 3.

In an arrangement as above described cylindrical rolls may be used since the discharge of the cross folded signatures with their edges at an angle to the axes of the rolls is immaterial, but if it is desired to discharge the signatures with the line of the cross fold at right angles to the direction of their subsequent travel as would be desirable if further folding of the signatures is to be effected, the rolls preferably would be formed frusto-conical in shape as shown in Figs. 9 and 10, so that while the leading edge or head of the signature would be oblique to the axes of the rolls when engaged thereby the completely folded signature would be delivered therefrom with its leading edge positioned at the desired angle. As shown in Figs. 9 and 10, the third roll 19a of the normal cross fold set is replaced by a deflecting plate 65 whereby the cross folded sheet as it emerges from the bite of the frusto-conical fold roll 19 is guided onto the discharge conveyor 63 or directed into a further fold set (not shown).

The signatures folded in this manner can either be stacked by the discharge conveyor as shown in Fig. 3 or may be fed to another fold section (not shown) which may for example operate in a manner similar to that of the cross fold section above described.

To those skilled in the art it will be obvious that the invention as herein defined constitutes a folding unit not only useful as a machine by itself, but also useful as an attachment applicable to any kind of sheet folding machine without material deviation, while the particular construction herein described may be readily modi-

fied without departing from the spirit of the invention as hereinafter set forth.

We claim:—

1. In a machine for folding sheets, a fold unit comprising co-operating fold rolls, work conveying means arranged to present a sheet to said rolls, a travelling guide member arranged to move along a path inclined to the longitudinal axes of said rolls and leading to the bite thereof, and means for moving said guide member along said path to engage the presented sheet and deflect it into the bite of said rolls.

2. In a machine for folding sheets, a fold unit comprising co-operating fold rolls, work conveying means arranged to present a sheet to said rolls, a travelling guide member arranged to move along a path inclined to the longitudinal axes of said rolls and lying in a plane which passes through the bite thereof, and means for moving said guide member along said path to engage the presented sheet and deflect it into the bite of said rolls.

3. In a machine for folding sheets, a fold unit comprising co-operating fold rolls, work conveying means for progressing a sheet longitudinally of said rolls, a travelling guide member arranged to move along a path inclined to the longitudinal axes of said rolls and leading to the bite thereof, and means for moving said guide along said path to engage the sheet progressively along its intended fold line and deflect it into the bite of said rolls.

4. In a machine for folding sheets, a fold unit comprising co-operating fold rolls, a travelling guide member arranged to move along a path inclined to the longitudinal axes of said rolls and leading to the bite thereof, conveying means for moving a sheet between said rolls and said guide member, and means for moving said guide member along said path progressively to engage the sheet and press it into the bite of said rolls.

5. In a machine for folding sheets, a fold unit comprising co-operating fold rolls, a travelling guide member arranged to move along a path inclined to the longitudinal axes of said rolls and lying in a plane which passes through the bite thereof, work conveying means for moving a sheet between said rolls and said guide member and means for moving said guide to engage said sheet and deflect it into the bite of said rolls.

6. In a machine for folding sheets, a fold unit comprising co-operating fold rolls, work conveying means arranged to present a sheet to said rolls at a predetermined rate of travel, a travelling guide member arranged to move along a path inclined to the longitudinal axes of said rolls and leading to the bite thereof, and means for moving said guide at a speed substantially equal to the rate of travel of the presented sheet so as progressively to engage the latter and deflect it into the bite of said rolls.

7. In a machine for folding sheets, a fold unit comprising co-operating fold rolls, work conveying means arranged to present a sheet to said rolls at a predetermined rate of travel, a plurality of travelling guide members arranged to move in a continuous train along a path inclined to the longitudinal axes of said rolls and leading to the bite thereof, and means for moving said guide members at a speed substantially equal to the rate of travel of the presented sheet so that a number of said members successively engage the sheet and deflect it into the bite of said rolls.

