Feb. 8, 1938. G. W. SWIFT, JR 2,107,430

CORRUGATED PAPERBOARD MAKING MACHINE

Filed April 16, 1935 3 Sheets-Sheet 1

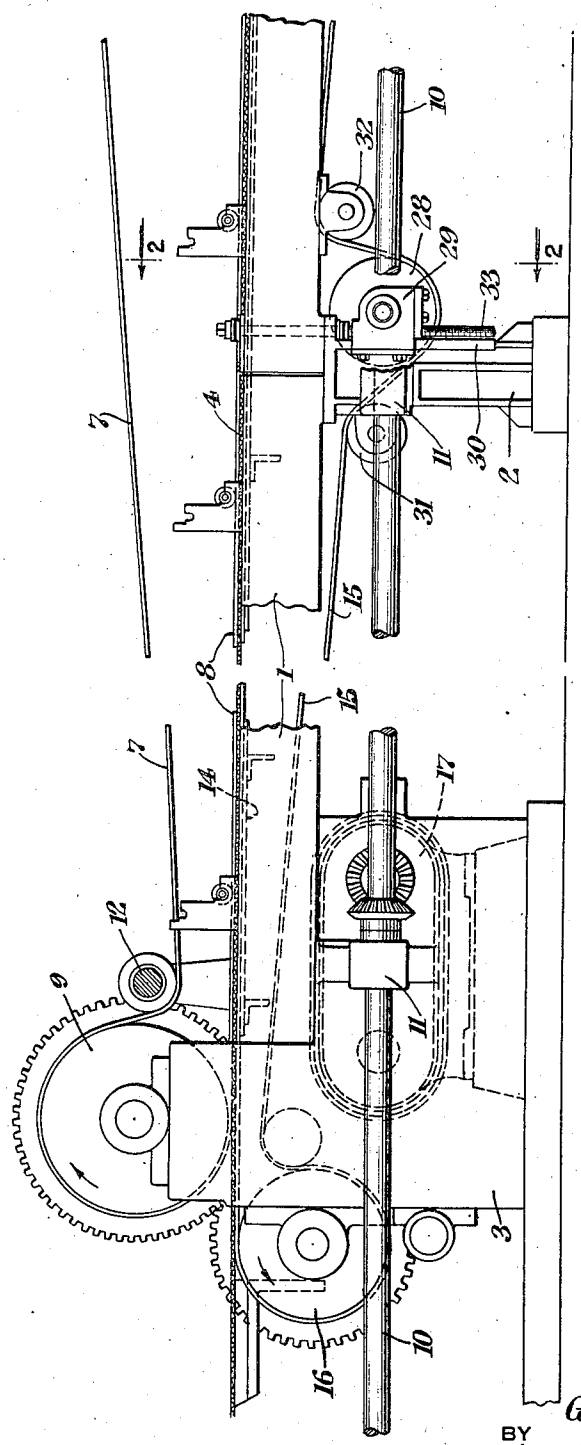


Fig. 1.

