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FOLDING MACHINE ROLL

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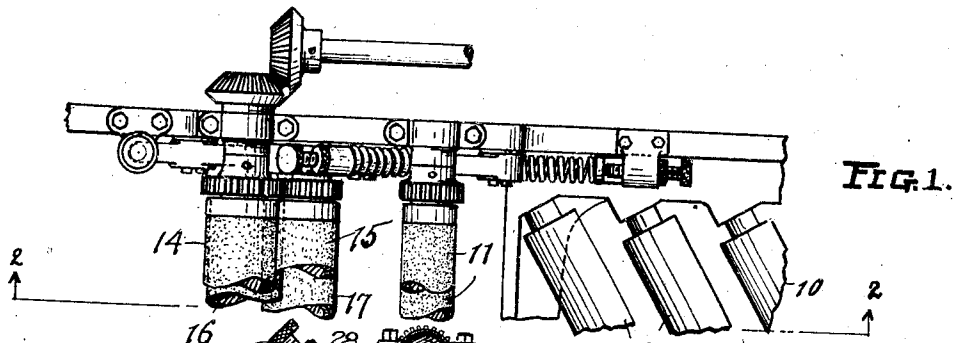


FIG. 1.

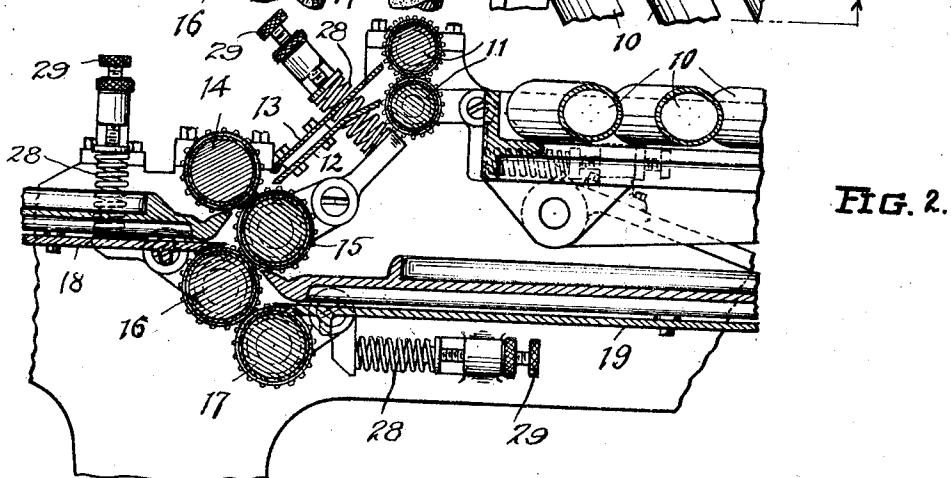


FIG. 2.

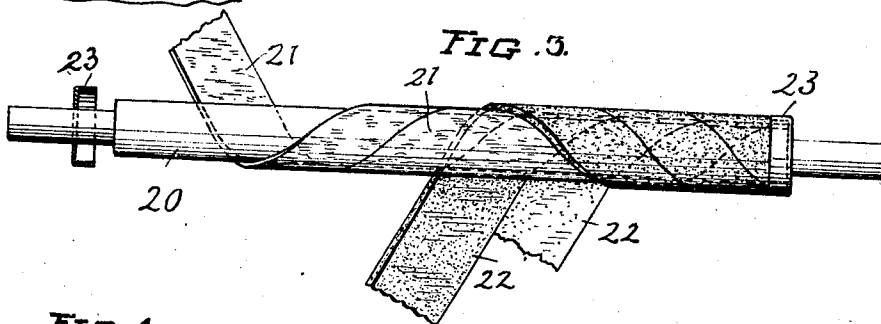
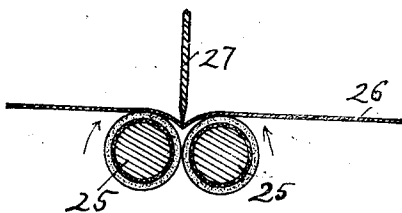


FIG. 3.

