Aug. 29, 1961 H. MÜLLER 2,998,116

MACHINE FOR CONVEYING SHEETS OF PAPER AND THE LIKE AND STAPLING SUCH SHEETS INTO BOOKLETS

Filed April 13, 1959 6 Sheets-Sheet 1

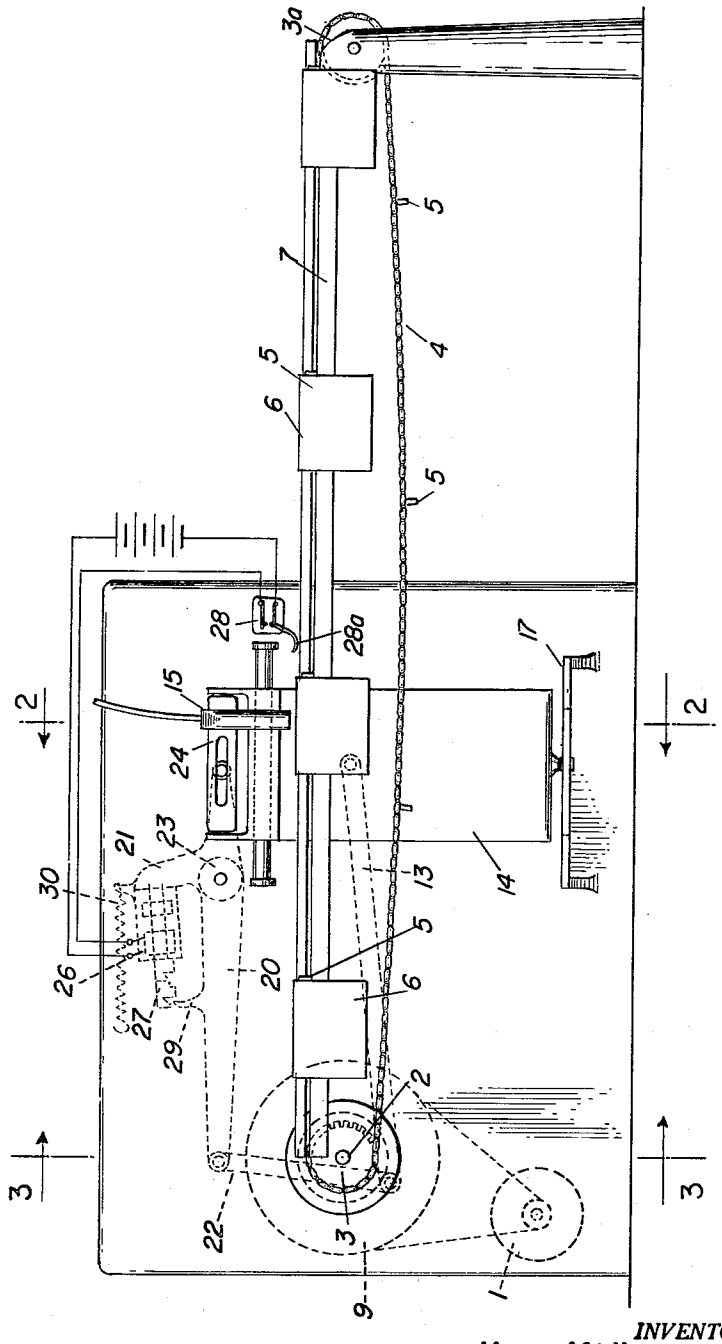


FIG 1

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Filed April 13, 1959 6 Sheets-Sheet 2