8. In a machine for folding sheets, a fold unit comprising co-operating fold rolls, work conveying means arranged to present a sheet to said rolls, a plurality of travelling guide members arranged to move in a continuous train along a path inclined to the longitudinal axes of said rolls and lying in a plane which passes through the bite thereof, and means for moving said guide members so that a number of these members successively engage the sheet and deflect it into the bite of said rolls.

9. In a machine for folding sheets, a fold unit comprising co-operating fold rolls, work conveying means arranged to present a sheet to said rolls, a plurality of travelling guide members, a guideway for said guide members having a part thereof inclined to the longitudinal axes of said rolls and leading to the bite of the latter, and means for moving said guide members in a continuous train along said guideway so that a number of said guide members successively engage the presented sheet and deflect it into the bite of said rolls.

10. In a machine for folding sheets, a fold unit comprising co-operating fold rolls, work conveying means to progress a sheet longitudinally of said rolls, a plurality of travelling guide members, a guideway having some part thereof inclined to the longitudinal axes of said rolls and lying in a plane which passes through the bite of said rolls, and means for moving said guide members in a continuous train along said guideway so that a number of said guide members successively engage the sheet and deflect it into the bite of said rolls.

11. In a machine for folding sheets, a fold unit comprising co-operating fold rolls, a guideway having a part thereof inclined to the longitudinal axes of said rolls and leading to the bite of the latter, a train of guide members positioned along said guideway in abutting relation, and means for positively displacing each guide member in turn to shunt said abutting guide members along said guideway in a continuous path of movement so that a number of said guide members successively engage the presented sheet and deflect it into the bite of said rolls.

12. In a sheet-folding machine, a fold unit as claimed in claim 10 which includes at least one runway associated with the guideway, and bearing members mounted upon the guide members so as to travel along said runway.

13. In a machine for folding sheets, a fold unit comprising co-operating fold rolls, work conveying means arranged to present a sheet to said rolls, at least one guide member arranged to move along a path inclined to the longitudinal axes of said rolls and leading to the bite thereof, means for moving said guide member so as to engage the presented sheet and deflect it into the bite of said rolls, and means for adjusting the position of said guide member relatively to said rolls and the work presented thereto.

14. In a machine for folding sheets, a fold unit comprising co-operating fold rolls, work conveying means arranged to present a sheet to said rolls, a work stop associated with said rolls to register said work in a predetermined position relative to said rolls, at least one travelling guide member arranged to move along a path inclined to the longitudinal axes of said rolls and leading to the bite thereof, and means for moving said guide member along said path to engage the sheet registered against said work stop and deflect it into the bite of said rolls.

15. In a sheet folding machine, a fold unit comprising co-operating fold rolls, work convey-

ing means arranged to convey a sheet longitudinally of said rolls, an adjustable work stop associated with said rolls to register the sheet in a predetermined folding position relative to said rolls, at least one travelling guide member arranged to move along a path inclined to the longitudinal axes of said rolls and lying in a plane which passes through the bite thereof, and means for moving said guide member to engage the registered sheet and deflect it into the bite of said rolls.

16. In a sheet folding machine, a fold unit comprising co-operating fold rolls, continuous conveyor tapes arranged to travel longitudinally of said rolls to present the work thereto, at least one travelling guide member arranged to move along a path inclined to the longitudinal axes of said rolls and lying in a plane which passes through the bite thereof, and means for moving said guide member along said path to engage the sheet carried upon said tapes and deflect it into the bite of said rolls.

17. In a sheet folding machine, a fold unit comprising co-operating fold rolls, continuous conveyor tapes having sheet carrying stretches extending parallel with said rolls, means for driving said tapes so that a sheet laid thereon is presented to said rolls, at least one travelling guide member arranged to move along a path inclined to the longitudinal stretches said tapes and lying in a plane which passes through the bite of said rolls, and means for moving said guide member along said path to engage the sheet carried upon said tapes and deflect it into the bite of said rollers.

