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P. JENDRUSCH
 DEVICE FOR OVERLAPPING SHEETS OF PAPER, PRESS
 BOARD AND OTHER MATERIAL

3,096,978

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2 Sheets-Sheet 1

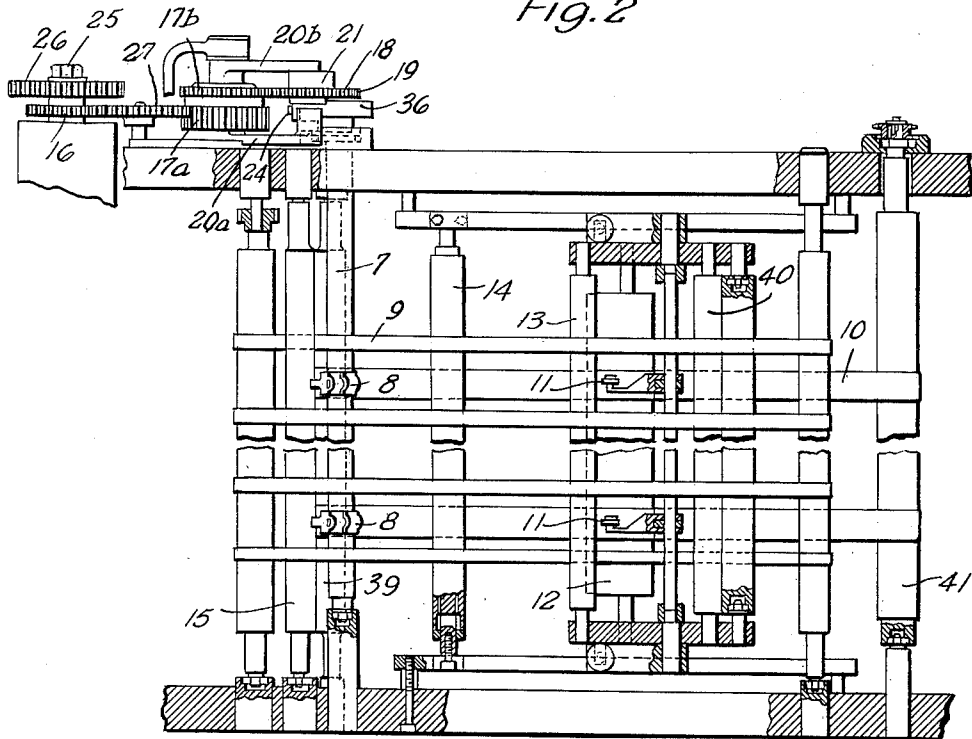
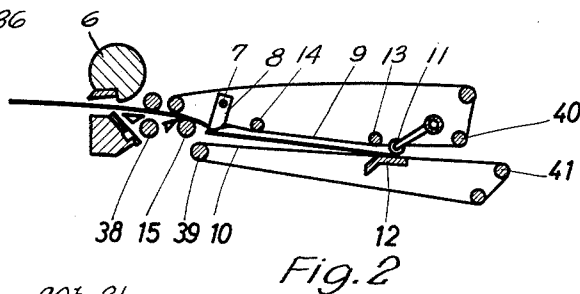
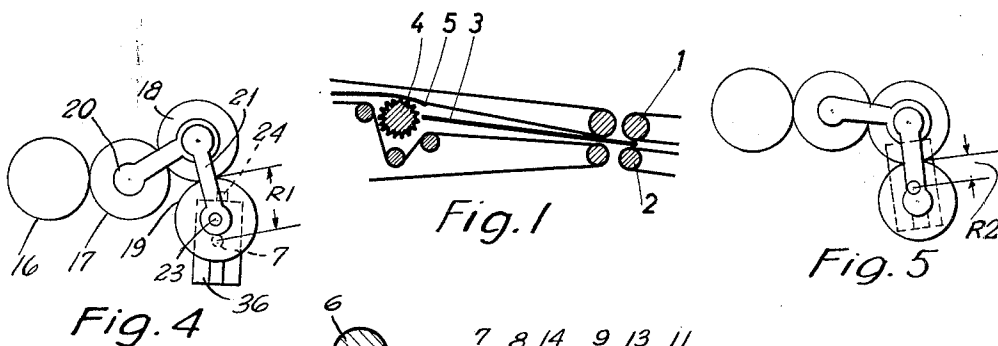


