FOLD PLATE FOR FOLDING MACHINES

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This invention relates to a folding machine and more particularly to a fold plate for a folding machine of the buckle type. In the buckle type of folding machine the sheet of material to be folded is inserted between two rolls which move the end portions of the sheet into a fold plate, which comprises upper and lower members spaced apart to receive the end portion of the sheet between them and is provided with a stop to limit the movement of the sheet. When the end of the sheet engages the stop the continuous movement of the rear portion of the sheet causes an intermediate portion of the sheet to buckle toward and to enter the bite between one of said rolls and a third roll which complete and crease the fold. When more than one fold is to be made in the sheet the last mentioned rolls move the fold plate into a second fold plate and cause the same to again buckle between the third roll and a fourth roll, this folding operation being repeated for each additional fold. It is important that the sheet shall be supported by the fold plate substantially in a true plane, that there shall be no binding or unequal resistance to the movement of the sheet and that the stops, of which there are usually two, shall be of such a character that there is no possibility of the edges of the sheet extending between the stop and one member of the plate so as to wedge therein or to inaccurately position the sheet.

Heretofore it has been customary to provide both the upper and lower members of the fold plate with slots extending in the direction of movement of the sheets and to mount the stops on the outer side of one member, each stop extending through a slot in the adjacent member and into the corresponding slot on the other member. The slots extend for the major portion of the length of the plate, to permit a wide range of adjustment of the stops, and are of such width that the sheet tends to sag into the slots in the lower member of the plate. This sagging of the sheet often distorts the same in such a manner as to cause wrinkles to be formed therein as it passes between the folding rolls. If one lateral portion of the sheet sags to a greater extent than the other lateral portion thereof increased resistance is offered to movement of those portions of the sheet which have entered the slots and this may so displace the sheet that the fold line will be improperly formed. The slitting of the lower member of the fold plate is very apt to distort the same and it is difficult, if not impossible, to thereafter straighten the distorted member so as to provide the same with a plane sheet supporting surface. Any unevenness in the supporting surface results in binding or in more resistance being offered to the movement of certain portions of the sheet than is offered to other portions and this may so displace the sheet that the fold line will not be properly formed. Further, the lower member of the fold plate is usually formed of relatively thin sheet metal and the slitting thereof requires the use of expensive dies, so that the cost of a slotted member is much greater than the cost of an unslotted member.

One object of the invention is to provide a fold plate which will support the sheet in a flat condition and will offer uniform resistance to the movement of all parts thereof.

A further object of the invention is to provide a fold plate the lower member of which has a continuous sheet supporting surface arranged substantially in a true plane.

A further object of the invention is to provide a fold plate in which the stops rest upon the supporting surface of the lower member and have such contact therewith as to prevent the edges of the sheet extending between the stop and the supporting surface.

A further object of the invention is to provide a fold plate with a stop which can be quickly and easily moved from one transverse position to another transverse position without affecting the adjustment thereof lengthwise of the fold plate.

A further object of the invention is to provide such a fold plate which is simple in construction and which can be manufactured at a relatively low cost.

Other objects of the invention may appear as the device is described in detail.

In the accompanying drawings, Fig. 1 is a plan view, partly broken away, of a fold plate embodying my invention; Fig. 2 is a sectional view taken on the line 2—2 of Fig. 1 with the fold plate supported in operative relation to the folding rolls; and Fig. 3 is a detail of one of the stops showing its relation to the two members of the fold plate. In this drawing I have illustrated one embodiment of my invention and have shown the same in association with a set of folding rolls of standard arrangement. It is to be understood, however, that the invention may take various forms and may be used with folding devices of any suitable character.

In the embodiment here illustrated the fold plate comprises an upper member or top plate 5
substantially rectangular in form and provided with a plurality of slots 8 extending lengthwise thereof, that is in the direction of movement of the sheet, for the major portion of the length of the member. Preferably the slots terminate short of the ends of the member so that both end portions thereof are continuous for the full width of the member, and the member is of sufficient thickness to impart rigidity to the fold plate as a whole.