FIG 2

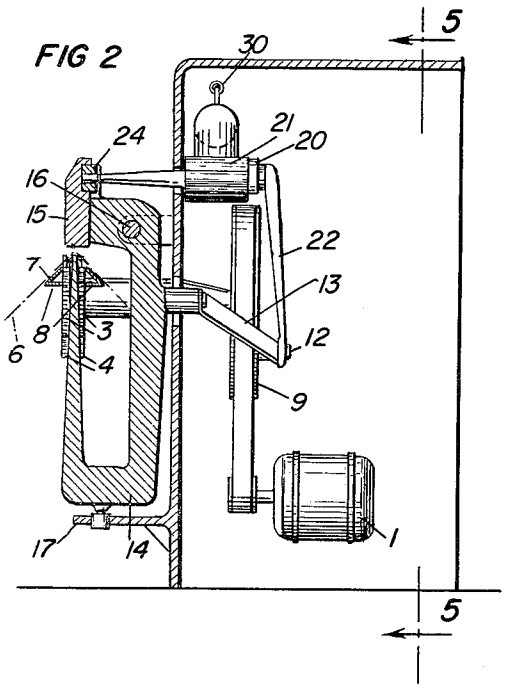
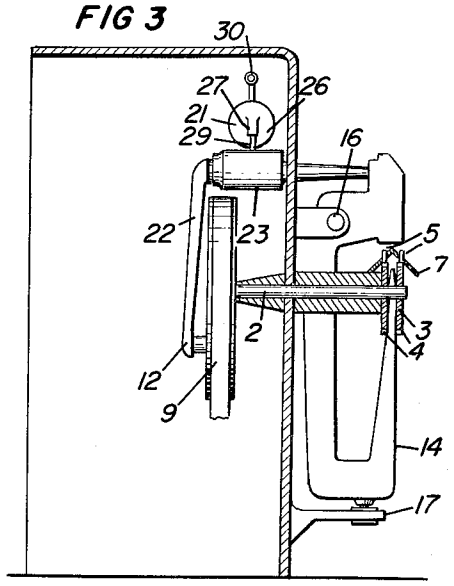


FIG 3



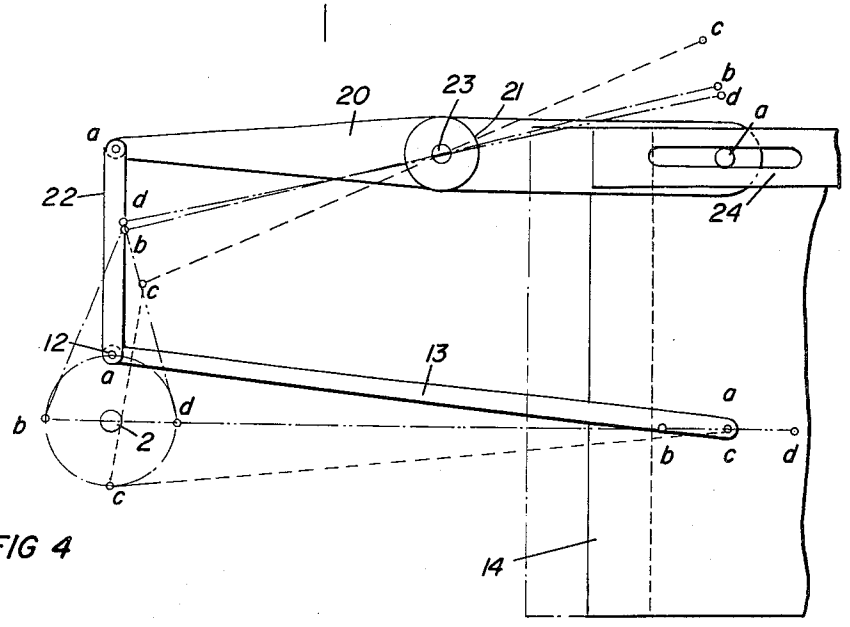


FIG 4

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MACHINE FOR CONVEYING SHEETS OF PAPER AND THE LIKE AND STAPLING SUCH SHEETS INTO BOOKLETS