Fig. 3A

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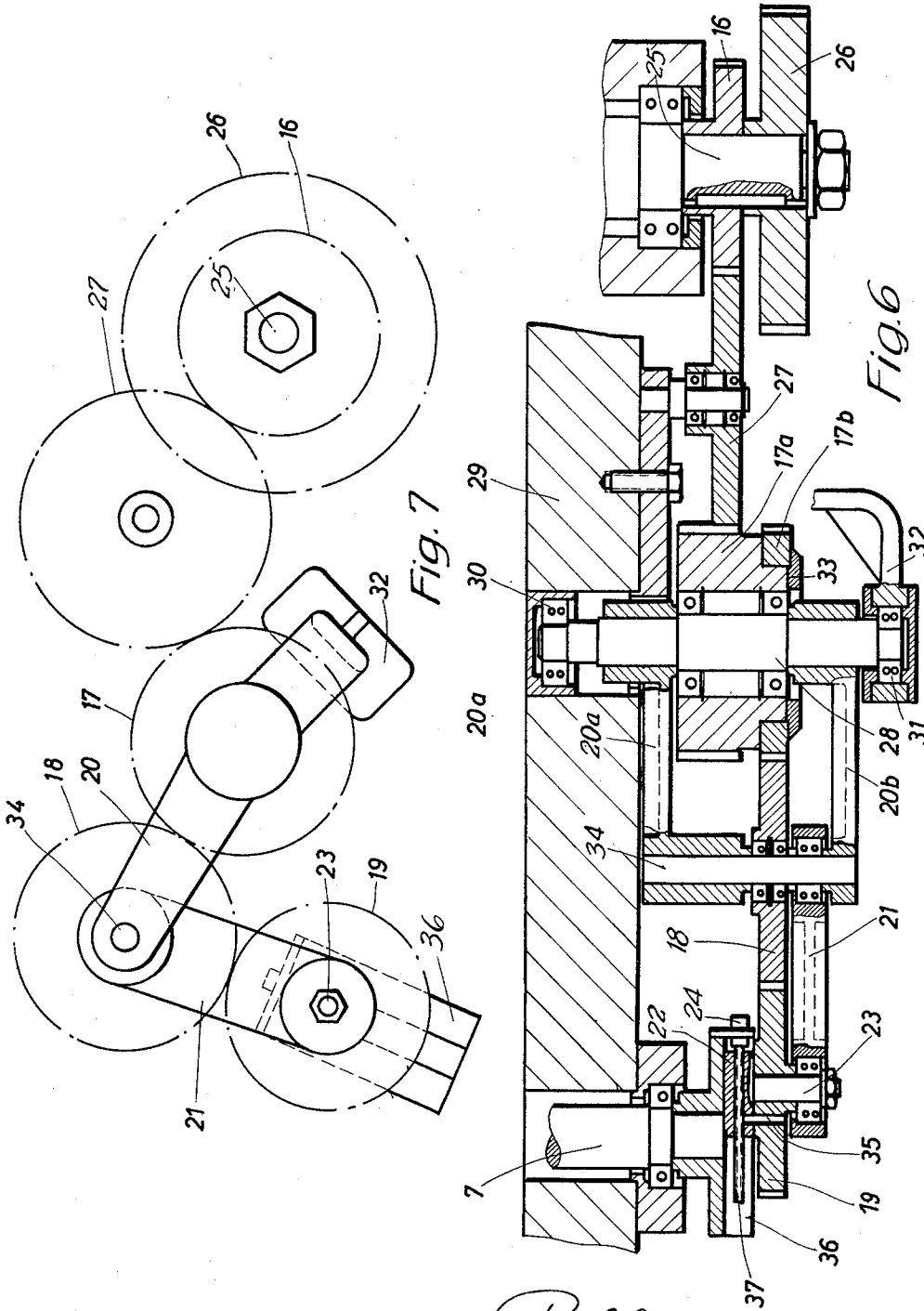
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DEVICE FOR OVERLAPPING SHEETS OF PAPER, PRESS BOARD AND OTHER MATERIAL

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3 Claims. (Cl. 271-46)

The invention relates to a device with which sheets of paper, press board or other material are overlapped at a high working speed so that the speed of conveyance of the work material is reduced by approximately 50 to 70% and is then further transported at a lower speed into collecting devices, repositories etc.