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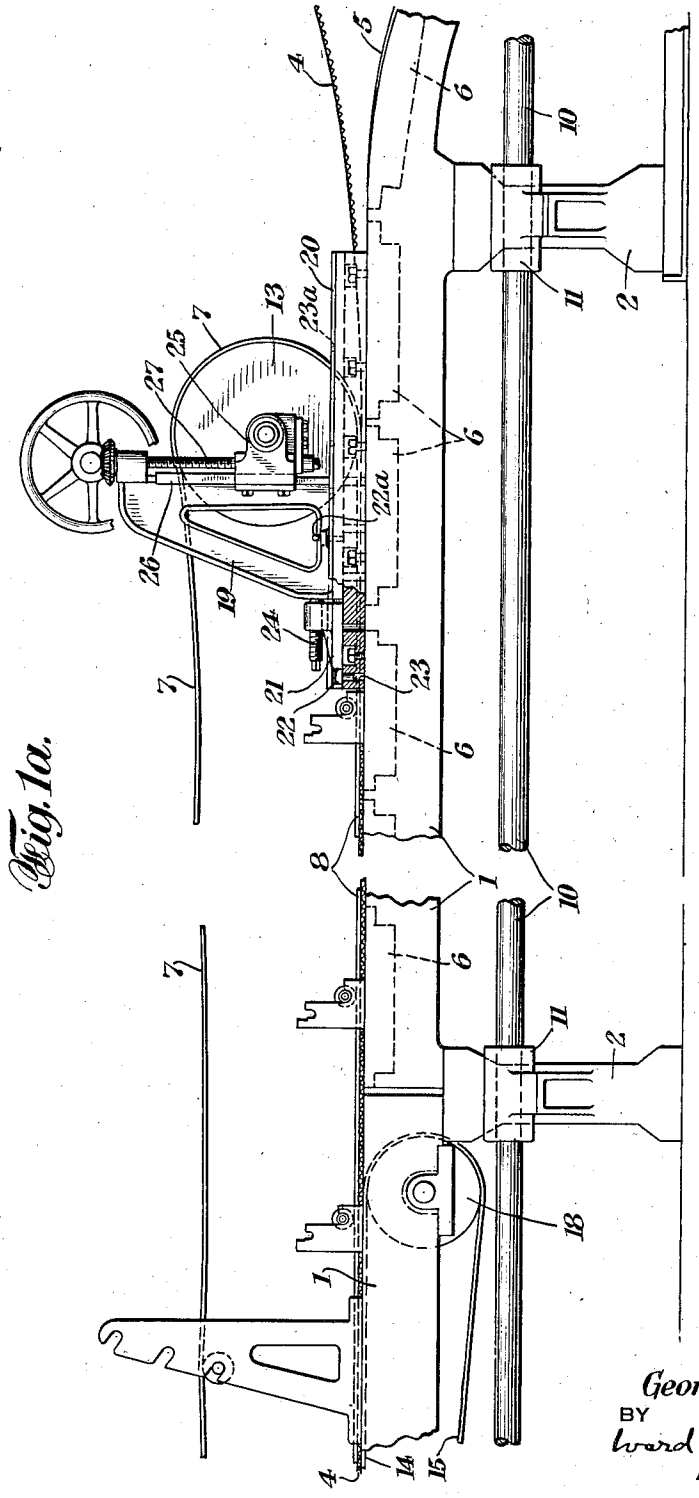


Fig. 1a.

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Fig. 2.

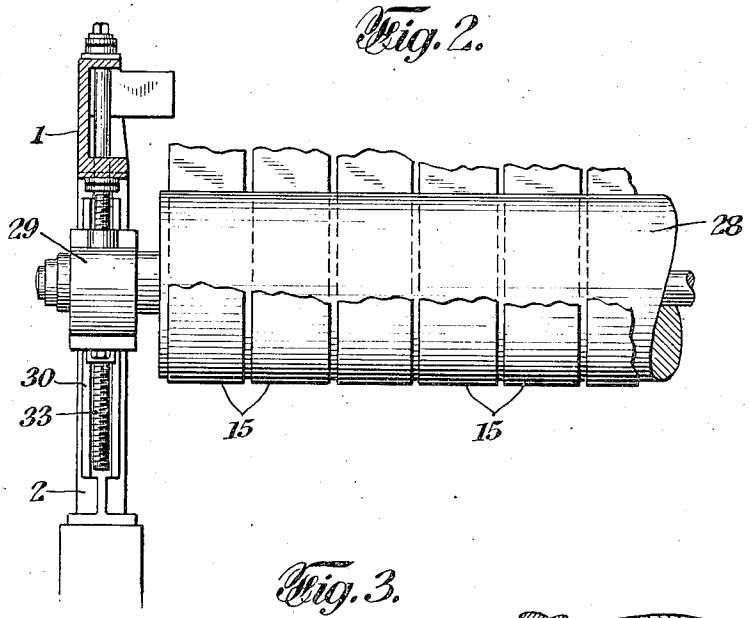


Fig. 3.

