May 9, 1939. Y. A. F. DANIELSSON 2,157,849

SHEET FEEDING APPARATUS

Filed July 26, 1937 2 Sheets-Sheet 1

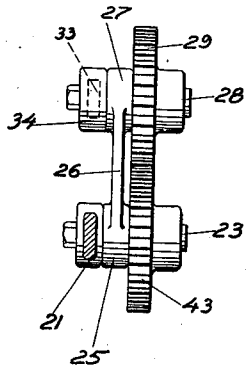


Fig 3

Fig 1

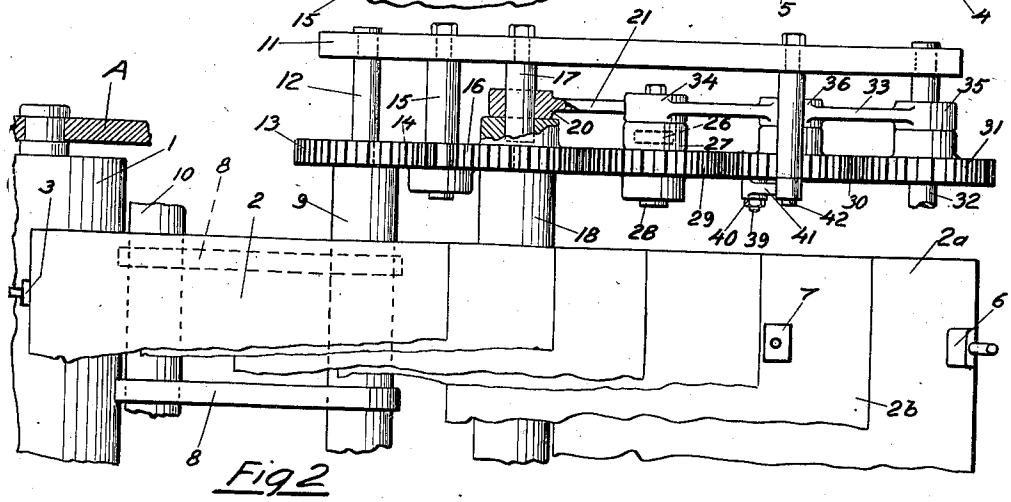


Fig 2

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Fig 4

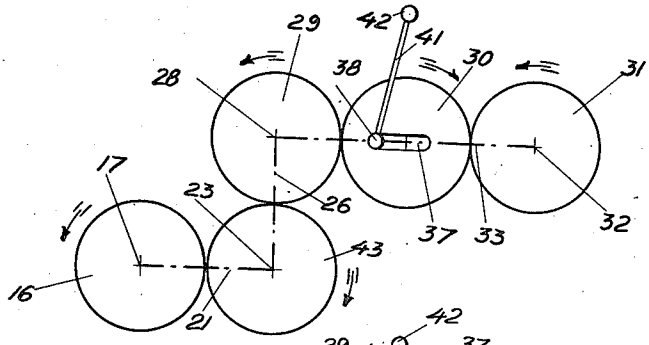


Fig 5

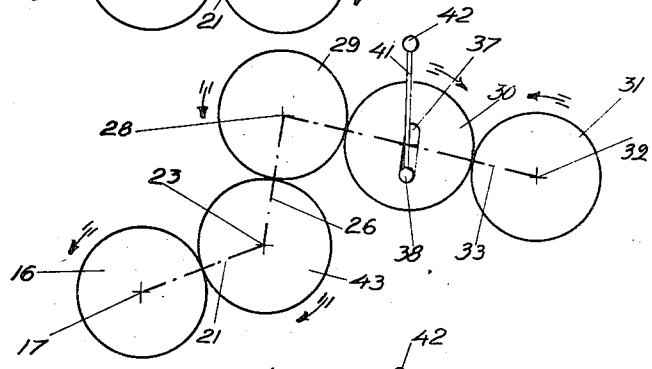
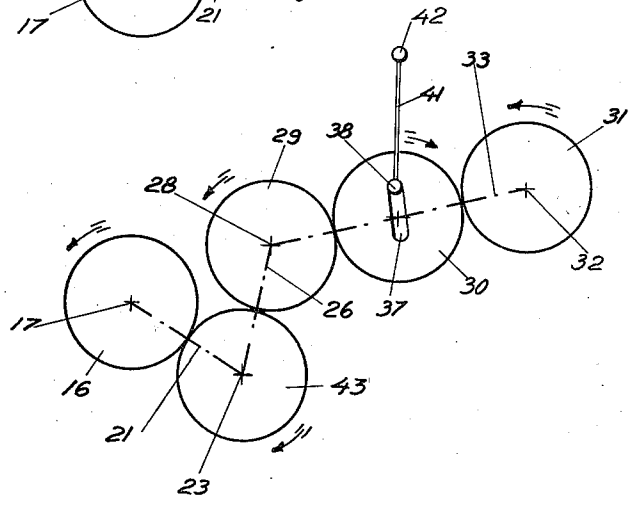


Fig 6



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UNITED STATES PATENT OFFICE

2,157,849

SHEET FEEDING APPARATUS

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Application July 26, 1937, Serial No. 155,771

3 Claims. (Cl. 271—12)

The principal object of this invention is a sheet feeding apparatus in conjunction with printing presses or similar machines which will enable sheets of various thicknesses to be fed with a high speed from a pile of sheets on to the printing press or such other machine to which the feeding device is applied. The modern printing presses usually operate rather quickly so that it is necessary that the sheets be fed into them with a rather high speed. To accomplish this, feeding devices have been designed in which the individual sheets are fed forward in an overlapped state viz. so that the next sheet is pushed ahead when the preceding sheet has been moved forward only a short distance, and as a consequence the sheets will be displaced relatively to each other similarly to the scales of a fish.

In other appliances for the same purpose the individual sheets are moved forward in such a way that their speed increases during the motion from the pile on to the printing press. Notwithstanding the possibility of accelerating the feeding of the sheets by this last mentioned method experience has shown that such an accelerated speed makes it difficult to arrest the sheets when arriving at the stoppers or registers at the entrance into the printing press especially as regards very thin sheets which are pushed against said stoppers so violently that their rather soft fore edges are liable to be bent or otherwise damaged.