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FIG 5

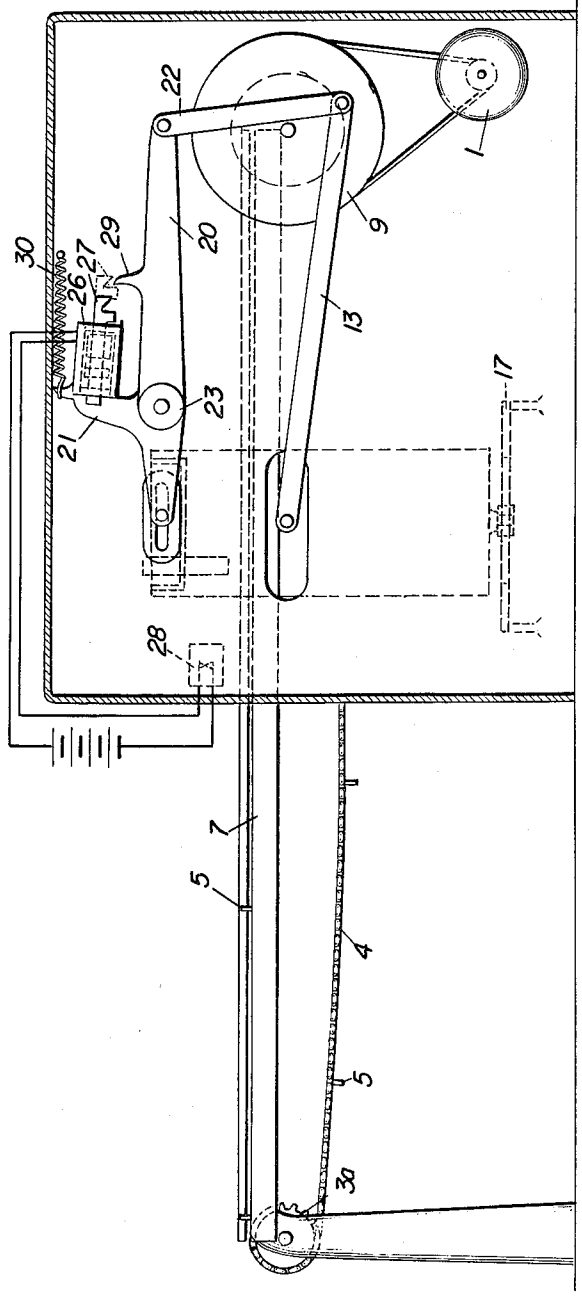
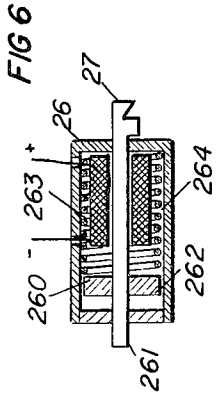