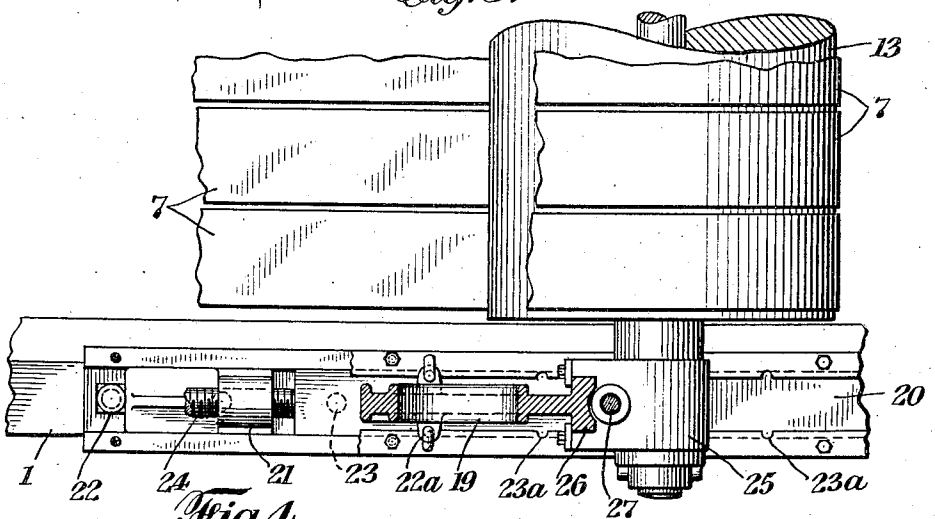
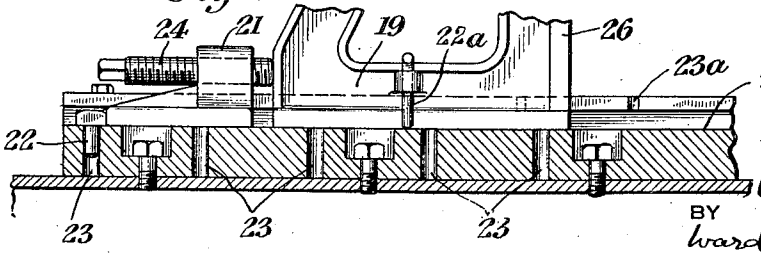


Fig. 4



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UNITED STATES PATENT OFFICE

2,107,430

CORRUGATED PAPERBOARD MAKING MACHINE

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Application April 16, 1935, Serial No. 16,542

1 Claim. (Cl. 154—30)

In the manufacture of double faced corrugated paperboard, the continuously produced sheet is usually fed from the delivery end of the so-called double-backing machine to a cut-off mechanism driven in timed relation thereto and operating periodically to cut up the continuous sheet into blanks of specified lengths; and to avoid the expense of retrimming operations it is frequently important that the length of cut be very precise. It is possible to time the cycle of operation of the cut-off mechanism very precisely for blanks of different lengths, but the rate of feed of the corrugated paper web through the cut-off mechanism necessarily corresponds to its rate of travel through the double-backer and accordingly if this rate of feed is irregular and uncertain, the blanks cut will be irregular in length even though the cut-off mechanism is set to operate at precisely timed intervals. The corrugated paper sheet while passing through the double-backer, in order to avoid injury thereto, must be fed frictionally under relatively light pressure as contrasted to high pressure which would insure a positive feed proportional to the speed of the machine, and variations between the speed of travel of the paper web and the positively driven parts of the double-backer accordingly are an important factor leading to the production of blanks which are irregular in length.

I have found that a regularity of feed of the corrugated sheet sufficient to avoid the necessity of retrimming operations and using cut-off mechanisms already commercially available, may be obtained in a simple and practical manner, by maintaining while the corrugated paper web is passing through the double-backer, substantially constant (but moderate) longitudinal tension on the series of endless friction conveyor members which engage and frictionally advance the corrugated paper web through the machine. The conveyor members moreover will operate more smoothly at high speeds. Such an arrangement also has the advantage of saving shut-down time and consequent loss of production on the machine, in that the operation of cutting pieces out of the friction belts to shorten them, which heretofore has often required shutting down the machine, and has frequently interrupted production, may be avoided or postponed until the machine is non-productive by taking up on the tensions of the belts as above described, during production. Further objects and advantages of the invention will be in part obvious and in part specifically referred to in the specification hereinafter contained which, taken in conjunction with the accompanying drawings, discloses certain constructions operable in accordance therewith; this disclosure, however, is to be regarded as merely illustrative of the principles of the invention. In the drawings—

Fig. 1 is a general side view, somewhat diagrammatic and with certain sections of the machine cut away, of the cooling section of a double-backer.

Fig. 1a is a view generally similar in nature to Fig. 1 showing at the left the intermediate part of the machine where the heating section ends and the cooling section begins, and at the right the entrance end of the machine.

Fig. 2 is a section on line 2—2 of Fig. 1 looking in the direction of the arrows.

Fig. 3 is a top plan view of the entrance end of the machine.

Fig. 4 is a detail side view, with certain parts cut away, of the entrance end of the machine.