For achieving higher working speeds with such devices there are a number of constructions by means of which the sheets are overlapped during conveyance. One of these devices is shown in FIG. 1. In this device the sheets 3 are retarded by rollers 1 and 2 to a speed approximately 60% slower and the rear edge of the sheet 3 is pressed downwards by means of a toothed shaft 4. From a certain speed onwards, which depends on the strength of the materials being processed this device works unreliably since the teeth of the toothed shaft 4 do not press down the rear edge of the sheet 3 securely enough so that the next arriving sheet 5 presses with its front edge against the rear edge of the first sheet 3. In this device the rear edge of the sheet 3 is left more or less free and the velocity of the rear edge of the sheet 3 as it moves downwardly, so that the next sheet can gain on sheet 3, depends on a number of circumstances.

According to the invention, for overcoming these disadvantages the sheets are overlapped during the passage by means of opposed sets of endless belts moved at different speeds, by means of shafts and by means of guide fingers and are thus positively guided. In this manner, the speed of conveyance of the sheets can be considerably increased and the output of a machine correspondingly raised. The two sets of belts are expediently arranged displaced from one another in the vertical direction. There are also at least two shafts which are adjustable in height and by means of which the spacing between the two sets of belts can be altered.

Also in accordance with the invention, downward pressing rollers are provided which act on the sets of belts rotating at the lower speed. The guide fingers of the invention expediently rotate and with a speed of rotation which can be adjusted to the speed of advance of the sheet during the pressing downwards of the rear edge of the sheet for all format lengths to be treated. In this connection, it is also recommended that the guide fingers be driven by a drive by means of which the speed of rotation of the fingers is smoothly variable in accordance with the speed of advance of the sheet.

In this manner, the downwards movement of the rear edge of the respective retarded sheet is accurately controlled with the help of guide fingers so that the rear edge does not remain free. It is positively pushed downwards by the guide fingers so that the next sheet can no longer press against the rear edge of the preceding sheet.

Further improvements and preferred features of the invention are described with respect to the accompanying drawings, in which an embodiment of the invention is illustrated diagrammatically and in which:

FIG. 2 shows a diagrammatic sectional view through a device constructed according to the invention;

FIG. 3 shows a detailed partially sectioned plan view of a device in accord with the invention;

FIGS. 4 and 5 show diagrammatic views of a special drive for alteration of the speed of rotation of the rotat-

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ing fingers at the instant of their engagement, the drive being adjusted to a high angular velocity and thus to a high peripheral velocity at the moment of engagement. FIG. 4 shows the drive at the instant of its smallest angular velocity, which FIG. 5 shows the drive at the instant of its greatest angular velocity, in which the fingers 8 are in engagement and are pressing downwards the rear edge of a fully retarded sheet 3.

In FIGS. 2, 4 and 5 the support walls in which the shafts are journaled are not shown.

FIG. 6 shows a longitudinal section through the special drive of FIGS. 4 and 5 in a somewhat more detailed illustration;

FIG. 7 shows a view of the device shown in FIG. 6.

The shaft 7, on which the fingers 8 are fixed, is synchronously driven from the transverse cutter 6. One rotation of the transverse cutter corresponds to one sheet and one rotation of the shaft 7. The sheet is conveyed by the set of belts 9 on to the set of belts 10 which runs approximately 60% slower than the belts 9. On each of the belts 10 there runs a roller 11. In order that the belts do not hang loosely, an underneath support plate 12 is provided under the roller 11. The shafts 13 and 14 are preferably adjustable in height by any conventional means so that the spacing between the belts 9 and the belts 10 can be adjusted. The shaft 13, the rollers 11 and the underneath support plate 12 are also supported in a mounting which is movable in the longitudinal direction. The mounting and the device for the longitudinal movement are not shown in FIGS. 2 and are only generally shown in FIG. 3. The distance between the rollers 11 and the shaft 15 corresponds to the length of the sheets. The sheets are conveyed by the belts 9 to the belts 10 and run under the rollers 11. Since the belts 10 run considerably slower than the belts 9, the sheets are retarded as soon as their forward edges arrive under the rollers 11. At the same instant, the rear edge of the retarded sheet is pressed downwards by means of the finger 8 and the next sheet can then safely run on to the first sheet. This process is repeated for each sheet. The rollers 11, as shown in FIG. 3, extend between the belts 9 and on the belts 10. The overlap fingers 8 are likewise accurately positioned above the belts 10 and between the belts 9.