FIG 6



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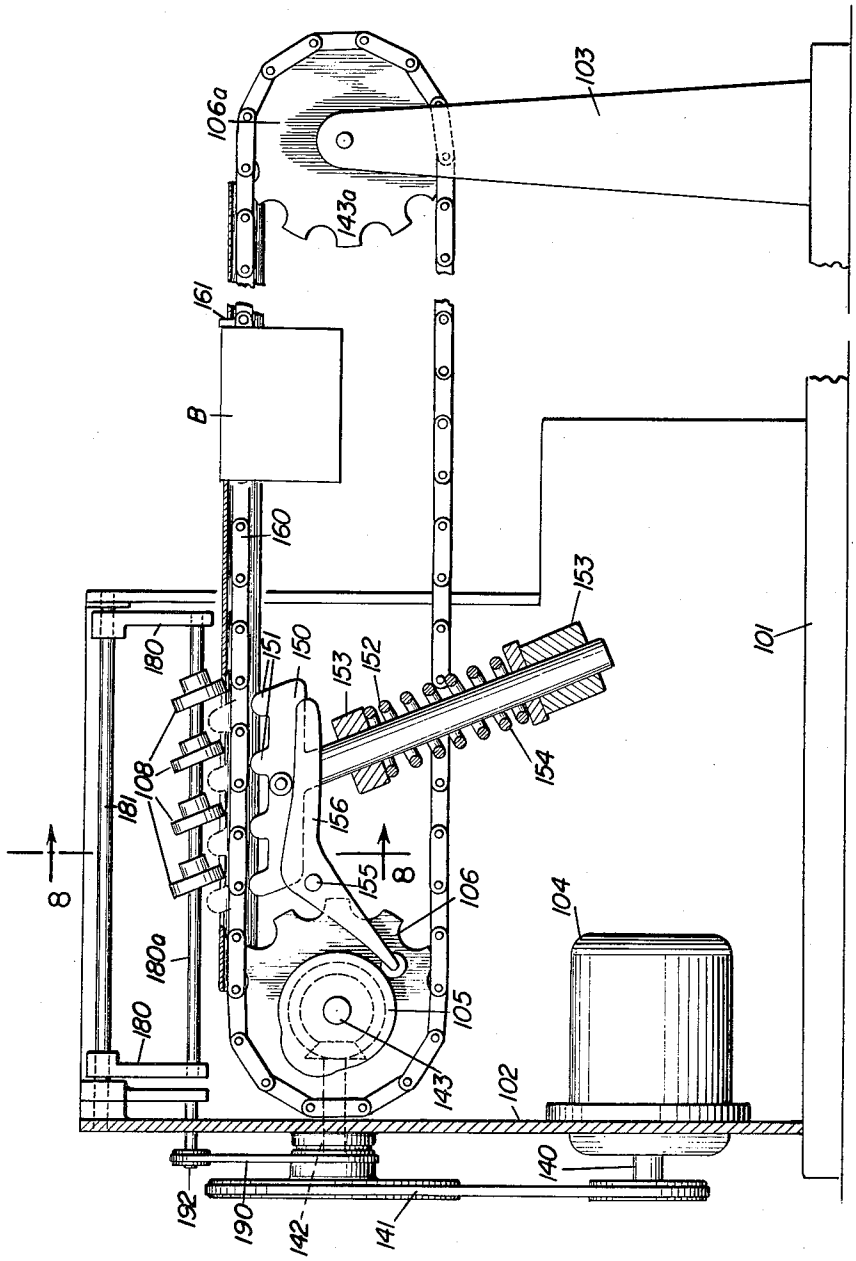
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MACHINE FOR CONVEYING SHEETS OF PAPER AND THE LIKE AND STAPLING SUCH SHEETS INTO BOOKLETS

Filed April 13, 1959 6 Sheets-Sheet 4

FIG 7



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MACHINE FOR CONVEYING SHEETS OF PAPER AND THE LIKE AND STAPLING SUCH SHEETS INTO BOOKLETS

Filed April 13, 1959 6 Sheets-Sheet 5

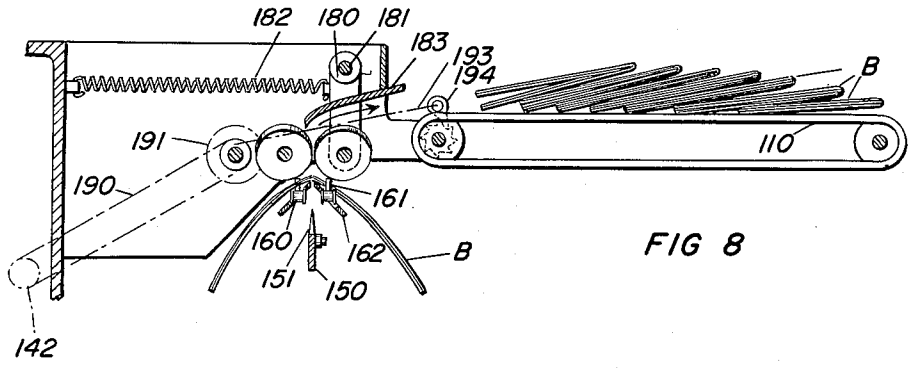
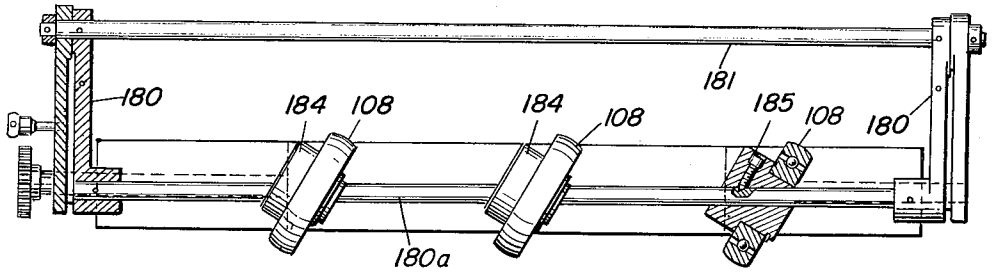