FIG. 4.



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FOLDING MACHINE ROLL

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This invention relates to improvements in folding machine rolls, and has its greatest utility in connection with rolls working in pairs, where the paper is fed or folded and fed between the rolls of a pair.

Rolls of various kinds have been employed for the purpose heretofore with varying degrees of success. At the present time the generally accepted practice is to employ for paper feeding a metal roll with roughened surface and a roll carrying spaced rubber covered wheels, the paper being fed between these two rolls, while for the folding of paper two cooperating metal rolls with their surfaces roughened are generally employed. The operation of folding is satisfactorily performed by knurled rolls of this character, particularly when new, but after the fine, feather edge of the knurl, which actually grips the sheet, becomes worn smooth in spots, the grip on the sheet is no longer uniform and the feeding of paper becomes less positive and accurate. Eventually the rolls must be replaced with new ones at considerable cost. Another difficulty encountered is the filling up of the interstices in the surfaces of the roughened metal rolls by paper fibers and by powder applied to paper or printed sheets for one reason or another.

In recent printing processes, particularly for multi-color work, printed sheets as they leave the press are sprayed with fine particles of melted wax. This treatment is employed frequently where several impressions are necessary, and is for the purpose of preventing the wet ink from causing the sheets to stick together and offset. In printing establishments where this wax spraying is used, folding has become a major problem. When folding this wax sprayed paper on machines using steel knurled rolls, the rolls act as fine knives which scrape and loosen the wax so that after a few thousand, and sometimes only a few hundred sheets have been folded sufficient wax has accumulated upon the rolls

and other parts of the machine to interfere with proper folding. The wax which accumulates upon the rolls does not deposit itself uniformly over the surface of the roll, but always builds up in spots. In an effort to get away from this difficulty numerous attempts have been made to employ rubber covered rolls for folding waxed sheets, but the suction action of the rubber loosens the wax from the paper so that similar difficulties are experienced as in the case of steel rolls. The felt covered rolls of the present invention, having neither the fine knife scraping action of the knurled steel roll, nor the suction action of the rubber roll, do not loosen the wax from the paper. The amount of wax adhering to the rolls is therefore reduced, and its accumulation upon other parts of the machine is practically eliminated. It therefore becomes unnecessary to stop the machine at frequent intervals for the purpose of cleaning out the wax as has heretofore been necessary. Furthermore, where large drops of wax are inadvertently deposited upon the paper, due to improper functioning of the spraying apparatus, the flexible felt will be compressed sufficiently to permit the sheets to pass through the machine without disturbing such abnormal wax deposits.

It is accordingly an object of the present invention to provide a roll having a feeding or folding surface which may be readily replaced at small expense.

Another object is the provision of a roll surface such that powder, wax and loose fibers will not cling to it to an extent sufficient to interfere materially with its paper gripping qualities.

Other objects and features of novelty will appear as I proceed with the description of those embodiments of the invention which, for the purposes of the present application, I have illustrated in the accompanying drawings, in which—

Figure 1 is a fragmental plan view of a por-

tion of a folding machine of the buckle-fold type in which my invention is employed.

Fig. 2 is a vertical, longitudinal section of the same taken substantially on the line 2—2 of Fig. 1.

Fig. 3 is a detail view of a roll embodying the invention, parts of the roll cover being removed to more clearly illustrate the same, and

Fig. 4 is a transverse sectional view, somewhat diagrammatic in character, through a fold unit of the knife-fold type, embodying my invention.

In Figs. 1 and 2 of the drawings I have illustrated a fragment of a buckle-fold type folding machine having a feed table comprising rolls 10. Although I have illustrated these rolls herein as of conventional tubular steel construction, it should be understood that the covered roll of the present invention could be employed for this purpose if desired. This feed table is designed to deliver paper sheets to a pair of feed rolls 11, which are positively driven by any suitable power connections. Sheets passing through the rolls 11 are fed between spaced guide plates 12 and 13 (omitted from Fig. 1 for the sake of clearness) and into the rolls 14 and 15 of a fold section. This section comprises also rolls 16 and 17 and fold plates 18 and 19, the rolls and plates of the section being arranged in the conventional way and operating in a manner well known in the art. A sheet of paper travelling through the section may be buckled between rolls 15 and 16 and again between rolls 16 and 17, or between one such pair only, as the nature of the work demands, but in any event each sheet must travel between rolls at three different points in the fold section. The rolls 11, 14, 15, 16 and 17 are all constructed in accordance with the present invention.