The illustrated construction of double-backing machine or double-facer has a long table 1 supported by standards 2 at appropriate points and as well as by a frame 3 at its delivery end. A web of single faced corrugated paper 4 (Fig. 1a) is fed in known manner, into the entrance end of the machine in conjunction with a second facing sheet 5 and the double-faced corrugated paperboard thereby constituted then passes through the first or heating section of the machine where it passes over a series of heater plates 6 located in table 1.

The upper surface of the sheet of corrugated paperboard is frictionally engaged and fed forward through the heating section of the machine, and in fact substantially throughout its travel through the machine, by an upper series of flexible endless friction-conveyor members 7 usually made of canvas, which are disposed side by side across substantially the entire width of the machine and have their lower passes 8 in contact with the corrugated paper sheet. These flexible conveyor members 7 pass around and are driven by frictional engagement with the positively driven driving roll 9 supported by the frame 3 at the delivery end of the machine, the roll 9 being driven in suitable manner not necessary to be described in detail, from a main drive shaft 10 which may extend along one side of the machine and be supported by suitable bearings 11 carried by the standards 2 and frame 3. The main drive shaft 10 usually will serve to drive in timed relation all of the machinery used in conjunction with the double-facer, such as a single-facer which precedes it and cut-off mech-

anism (not illustrated) located somewhat beyond the delivery end of the double-facer and receiving the paperboard at the same rate as fed the double-facer. A variable speed transmission 17 of suitable known type will usually be interposed between the drive shaft 10 and roll 9, as indicated diagrammatically in Fig. 1, for the purpose of enabling the speed of rotation of the driving roll to be accurately coordinated with the speed of other mechanisms which are also driven from shaft 10 in timed relation.

The upper passes of conveyor members 7 may be held in contact with roll 9 by a guide roll 12 indicated diagrammatically in Fig. 1, and at the entrance end of the machine these conveyor members 7 may pass around an idler roll 13 (Fig. 1*a*).

The part of the continuous web which is passing through the above described heating section of the machine is frictionally urged forward only by engagement with the lower passes 8 of the conveyor members above described, the lower face of the sheet being exposed to the action of the stationary heater plates 6, but as the sheet passes to the second or cooling section of the machine, the under surface of the sheet is also engaged by the upper passes 14 of a second series of flexible friction conveyor members 15 which pass around and are frictionally driven by a roll 16 at the delivery end of the machine, this roll 16 being positively driven in suitable manner which need not be described in detail from the main drive shaft 10 and in timed relation to driving roll 9, but the driving connections usually including the variable speed transmission 17 above referred to.

The endless conveyor members 15 also pass around an idler roll 18 (Fig. 1*a*) located at the entrance end of the cooling section of the machine and thus the corrugated paper sheet is fed through the machine, in the heating section thereof, by the frictional engagement of the upper conveyor members therewith, and in the cooling section of the machine by the result of the combined advancing frictional forces produced by the engagement of the upper conveyor members with the upper surface of the sheet and the engagement of the lower conveyor members with the lower surface of the sheet.

In the operation of a machine of the above character, using the relatively limited degree of pressure on the sheet which is necessary to avoid injury thereto, irregularities of feed may arise from a cause or causes which are difficult to segregate for given operating conditions; it may be for example that the advancing forces applied to the sheet by the upper and lower series of conveyor members are unbalanced causing the sheet to slip back irregularly with respect to one series or the other, or both, and/or causing either or both series to slip back irregularly with regard to its respective driving roll, or a combination of the above factors. In any event if a cut-off mechanism be used which is precisely timed in its cycle (and such are commercially available) I have found that regulation of the longitudinal tensions of the conveyor members as hereinafter described in greater detail may be effectively employed to correct irregularities in the length of cut. Usually it will be required to adjust the tensions of the conveyor members to eliminate slack and provide a moderate tension thereon whenever it is observed that blanks of irregular length are being produced, although at times, for example if the conveyor members become moist after their tensions have been adjusted while dry, it may be desirable to relieve the tensions somewhat for the purpose of avoiding unnecessary stretching of the conveyor members. The above operations moreover do not entail the likelihood of applying injurious pressure to the corrugated paperboard sheet. I am of course aware of the prior use of so-called belt tighteners of various constructions, but in so far as I am aware the possibility of remedying irregularities of feed under the peculiar conditions met with in feeding corrugated paperboard frictionally between series of endless conveyors such as are found in double-facers, by maintaining longitudinal tension in the conveyor members as above described, has not been previously appreciated nor demonstrated, although these double-facing machines have been in use over a period of about twenty-five years or more, and numerous efforts have been made throughout this period to reduce or eliminate irregularities in the length of blanks cut from the corrugated material as fed from the double-facer.