This invention combines the good features of the known highly efficient feeding methods but it avoids their inconveniences so that it allows the sheet to be fed forward in an overlapped state with increased speed without hitting the stoppers or registers of the printing press so forcibly that their fore edges become injured. According to this invention the speed of the sheets when pushed forward is varied periodically in such a way that the speed fluctuates between a maximum and a minimum, and so that the sheets arrive against the stoppers in the printing press with a moderate velocity only. This variable feeding speed is due to the characteristic device which will be described below with reference to the accompanying drawings.

In the drawings—

Figure 1 is a broken sectional side elevation of the new feeding device,

Figure 2 is a broken plan view of the same device,

Figure 3 is a partial cross sectional view of Figure 1 on the line I—I seen in direction of the arrows, and Figures 4–6 are diagrammatical side views of gears which impel the new art of feeding motion on to the sheets which are to be carried ahead to the printing press.

Notwithstanding that the present feeding device will be described below in combination with a printing press it must be understood that this application has been chosen as an example only, as already mentioned in the preamble, and everywhere a printing press is mentioned in this specification it must not be taken as a limitation of the invention and its application.

All parts of the same character will be referred to with the same designations.

Referring to Figures 1 to 3, the intake end of the printing press is designated with A, and is indicated by the roller 1 which receives the sheets 2 as they arrive at the press, and conveys them further into the press. The sheets 2 when arriving on the top of the roller 1, are stopped by the known stopper or register 3 as clearly understood from Figures 1 and 2.