However, it is particularly important and advantageous to employ my felt covered roll as the pull-out roll for each fold plate. By pull-out roll is meant the roll which first comes into play, as regards any given sheet of paper, after the paper begins to buckle. In the machine illustrated in Figs. 1 and 2, for example, the pull-out roll for plate 18 is the roll 16, while for plate 19 it is roll 17. In a three-fold section the pull-out rolls are the third, fourth and fifth rolls of the series. If these rolls are felt covered the principal advantages of my invention in the feeding of paraffine sprayed paper are realized to a large extent, regardless of the character of the other rolls in the machine.

Referring now to Fig. 3, I have shown therein a roll having a hard or relatively hard core 20 which is formed preferably of solid metal, although it may be hollow or may be constructed of other relatively unyielding materials possessing sufficient strength for the purpose. This core is provided with a sur-

face layer of fabric, or other relatively soft, yieldable material, preferably felt. Woven or knitted fabrics can be employed and are therefore within the broader aspects of the invention, but felt has a particular and highly important advantage, namely that it maintains this texture after wear, whereas in the case of woven and knitted fabrics threads become broken after considerable wear and thereafter the material tends to disintegrate rapidly. The breaking of threads may even occur in the surfacing of the material before the roll is put into use.

In carrying out the invention the outer covering may be applied to the core in various ways. It may be manufactured for instance in tubular form, the tubes being drawn onto the core from one end, such a construction being indicated in Fig. 4. However I prefer to cut the felt in strips and wind it upon the roll spirally, as indicated in Fig. 3, cementing it down securely. It is advantageous, although perhaps not essential, when employing the spirally wound strips illustrated in Fig. 3, to first glue a strip of heavy paper or like fibrous material to the metal. This paper strip is dampened before it is applied, and in drying it is shrunk tightly to the iron core. The felt strip is then wound upon the paper strip in a reverse spiral, so that the turns of one strip cross those of the other. The felt strip may be very securely glued or cemented to the paper strip, and the two strips reinforce and strengthen each other, forming together a composite tube which is tightly fitted to the iron core. On this account the character of the union between the paper and iron core becomes less important, as relative movement between the core and its tightly fitted tubular cover would not be apt to occur even if the adhesive between the paper and the core were more or less ineffective.

In Fig. 3 I have shown two strips of paper 21 wound spirally upon the core 20 to form a single layer. Obviously this layer could be formed of one strip or three strips with the pitch of the spiral regulated accordingly. In this figure also there are shown two strips 22 making up the layer of felt, the felt strips being wound spirally in a direction opposite to the spiral of the strips 21 but at the same pitch, the edges of the strips in all cases being abutted closely. More than one layer of paper and more than one layer of felt may be employed if desired. The ends of the operative portions of the roll are finished with hardened steel bands or cups 23, those of one roll running upon those of the roll paired with it, whereby a limit of approach between the two rolls is provided. When the adhesive employed in attaching the cover material is hardened, the outer surface of the felt is accurately finished by grinding, and the bands 23 are similarly finished, although generally to

a diameter slightly different from that of the felt covered portion of the roll.

Fig. 4 serves to illustrate the application of the roll of the present invention to a folding machine of the knife-fold type, two such rolls being shown at 25. A sheet of paper in the process of being folded is shown at 26, and a knife 27 is shown in the act of forcing the paper at the line of the fold between the rolls 25, which are so driven as to feed the sheet downward between them as soon as the movement of the knife 27 has enabled the rolls to grip the paper. In the case of a machine of this kind I have found that the surfacing of one only of the rolls 25 with felt will not suffice. Both rolls must be felt covered in order to obtain the best results.