The shaft 7 is driven from the transverse cutter 6 by a special drive (see FIGS. 4, 5 and 6, 7). With the help of the special drive it is possible to alter the speed of the fingers 8 during a rotation. The radius of the finger 8 is for example 60 mm. One rotation corresponds to a sheet advance of about 375 mm. For a sheet length of 375 mm, the circumferential speed of rotation of the finger 8 would be the same as the speed of the sheet. For a format length of 750 mm. on the other hand the speed of the overlap fingers designated 8 would be a half that of the sheet. In order, however, to be able to guide the rear edge of the sheet accurately the speed of the sheet, in the position in which the fingers 8 press the rear edge of the sheet downwards, must correspond with that of the fingers 8. For this reason the special drive (see FIGS. 4 and 5) is provided.

Beyond the transverse cutter 6 the sheets are transported by rollers of which the roller 38 is driven. Beyond the roller 38 the undriven roller 39 is important. The distance between the rear edge of this roller 39 and the middle of the downward pressing roller 11 must be approximately equal to the length of the said format. The roller 39 is located beyond the roller 15 and serves as the deviation roller for the lower belts 10. The finger 8 is arranged above this roller. Thus, between the upper edge of the roller 15 and the belts 10 there is a certain depth of fall.

From the above statements it is apparent that the speed

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of rotation of the fingers 8 at the instant of engagement must be equal to the speed of conveyance of the sheet beneath the transverse cutter. After the rear edge of the advancing sheet is pressed downwards by means of the fingers 8, the following sheet is advanced in practice at the speed of the upper belts. In this connection the widths and the material of the belts 9 are chosen so that the friction between these belts is greater than the friction between the upper sheet and the fully retarded sheet lying thereunder.

The upper belts 9 are driven from the roller 40, while the lower belts 10 are driven from the roller 41. The individual rollers 11 lie only under their own weight, although if necessary the rollers 11 can also be downwardly biased by a light spring pressure.

By means of the gear wheel 16 (see FIGS. 4 and 5), the gear wheels 17, 18 and 19 are driven from the transverse cutter 6. The gear wheel 18 is supported rotatably about the axis of the gear wheel 17 by a rocker arm 20 and is connected by means of a link 21 with the pivot pin of the gear wheel 19 so that spacing between the axes of the gear wheels 18 and 19 always remains constant. The gear wheel 19 is mounted on a pin 23 of a slide block 22 which is supported movable and adjustable in a guide fixed on the shaft 7. Furthermore, the driven gear wheel 19 is fixedly coupled with the slide block 22 in any manner e.g. by means of an additional locking pin. The fingers 8 are arranged on the shaft 7. After release of a lock nut the pin 23, with the gear wheel 19, can be adjusted in the slide block 22 by means of the screw 24. The bolt 23 with the gear wheel 19 can thus be moved either to the centre of the shaft 7 or to the outermost position, as is shown in FIGS. 4 and 5. The link 21 is rotatably fixed to the bolt 23 and the rocker arm 20. In the position shown in FIGS. 4 and 5 the bolt 23 of the gear wheel 19 is adjusted eccentric with respect to the middle of the shaft 7. In this position the angular velocity of the shaft 7 alters within one rotation, while for central positioning of the slide block 22 with reference to axis of the shaft 23 the angular velocity of the shaft 7 remains constant.

In the position shown in FIG. 4 the lowest angular velocity of the shaft 7 is obtained, since the radius has its maximum value R1. In the position shown in FIG. 5 there is obtained the highest angular velocity, since in this case the radius has its smallest value R2. Since the eccentricity of the pin 23 and thus the gear wheel 19 can be adjusted, the speed of the fingers 8 at the moment that the rear edge of the sheet is pressed downwards can be adjusted to the paper speed.

Accordingly, the fingers 20, when the bolt 23 of the driven gear wheel 19 is adjusted eccentric with reference to the axis of the shaft 7, is swung to and fro so that the gear wheel 19 and thus also the slide block 22 and the shaft 7 are driven as a crank drive by means of the link 21.