The sheets 2 are stocked in the known way in a pile 4 supported by a table 5, and they are separated from said pile one by one by means of some known implements 6, which, for instance operate by aid of vacuum, which implement catches the uppermost sheet 2a near the rear edge thereof. Having been separated from the pile 4 by means of the implement 6 the sheet 2b gets advanced by some known feeding apparatus as indicated by 7 whereby the cooperation of separating implement 6 and feeding apparatus 7 is such that the sheets 2 advance overlapped at a certain extent as clearly shown in Figures 1 and 2. Such an overlapped feeding of the sheets is known per se, and I do not claim the same.

When arriving to the left hand end of the feeding device the sheets 2 come in cooperation with a series of endless conveyer belts 8 moving in direction of the arrow in Figure 1 from a roller 9, and carried by another roller 10 journalled for instance in the printing press adjacent the intake end roller 1.

The driving conveyer roller 9, which is journalled in the frame 11 of the feeding device, carries on its shaft 12 a toothed gear wheel 13 which meshes with another toothed gear wheel 14 on a shaft 15 journalled in the frame 11.

The said gear wheel 14 meshes with another gear wheel 16 the shaft 17 of which is journalled in the frame 11 and carries a feeding roller 18 between which and a press roller 19 the sheets 2 are fed forward. Shaft 17 is surrounded by a hub 20 of a link 21 the other end of which also forms a hub 22 surrounding a shaft 23 which is surrounded by another hub 25 of a substantially vertical link 26 the upper end of which forms a hub 27 around a shaft 28 which carries a gear wheel 29 that meshes with a gear wheel 30 which in turn meshes with a further gear wheel 31 on a shaft 32. The three gear wheels 29, 30, 31 are kept in cooperation by aid of a substantially horizontal link 33 with a hub 34 about shaft 28 and a hub 35 about shaft 32 which last mentioned shaft is journalled in frame 11.

The link 33 has an intermediate hub 36 for the central shaft of wheel 30 (which shaft is not visible in the drawings), and the wheel 30 is provided with an elongated slot 37 in which a movable crank pin 38 is adjustable, the screw threaded end 39 of which is provided with a nut 40 by means of which the crank pin 38 can be stationarily fixed at any selected distance on each side from the centre of wheel 30 or in said centre proper. As shown in Figure 1 the slot 37 is somewhat longer on the one side of the centre of the wheel 30 than it is on the opposite side. Crank pin 38 is suspended at the lower end of a connecting rod 41, the upper end of which is pivoted on a pin 42 in the frame 11 substantially perpendicularly above the centre of wheel 30.

Shaft 23 carries a gear wheel 43 which meshes with gear wheel 16 as well as with gear wheel 29.

The diameter of conveyer roller 9 is smaller than the diameter of roller 18 so much as is the thickness of the conveyer belts 8 for the purpose to invest the very same speed to the operative surface of said belts as is the periphery speed of roller 18 notwithstanding the diameters of the gear wheels 13 and 16 which both mesh with the same gear wheel 14 are equal.

The Figures 4, 5 and 6 demonstrate diagrammatically how the gears operate when feeding sheets 2 into the printing press, and this operation will now be described in connection with an explanation of the operation of the whole apparatus. It must then be understood that the links, shafts and gear wheels shown in Figures 1 and 2 are present on the opposite side of the apparatus also which is removed in Figure 2.