FIG 8

FIG 9



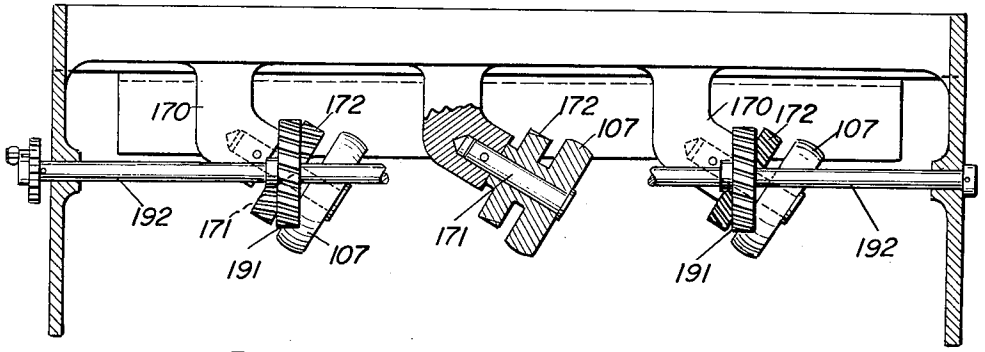


FIG 10

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MACHINE FOR CONVEYING SHEETS OF PAPER AND THE LIKE AND STAPLING SUCH SHEETS INTO BOOKLETS