In FIGS. 3, 6 and 7 the special drive is illustrated somewhat more clearly, the same reference numerals being used where possible as in FIGS. 2, 4 and 5. The cutter spindle is indicated by 25 and is driven by means of a gear wheel 26. A gear wheel 16 is keyed to the cutter spindle and drives a gear wheel 17a through an intermediate gear wheel 27, the gear wheel 17a being rotatably supported on a shaft 28 which in turn is rotatably supported in the support wall 29. One bearing for supporting the shaft 28 is indicated by reference numeral 30, while the other bearing is indicated by the reference numeral 31. The bearing 31 is fixed to the support wall 29 by a support member 32. Furthermore, a gear wheel 17b rotatable on the shaft 28 is so fixed on the gear wheel 17a that this gear wheel 17b is fixedly connected with the gear wheel 17a during the drive. The gear wheel 17b, however, is supported rotatable on the body of the gear wheel 17a and can be fixed in any desired position by means of a locking screw 33 or in any other suitable

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manner to the body of the gear wheel 17a. The gear wheel 17b meshes with the gear wheel 18 to which is supported loosely rotatable on a pivot pin 34 which is fixed in a rocker arm 20 arranged on the shaft 28. The rocker arm 20 in this embodiment comprises two arms 20a and 20b coupled together, between which the gear wheel 18 is arranged rotatably supported on the pivot pin 34 which is fixed in the arms 20a, 20b. The arms 20a, 20b are swingable about the axis of the shaft 28.

The gear wheel 18 meshes, as already stated, with another gear wheel 19, which is fixedly coupled to a slide 22 which is constructed in the embodiment in the form of a slide block. For the purpose of coupling the gear wheel 19 to the slide block 22 the gear wheel 19 is fixed on one hand to the pivot pin 23 to the slide block 22. On the other hand a coupling bolt 35 is provided between the slide block 22 and the gear wheel 19. The slide block 22 is arranged movable in a guide 36 which is fixed on the shaft 7 which in turn is rotatably mounted in the support wall 29. The slide block 22 can be adjusted by means of a threaded spindle 37 which is supported rotatable but axially immovable in the guide 36. The threaded spindle 37 can be rotated by means of its head 24, and engages in a threaded boring in the slide block 22. The axis of the slide block guide 36 intersects the axis of the shaft 7. The link 21 is supported rotatable on one hand about the bolt 23 of the gear wheel 19 and on the other hand about the pivot pin 34 of the arms 20a, 20b.

What I claim is:

1. A device for overlapping sheets of paper, press-board or similar material, comprising in combination, first conveying means consisting of a plurality of endless conveyor belts spaced in parallel relation and having taut portions, end rollers guiding said belts, means driving said rollers to move said belts at a speed corresponding to the speed of the sheets advanced toward said conveying means, the taut portions of said first conveyor belts being disposed above said sheets and forming a first guide surface for said sheets, second conveying means disposed below said first conveying means and consisting of a plurality of endless conveyor belts spaced in parallel relation to each other in a position between adjacent conveyor belts of said first conveying means and having second taut portions, second end rollers guiding said second belts, means driving said second rollers and said second belts at a lesser speed than said first conveyor belts, the taut portions of said second conveyor belts forming a second guide surface for said sheets, a first shaft extending normally to said first conveyor belts and rotatably supported above the taut portions of said first conveyor belts, means rotating said shaft with a speed proportional to that of said first conveyor belts, fingers mounted on said first shaft dimensioned and arranged to extend through the spaces between said first conveyor belts and engage each sheet moved past therebelow at the rear top end so as to positively urge said rear edge to a lower plane, a second shaft spaced from said first shaft extending normally to said conveyor belts and freely rotatable above the taut portions of said first conveyor belts, rollers mounted on said second shaft extending through the spaces between said first conveyor belts and engaging the leading edges of said sheets urging said sheets against said conveyor means moving at a slower speed than said first conveyor means so as to overlap successively fed sheets, a plurality of idling rollers extending normally to said conveyor belts disposed in spaced parallel relation between said first and said second shafts and engaging the top side of said first conveyor belts portions forming said first guide surface, a driven gear wheel journaled on a pin drivably connected with said first shaft, and means for adjusting said pin eccentrically to said first shaft whereby the circumferential speed of said fingers may be adjusted to the rate of travel of said sheets while the trail-

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ing edge of a sheet is positively urged downwardly by said fingers.

2. A device as in claim 1, wherein said driven gear wheel meshes with a first intermediate gear, a first pivoting arm connecting said pin of said driven gear wheel with the shaft of said first intermediate gear wheel, said first intermediate gear wheel meshing with a second intermediate gear wheel, a second pivoting arm connecting the shaft of said first intermediate gear wheel and the shaft of said second intermediate gear wheel whereby a constant mesh of said gears is maintained when the eccentricity of said pin of said driven gear wheel is adjusted relative to said first shaft.

3. A device as in claim 1, wherein said pin of said

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driven gear wheel is fixed to a sliding block adjustably mounted in guide means provided on said first shaft, and means coupling said sliding block with said driven gear wheel.

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