In Figure 1 as well as in all the diagrammatical Figures 4, 5, 6 the adjustable crank pin 38 is supposed to be fixed in one of its extreme positions viz. at the most remote end of slot 37. From the preceding description it is evident that only the shafts 15, 17 and 32 are journalled in fixed bearings in frame 11 while the shafts 23 and 25 as well as the nonvisible shaft of gear wheel 30 are carried by the movable systems composed of the three links 21, 26 and 33 as also of the connecting rod 41 and the crank pin 38. The driving motion is supplied to the apparatus by aid of the shaft 32 and gear wheel 31 which revolves the gear wheel 30, and this motion is transmitted to the gear wheels 29, 43, 16, 14 and 13 so that the conveyer belts 8 are put in motion. On account of the movable link systems 33, 26, 21 and the suspension thereof in the connecting rod 41 on crank pin 38 the link 33 will swing up and down with its left hand end around the shaft 32 as a pivot, as well as the right hand end of the link 21 upon shaft 17 as pivot. That is clearly shown by Figures 5 and 6. As a result of these swinging motions the gear wheel 30 rolls to and from along a portion of the periphery of gear wheel 31 as also does the gear wheel 43 in relation to gear wheel 16 simultaneously as they revolve around their respective centres, as the arrows in Figures 4–6 indicate. It is clearly understood that the amplitude of the swings of the links 33, 21 stand in relation to the displacement of the crank pin 38 in the slot 37 so that in the position exemplified in Figures 4–6 the amplitude has its maximum and will be zero if the crank pin 38 is removed exactly into the centre of wheel 30. When moved to the opposite end of slot 37 a similar swinging motion will occur but with another ratio.

On account of said rolling motion between the wheels 30, 31 as also between the wheels 43, 16 the revolving of the rollers 18 and 9 will be irregular notwithstanding the regular revolving of the driving shaft 32, which also results in an irregular motion of the conveying belts 8. This irregularity is such that the sheets 2 when they pass along between rollers 18 and 19 and on the conveyer belts 8, are given a speed which varies periodically between a maximum and a minimum, and so that they arrive on to the stoppers or registers 3 with a rather moderate speed which does not involve any undue hit when the sheets get arrested thereby notwithstanding the mathematical medium of the speed during the whole movement from the pile 4 until the entrance into the printing press will be considerably above that which is possible to attain by feeding apparatuses hitherto known.

The aforesaid reduced diameter of roller 9 in relation to roller 18 makes the conveying of the sheets upon the conveyer belts 8 smooth and even so that no wear on the sheets will take place when they are transferred from the rollers 18, 19 on to the conveyer belts 8.

What I claim is—

1. A sheet feeding apparatus comprising a sheet separator and a main feeding device, a feeding roller and conveyer belts combined so as to produce an overlapping motion to the sheets fed thereto at regular intervals, means for giving an irregular feeding speed to the sheets and comprising pivotal links, a train of circular gear wheels on the links, the gear at the free end of the links geared to the feed roller and conveyer belts, a connecting rod pivoted to a fixed pivot at one end and having a crank pin on the opposite end engaging in a longitudinal slot provided in one of said wheels causing the links to oscillate, resulting in a periodical variation of the speed of the sheets, whereby said main feeding device passes a sheet over said feeding roller to the conveyer belts.

2. A sheet feeding apparatus comprising a sheet separator, a main feeding device, speed reducing means consisting of a feeding roller and conveyer belts combined so as to produce an overlapping motion to the sheets fed thereto at regular intervals, pivotal links and gears revolubly mounted thereon, the gear at the free end of the links geared to the feed roller and conveyer belts, a connecting rod pivoted to a fixed point at one end and having a crank pin on the opposite end for controlling the relative position of said links, the crank pin being radially adjustable on one of said gears so as to impel an irregular feeding motion to the sheets, resulting in a periodical variation of the speed of the sheets, whereby said main feeding device passes a sheet over said feeding roller onto said conveyer belts.

3. A sheet feeding apparatus comprising a sheet separator and a main feeding device, conveyer belts and a driving roller therefor combined so as to produce an overlapping motion, to the sheets fed thereto at regular intervals, and means for impelling an irregular feeding motion to the sheets so that the speed thereof changes periodically from that given by the main feeding device, and a feeding roller for the sheet positioned adjacent the conveyer belts and adapted to have the same surface feed as the belts, the driving roller for the belts having a correspondingly smaller diameter than that of said feeding roller, whereby a sheet from said separator is passed from the main feeding device over the feeding roller onto said conveyer beits.

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