Filed April 13, 1959 6 Sheets-Sheet 6

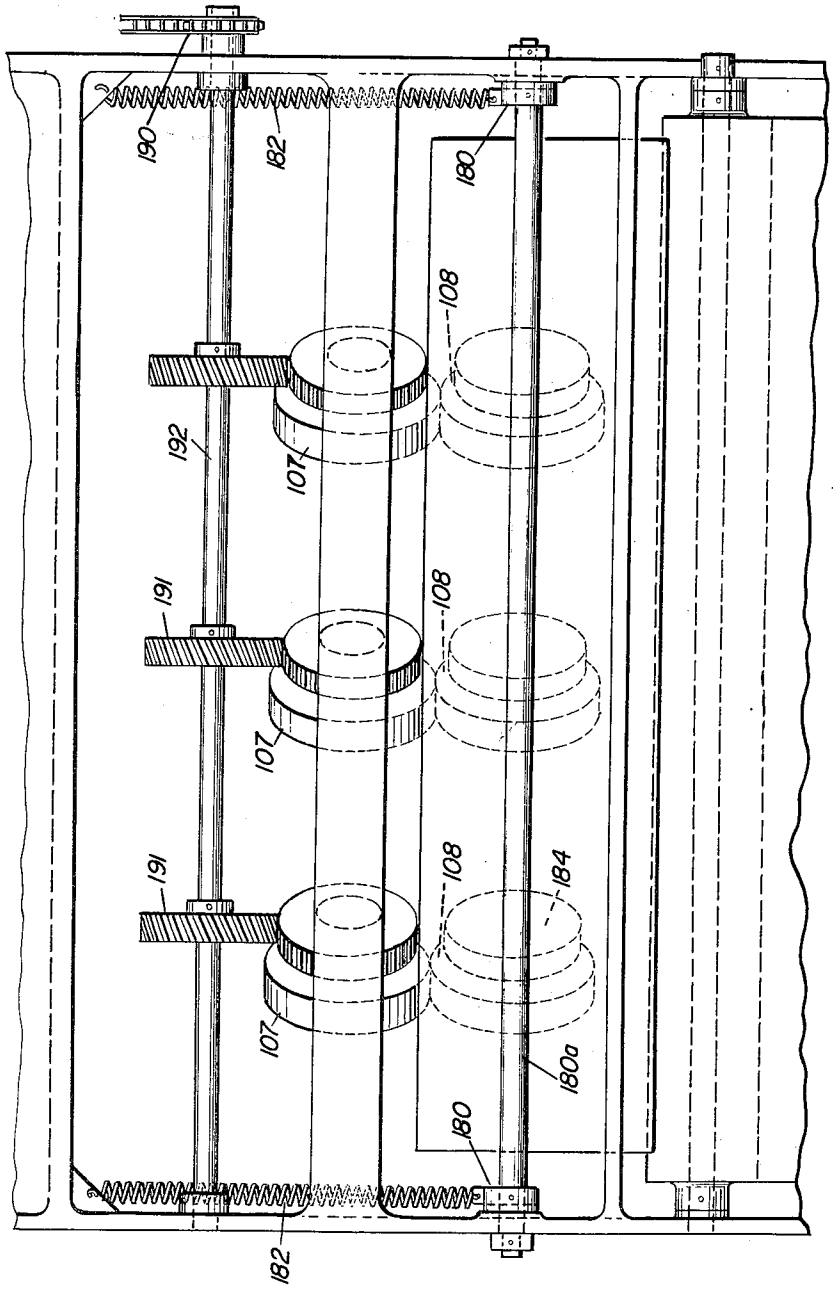


FIG 11

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United States Patent Office 2,998,116 Patented Aug. 29, 1961

2,998,116

MACHINE FOR CONVEYING SHEETS OF PAPER AND THE LIKE AND STAPLING SUCH SHEETS INTO BOOKLETS

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Filed Apr. 13, 1959, Ser. No. 806,162
Claims priority, application Switzerland Dec. 12, 1956
6 Claims. (Cl. 198—24)

This application is a continuation-in-part of my application Serial No. 700,209 filed December 2, 1957, now abandoned, entitled, Machines for the Stapling of Folded Booklets on the Back Folds Thereof.

The present invention relates to machines for stapling folded booklets on the back folds thereof and distributing the same.

In machines of this kind the folded booklets are carried by intermittently operated conveyer means past one or more stationary stapling devices, and are stapled when the conveyer means is at a standstill.

An object of the present invention is to provide a machine of the kind referred to wherein the periodical accelerating and decelerating of the conveyer means and booklets carried thereby is obviated, and yet the stapling operation is effected while the booklets are at rest relative to the stapling device.

A further object of the invention comprises a device for paper processing plants, especially a device with a conveyer device which is driven by a motor for folded individual sheets of paper or for sheets of paper which are to comprise a booklet. Such conveyer devices are often used in paper processing plants. Such a conveyer device can be arranged for instance next to a row of distributing apparatuses in a way that the distributing apparatus places the printed sheets from a stapler each to the conveyer device, by placing its sheets on the sheets of the precedingly arranged distributing apparatus. Sheets which are formed into booklets in this way can be led past a stapling machine by the conveying device, said stapling machine being devised and destined to staple the accumulated sheets. Such a distributing apparatus suitably comprises a sprocket chain arrangement provided with grippers which circulate in a vertical plane under a guiding bar.

The present invention provides a lifting device proper, which comprises a lifting bar which is arranged under a longitudinal slot in the guiding bar and to which an actuating system is correlated which is coupled to the distributing apparatus in order to lift it periodically with a vertical movement component which is orientated obliquely to the feeding direction through said longitudinal slit, whereby sheets which are raised by the bar are slid between pairs of rollers which are successively arranged, the axes of rotation of which are positioned in the movement plane of the lifting bar and are always orientated vertically to the movement component of said bar, whereby always on one hand rollers of a pair of rollers are driven and on the other hand the rollers which are loosely mounted bear elastically against the driven rollers.