The longitudinal tension of the upper endless conveyor members 7 may be regulated in a simple manner by adjusting the position of the idler roll 13. As illustrated in Fig. 1*a* for example, the bearings for roll 13 may be carried by a pair of brackets 19 which are slidable along ways 20 at the opposite sides of table 1, and abutment members 21 which are held in position on the ways 20 as by pins 22 insertable in any one of a number of holes 23 in ways 20, may be provided to hold the brackets 19 in position. When it is desired to regulate the tension of the conveyor members 7, screws 24 in the abutment members 21 may be adjusted to move brackets 19, and therefore roller 13, along the ways 20 as desired.

The roll 13 will be adjusted from time to time to maintain a moderate tension in the conveyor members 7, and in case the screws 24 have operated to their full extent, the pins 22 and abutment members 21 may be adjusted further toward or from the entrance end of the machine to provide an added range of further adjustment through the operation of screws 24. During the adjustment of abutment members 21, the brackets 19 may be temporarily held in position by pins 22*a* (Fig. 4) which are selectively engageable in notches 23*a* (Fig. 3) in the ways 20, these pins 22*a* being disengaged as soon as the screws 24 are again brought into play. To adjust the roll 13 toward and away from the corrugated paper sheet its bearing blocks 25 may be slidable along vertical ways 26 on brackets 19, and adjusted by threaded spindles 27 passing through the bearings blocks 25, but with this phase of the machine the present invention is not particularly concerned.

To regulate the tensions of the lower series of endless conveyor members 15, a roll 28 (Fig. 1) supported by bearing blocks 29 which are slidable vertically on ways 30 on one of the pedestals 2, may be employed. As shown the lower passes of conveyor members 15 pass underneath and partially around this roll 28, and are held in engagement therewith by guide rolls 31 and 32. For changing the position of roll 28, threaded spindles 33 passing through its bearing blocks 29 may be used, the roll 28 thereby being raised or lowered to increase or decrease the tension on the lower series of conveyor members, as the spindles 33 are turned. In the illustrated form of the invention, all the conveyor members making up each series are regulated simultaneously by the adjustment of roll 13 or roll 28 as the case may

be, it not being essential to regulate individually each of the conveyor members of the respective series although there is no objection to so doing except the added expense and complication involved. The specific mechanisms above described for the purpose of maintaining longitudinal tension in the conveyor members moreover are to be regarded from the broader aspects of the invention as merely examples of mechanisms having the wide range of adjustment which is necessary for the purpose of maintaining tension throughout the lengths of the conveyor members.

A double-facer having the features of the present invention has another advantage in addition to or aside from the accuracy of feed which may be thereby obtained. In using prior machines, it has been the practice to run the conveyor members loose, and although a small amount of excess slack could be taken up (it was not practical thereby to keep the conveyor members under tension) for example by lifting up the small idler rolls such as have been used to support the upper passes of the upper series of conveyor members, it has often been necessary to interrupt production on the machine and shut it down while pieces of the conveyors were cut out and their ends respliced. In the case of a machine having the features of the present invention, however, the necessity of so cutting out pieces of the conveyors may be in some instances entirely avoided, and in other instances adjustment of the tension mechanisms will enable repairs to be postponed until the machine is idle for other reasons.

It should be understood that various features of a double-facing machine with which the present invention is not particularly concerned, have not been described in detail including some parts shown in the drawings, since the same are well understood in the art and are not necessary to an understanding of the features of this invention, and while a particular construction of double-facer has been described it should be understood that many changes may be made therein without departing from the invention in its broader aspects, within the scope of the appended claim.

I claim:

A corrugated paper double-backing machine, having an upper series of flexible endless friction-conveyor members disposed side by side across substantially the entire active width of the machine, and with their lower passes in position to overlie and frictionally advance the upper surface of a corrugated paper web traveling through the machine, a driving roll around which said frictional conveyor members run, and an idler roll located at the entrance end of the machine around which said frictional conveyor members also run, means being provided whereby the position of said idler roll may be adjusted toward and away from the entrance end of the machine to maintain longitudinal tension in said conveyor members, an abutment member adjustable along the machine for limiting the longitudinal movement of said idler roll, and means for adjusting the longitudinal position of the roll relatively to said abutment member.

GEORGE W. SWIFT, JR.