The lower member or bottom plate 1 is rigidly secured to the upper member 5 and is spaced from the lower surface of the upper member to provide a selected distance over which the sheet to be folded may have free movement. This lower member is of substantially the same size and shape as the upper member but is of less thickness, it preferably being formed of thin sheet material. The lower member, or at least the supporting surface thereof, is continuous throughout its area and the supporting surface is substantially in a true plane, so that it supports the sheet in a true plane and offers equal resistance to the movement of all parts of the sheet supported thereon. The supporting surface may be rigidly secured to the upper member in any suitable manner, as by bolts 8, extending through both members and through spacers arranged between the two members adjacent the edge portions thereof.

There may be any suitable number of stops but usually two are employed and in the present instance these stops are of such a character that they may be supported on the upper member and will have firm contact with the supporting surface of the lower member. Preferably each stop is so supported that it can be adjusted both transversely and lengthwise of the fold plate. In the arrangement shown each stop 9 is mounted on a rod 10 which extends transversely to and above the upper member. The stop has an enlarged portion 11 to receive the rod 10 and a downwardly extending portion 12 is adapted to rest upon the lower portion of the member 7. The lower end of the stop is slightly beveled as shown at 13, to provide the same with a relatively narrow contact edge at that face thereof adjacent the slot 4 so that when the stop rests upon the lower member there will be no possibility of the edge of the sheet being moved between the stop and the lower member, thereby preventing any wedging or binding of the sheet under the stop. The stop is mounted on the rod 10 for pivotal movement about the same and for movement lengthwise of the rod, that is, transversely to the slots. Thus by first moving the stop about the axis of the rod it can be moved lengthwise of the latter into a position above a selected slot 8.

This enables the two stops to be quickly and easily adjusted with relation to the width of the sheet which is to be folded. Each stop is preferably so mounted that it will be moved by gravity into engagement with the supporting surface of the lower plate and held in firm contact therewith, although if desired the stops may be spring actuated. To increase the gravitational action and to maintain a firm pressure of the stop on the supporting surface each stop is here shown as provided with an upper portion, 12a, which extends some distance above the rod 10 and is so arranged that when the stop is in operative position it will be inclined forwardly and this upwardly extending portion will materially increase the pressure thereof on the supporting surface.

To enable the stops to be adjusted lengthwise of the fold plate, to determine the position of the fold, the rod 10 is supported at its ends in blocks 14 which are slidably mounted upon rods 15 extending lengthwise thereof to facilitate the accurate adjustment of the rod 10 and the stop 9, there being preferably two of these gages arranged adjacent the respective sides of the fold plate. In this manner a fairly accurate adjustment of the stops can be quickly effected by loosening the slide blocks 14 and moving them subsequently to correct positions but to enable fine adjustments to be made the longitudinal rods 15 are mounted for longitudinal adjustment and, as here shown, these rods are mounted in bearing blocks 16 at that end of the fold plate toward which the sheet moves, these bearing blocks being in the present instance rigidly mounted on the upper member of the fold plate. Those ends of the rods which extend through the respective bearing blocks are screw threaded and knurled nuts 19 are retained thereon and bear against the respective blocks 15 to effect the fine adjustments of the rods. Preferably those portions of the rods which extend through the blocks 16 are of reduced diameter to form shoulders 20 on the blocks 16, these shoulders 20 being clear of the edges to facilitate moving the block 16 with the nuts 19 in contact with the respective blocks 15.

The fold plate is usually mounted in an inclined position, preferably at an angle of approximately 45 degrees from the lower ends of the plates so that the roll 23 being arranged directly beneath the roll 22 and having yielding contact with the latter, and the roll 24 being arranged on that side of the roll 23 adjacent the fold plate and having yielding contact with the roll 23. The sheet 25, of paper or other material, is interposed between the rolls 22 and 23 and the forward portion thereof enters the space between the two members 7 and 8 and the end portion of the upper member 5 having a rounded lower surface 26 to guide the end of the sheet between the two members of the plate. When the forward edge of the sheet contacts the stops 12 the further movement of the rear portion of the sheet by the rolls 22 and 24 causes the web to buckle adjacent the lower end of the fold plate, as shown at 27, this buckling being toward the bite of the rolls 23 and 24 so that the buckled portion extends between these rolls and is gripped thereby to complete the fold, the fold being crossed as it moves between the rolls. The rolls 23 and 24 may discharge the folded sheet if a single fold is to be made therein, or, if an additional fold is to be made, the sheet may be delivered by the rolls 23 and 24 to a second folding unit.