With this and other objects in view I provide a machine for the stapling of folded booklets on the back folds thereof comprising in combination: a main drive shaft, conveyer means for the said booklets driven at uniform speed by the said drive shaft, at least one stapler device operatively connected to the said drive shaft and thereby periodically moved to-and-fro alongside the said conveyer means, and control means operatively connected to both the said conveyer means and the said stapler device triggering off stapling action of the said stapler device when the latter moves at the same rate

as and is in juxtaposition with a booklet moved by the said conveyer means.

These and other features and objects of my invention will be clearly understood from the following description of an embodiment thereof given by way of example and illustrated.

FIGURE 1 is a side elevation of the machine,

FIGURE 2 is a section on the section line 2—2 of FIG. 1,

FIGURE 3 is a section on the section line 3—3 of FIGURE 1,

FIGURE 4 is a kinematic diagram for the stapling device,

FIGURE 5 is a cross-section on the line 5—5 of FIGURE 2,

FIGURE 6 is a section of a detail of FIGURE 1 on a larger scale,

FIGURE 7 is a side view, partially in section, of the distributing device used in conjunction with the device of FIGURE 1,

FIGURE 8 is a vertical cross-section according to section line 8—8 of FIGURE 7,

FIGURE 9 shows the arrangement and bearing of the lifting rollers which pivot freely,

FIGURE 10 shows the arrangement and bearing of the driven lifting rollers, and

FIGURE 11 shows a top view of the lifting rollers.

The device disclosed in FIGURES 1 to 6 inclusive will first be described.

A motor 1 mounted in the machine casing drives the central shaft 2 by a belt pulley 9. Two sprocket wheels 3 are fixedly mounted on shaft 2. These sprocket wheels serve for driving the endless conveyer chains 4, each of which is passed over another, idly mounted, sprocket wheel 3*a* and the upper runs are supported by the horizontal faces of a booklet carrier 7 of delta-shaped cross-section.

Dogs 5 projecting from the chains 4 run in slots of the booklet carrier 7 and are designed for pushing the assembled sheets 6 of the booklets to be produced at a uniform rate along the carrier 7.

On the belt pulley 9 there is mounted an eccentric crank pin 12. On this crank pin 12 one end of a connecting rod 13 is articulated, the other end of which is articulated on the carrier body 14 of stapling heads 15. The body 14 is guided by guide rods 16 and 17 for a to-and-fro movement alongside the booklet carrier and parallel to the direction of running of the conveyer chains.

From the foregoing and with reference to FIGURE 4 it will be readily realized that in this manner the carrier body 14 of the stapler heads 15 is forced together with the latter to perform a periodical to-and-fro movement along the path of conveying the sheets for the booklets, which is coupled with the rotational movement of the driving sprocket wheels, the arrangement being made in such a manner that the carrier body of the stapler heads moves in the range of the two middle positions *a*, *c* at the same speed as the upper or lower run of the conveyer chain, respectively.

On the crank pin 12 moreover one end of a connecting rod 22 is articulated, the other end of which is articulated to the free arm of a lever 20 pivotally mounted in the stationary bearing 23.

In straight continuation of the lever arm 20 and rigidly coupled thereto a lever arm 21 is arranged, the end pin of which engages in a horizontal slide guide 24 of the stapler head 15 which latter is guided movably up-and-down in the carrier body 14.

The stapler heads 15 perform in addition to their periodical to-and-fro movement also a periodical up-and-down motion, the lowest position being reached at the

time (see FIGURE 4), when the crank pin 12 is at its highest position at the point *a*, i.e. when the carrier body 14 moves uniformly and at the same speed as the booklets. The spacing of the dogs, ahead of which the sheets 6 of the booklets are pushed, corresponds to one full circumferential path of the crank pin 12, and these dogs are so positioned that the place of the folded back provided for the stapling lies under the associated stapler head at any time when the lowest position, at which the staples are to be pressed in, is attained by the stapler heads.

The lever arm 21 is not permanently rigidly connected to the lever 20, but forms part of a bell crank lever idly mounted on the pivot 23, whose other arm, which is biased anti-clockwise by a spring 30, carries an electro-magnet 26 with a nose 27. When a booklet is conveyed to the stapler device, it operates a feeler 28*a* of an electrical switch 28 in the circuit of the electromagnet 26.