In setting up and adjusting a folding machine embodying rolls constructed in accordance with this invention, the rolls of each pair are so adjusted as to cause the resilient felt covers to be slightly compressed along the line of engagement and for a short distance on either side thereof. These short, temporarily flattened surfaces, afford a good grip upon the paper sheet and impart a positive movement thereto. However the felt material, backed by the unyielding core of the roll, is able to transmit enough pressure to effect a short, smooth fold when a buckled sheet of paper is passed between the rolls.

The metal end bands 23 definitely determine the minimum spacing of the rolls. The later are urged toward each other by springs in a well known manner, and the tension of these springs is adjustable, as shown particularly in Fig. 2 of the drawings, where the springs are given the reference characters 28 and the tensioning screws the reference characters 29. The felt coverings are particularly adaptable to rolls mounted in this manner, for the reason that it is possible to cause the sheets of paper being folded to exert substantially the same pressure against the felt covering or coverings, as the case may be, regardless of the sheet thickness or number of folds. For a thin sheet the spring tension will be set substantially at the maximum. For a thicker sheet or a folded sheet the tension will be relieved somewhat, but as the thicker sheet travels between the rolls its thickness compresses the tensioning spring sufficiently to bring about the same pressure against the felt covering. The tension on the springs is still further relieved as the number of folds increases, and hence the pressure on the felt is maintained substantially uniform, enabling it to function to the best advantage.

While in the accompanying drawings and in the foregoing specification I have disclosed certain embodiments of the invention more or less in detail, I desire it to be understood that such detail disclosure has been resorted to primarily for the purpose of fully illus-

trating the invention, and is not to be construed as limiting the scope thereof.

Having thus described my invention, I claim:

1. A folding roll for use in paper folding machines, comprising a core member, a layer of fibrous material mounted on said core member, and an outer surface layer of felt mounted upon said fibrous material.

2. A folding roll for use in paper folding machines, comprising a cylindrical support and a strip of felt wound spirally thereupon and secured thereto.

3. A folding roll for use in paper folding machines comprising a core, a strip of fibrous material wound spirally thereupon and secured thereto, and a strip of felt wound spirally upon said fibrous material and secured thereto, said two strips being wound in opposite directions.

4. A folding roll for use in paper folding machines, comprising a core, a plurality of strips one above another wound spirally upon said core, the strips of adjacent layers being wound in opposite directions, and the strip of the outer layer being felt.

5. A folding roll for use in paper folding machines, comprising a core, a plurality of strips one above another wound spirally upon said core, the strips of adjacent layers being wound in opposite directions, and the strips of adjacent layers being cemented together to form a composite tube possessing inherent strength.

6. In a paper handling machine, a pair of feed rolls, one of said rolls comprising a cylindrical support, and a strip of felt wound spirally thereupon and secured thereto.

7. In a buckle folding machine, a fold section comprising a fold plate and three rolls, the pull-out roll being covered with yieldable material.

8. In a buckle folding machine, a fold section comprising a plurality of fold plates and a series of rolls, each of the pull-out rolls being covered with yieldable material.

9. In a knife folder, a pair of fold rolls and a knife operatively associated therewith, both of said rolls being covered with yieldable material.

10. In a folding machine of the buckle fold type, a fold section comprising a fold plate and fold rolls, said rolls having metallic end bands and one of them having a yieldable surface between its end bands, springs for pressing together said last named roll and one of said remaining rolls, and means for adjusting the tension of said springs, whereby the pressure exerted against the said yieldable surface by the sheets being fed may be set to substantially a uniform value regardless of the thickness of the sheets being fed.

11. In a folding machine, a pair of cooperating fold rolls having coverings of yielding material, said rolls having at their ends me-

tallic bearing bands concentric with the roll
axes adapted to limit the movement of the
rolls toward each other, springs for urging
said rolls toward each other, and means for
5 adjusting the tension of said springs, where-
by the pressure exerted against the roll cov-
erings by the sheets being fed may be set to
substantially uniform value regardless of the
thickness of the sheets being fed.
10 In testimony whereof, I hereunto affix my
signature.

RICHARD IBELL.

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