18. In a sheet folding machine a fold unit comprising co-operating fold rolls, continuous conveyor tapes having sheet carrying stretches inclined to said rolls, means for driving said tapes so that a sheet placed thereon is carried to said rolls, at least one travelling guide member arranged to move along a path inclined both to said tapes and to the longitudinal axes of said rolls and lying in a plane which passes through the bite of the latter, and means for moving said guide member along said path to engage the sheet carried upon said tapes and deflect it into the bite of said rolls.

19. In a machine for folding sheets, a fold unit comprising co-operating fold rolls, a plurality of guide members arranged to move in a continuous path part of which is inclined to the longitudinal axes of said rolls and lies in a plane which passes through the bite thereof, continuous conveyor tapes arranged to travel between said rolls and said guide members to present the sheet to said rolls, said tapes being inclined to said rolls, and means for moving said guide members to engage the sheet carried upon said tapes and deflect it into the bite of said rolls.

20. In a machine for folding sheets, a fold unit comprising co-operating fold rolls, work conveying means arranged to present a sheet to said rolls, a scoring device arranged to score said sheet along the line of the intended fold, a travelling guide member arranged to move along a path inclined to the longitudinal axes of said rolls and lying in a plane which passes through the bite of said rolls, and means for moving said guide member along said path to engage the presented sheet and deflect the scored portion thereof into the bite of said rolls.

21. In a sheet folding machine, a fold unit as claimed in claim 20, including at least one runner disc arranged to enter the groove scored in said sheet as the latter is moved towards the fold rolls.

22. In a machine for folding sheets, a fold unit comprising co-operating fold rolls, work conveying means arranged to present a sheet to said rolls, a structure extending longitudinally of said rolls and having a continuous runway channel and continuous guideway channel formed therein, means for supporting said structure so that some part of said guideway channel lies at an inclination to the longitudinal axes of said rolls and in a plane which passes through the bite of said rolls, a train of guide members arranged in abutting relation in said guideway channel, bearing members secured to said guide members and arranged to run along said runway channel, driving means for moving said guide members along said guideway so that a number of said guide members engage the presented sheet and deflect it into the bite of said rolls, and means for adjusting said structure supporting means so that the position of said structure relatively to said rolls and said sheet conveying means may be varied as desired.

23. A machine for folding sheets which includes a parallel fold section provided with means for imparting at least one fold to a sheet fed thereto, a cross fold section arranged to receive and cross-fold the folded sheets delivered from said parallel fold section, said cross fold section comprising co-operating fold rolls, a travelling guide member arranged to move along a path part of which is inclined to the longitudinal axes of said rolls and leads to the bite thereof, means for conveying the folded sheet from said parallel fold section to said cross fold roll section, and means for moving said guide member along said path to engage the parallel folded sheet during the feed thereof to said cross fold rolls, so as to deflect said sheet into the bite of said rolls.

24. In a sheet folding machine, a fold unit as claimed in claim 1 in which the co-operating fold rolls are frustro-conical for the purpose set forth.

25. A machine for folding sheets which includes a parallel fold section provided with means for imparting at least one fold to a sheet fed thereto, a cross fold section arranged to receive and cross fold the folded sheets delivered from said parallel section, said cross fold section comprising co-operating fold rolls, a plurality of travelling guide members arranged to move along a continuous path part of which is inclined to the longitudinal axes of said rolls and lies in a plane passing through the bite thereof, continuous conveyor tapes arranged between said parallel fold and cross fold sections to convey the parallel folded sheets to said cross fold rolls, damper rollers co-operating with said conveyor tapes to control the sheet laid upon the latter, means for driving said tapes, means for moving said guide members along said path to engage the parallel folded sheet during the feed thereof to said cross fold rolls, so as to deflect said sheet into the bite of said rolls, and means for adjusting the operative position of said guide members relative to said cross fold rolls and said conveyor tapes.

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