It will be apparent from the foregoing description that I have provided a fold plate in which the sheet supporting surface of the lower member is continuous and in a substantially true plane so that the sheet will be supported in substantially a true plane and the resistance offered to the forward movement thereof will be uniform throughout the width of the supporting surface. The stops are so mounted that they move into contact with the supporting surface of the lower plate and are maintained in such contact, prefer-
erably by gravity, although springs may be used if desired. The mounting of the stops is such that they can be quickly and easily adjusted transversely of the fold plate without affecting their longitudinal adjustment and may be adjusted lengthwise of the plate quickly and easily and to very exactly determined positions. The unit as a whole is simple in its construction and can be produced at a low cost.

While I have shown and described one embodiment of my invention I wish it to be understood that I do not desire to be limited to the details thereof as various modifications may occur to a person skilled in the art.

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

1. A fold plate comprising an upper member having a plurality of slots, a lower member rigidly connected with said upper member and having a continuous sheet supporting surface spaced from said upper member, and a stop supported on said upper member, movable transversely thereof, and having an end portion movable through a selected one of said slots and into contact with said supporting surface.

2. A fold plate comprising an upper member having a plurality of slots, a lower member rigidly connected with said upper member and having a continuous sheet supporting surface spaced from said upper member, and a stop supported above and extending transversely to said upper member, a stop pivotally supported on said rod and movable lengthwise thereof, whereby said stop may be moved through a selected slot into contact with said supporting surface, and means for adjusting said rod lengthwise of said slots.

3. A fold plate comprising an upper member having a plurality of slots, a lower member rigidly connected with said upper member and having a continuous sheet supporting surface spaced from said upper member, a transverse rod supported by the first mentioned rods for adjustment lengthwise thereof, a stop pivotally supported by said transverse rod for movement through one of said slots into contact with said supporting surface, and means for adjusting the first mentioned rods lengthwise of said slots.

4. A fold plate comprising an upper member having a plurality of slots, a lower member rigidly connected with said upper member and having a continuous sheet supporting surface spaced from said upper member, and a stop freely pivotally supported on an axis transverse to said slots and having a weighted portion to move the same into and retain the same in firm contact with said supporting surface.

5. A fold plate comprising parallel upper and lower members between which the sheets to be folded are fed, said upper member having a longitudinal slot therein, and said lower member rigidly connected with, disposed below, and spaced from said upper member, a sheet stop adapted to extend through said slot to rest upon the lower sheet supporting member, and means for adjustably supporting said stop, said last named means comprising a guide member extending longitudinally of said upper member and supported thereby, a transverse member by which said stop is carried, means for supporting said transverse member on said guide member for adjustment thereon to dispose the stop approximately in position for affecting a fold of a certain length, and means for attaining a finer adjustment of the stop by longitudinal adjustment of said guide members along the upper member.

6. A fold plate comprising parallel upper and lower members between which the sheets to be folded are fed, said upper member having a plurality of longitudinal slots therein, and said lower member rigidly connected with, disposed below, and spaced from said upper member, a sheet stop selectively positionable through one of said slots to rest upon the lower sheet supporting member, and means for adjustably supporting said stop, said last named means comprising a pair of guide rods extending longitudinally of said upper member and supported thereby, a transverse rod by which said stop is mounted for free longitudinal sliding and rotational movement, means for supporting said transverse rod on said guide rods for adjustment thereon to dispose the stop approximately in position for affecting a fold of a certain length, and means for attaining a finer adjustment of the stop by longitudinal adjustment of said guide rods along the upper member.

7. The device as set forth in claim 6 in which brackets are provided on the plate through which the longitudinal guide rods extend, the rods being threaded at their ends, adjustable nuts on the ends of the rods adapted to bear against said brackets, and springs on said rods for urging the rods through the brackets in such direction as to cause the adjusting nut to bear against said brackets.

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