As shown in FIGURE 6 this electromagnet consists of a casing 260 wherein a rod 261 is slidably mounted on which the armature 262 is fixedly mounted and which has a nose 27 to engage a finger 29 of the lever 20. A coiled spring 264 biases the armature 262 away from the solenoid 263, which when energized overcomes the spring 264 and pushes the rod 261 out to the left into the position of the nose 27 shown in FIGURE 1 in dotted lines.

In this case, illustrated in FIGURE 1, the finger 29 projecting from the lever 20 engages the nose 27 of the armature rod 261 and forms a rigid connection of the lever 20 through the finger 29 and nose 27 of the electromagnet 26 to the bell crank lever 21. When no booklet is being conveyed past the stapler device, the armature nose 27 remains outside the range of the finger 29, so that the stapler heads are not depressed for stapling action.

The construction disclosed in FIGURES 7 to 11 inclusive which is designed to cooperate with the stapling device above set forth or with any sheet assembling machine as previously mentioned will now be described.

The illustrated device in these figures comprises a machine frame with the base plate 101 and the front walls 102 and 103. To the front wall 102 is annexed an electric motor 104, the driving shaft 140 of which drives a shaft 142 by a drive belt or chain 141, by which a cross shaft 143 is driven via a miter-wheel gearing which is not shown exactly.

On said cross shaft 143 are positioned a cam plate 105 and two sprocket wheels 106. On a shaft 143*a* positioned in front wall 103 and bearing parallel to the shaft 143 two more sprocket wheels 106*a* are positioned.

Via the sprocket wheels 106 and 106*a* the endless sprocket chains 160 with gripper pins 161 for the sheets B are led, so that these chains circulate in a vertical plane in the direction of the arrows. Above the chain arrangement a roof-like profiled guiding bar 162 is fixed, on which the folded sheets B ride and are pushed from the right towards the left (FIGURE 7) by the gripper pins 161.

At the end of this conveyer device the guiding bar is provided with a central longitudinal slot, under which a lifting bar 150 is arranged with protuberances 151 being directed towards the top. Said bar 150 is supported by a rod 152 which bears displaceable in obliquely arranged guides 153. A return spring 154 tends to keep the bar 150 in normal position as shown in FIGURES 7 and 8.

An actuating lever 156 pivoted at 155 has one arm which cooperates with the cam plate 105 via a roller and the other arm of which cooperates with a roller on the lower side of the bar 150. The lever 156 pivots once counterclockwise at each rotation of the shaft 143 (FIGURE 7), whereby each time the bar is raised upward sloping and falls back again.

The inclined movement of the bar is comprised of a vertical lifting component and a horizontal component being orientated in the feeding direction of the paper, whereby said horizontal component has to be as large as the feeding vector of the sheets B on the guiding bar.

By means of the upward sloping movement of the bar 150 the sheets are pushed between the pairs of lifting rollers 107 and 108 (FIGURE 8). Each pair of rollers consists of a driven roller 107 and a roller 108 which is pressed to the same by a spring.

The exact arrangement of the rollers and the construction of the driving mechanism for the rollers 107 will be explained in detail later on in FIGURES 7 and 9 to 11. For the time being, the effect of the lifting rollers and the other parts correlated to the lifting device are explained in principle in FIGURE 8.

From the driven shaft 142 via a drive belt 190 driving pinion 191 is driven on a shaft 192, by which driving pinions the lifting rollers 107 are driven. The freely rotating bearing lifting rollers bear in a frame 180 which is articulated at 181 with a fixed part of the frame and is pulled by tension springs 182 in a way that the rollers 108 are pressed against the driven rollers 107.

When the lifted sheets of paper enter between the rollers 107 and 108, they are gripped by said rollers and are placed along the lower side of a bent guiding sheet 183 on a horizontal conveyer belt 110, which is driven stepwise via a crank arrangement 193 and a ratchet mechanism 194 from the shaft 192 of the driving pinion 191. The free lower edge of the guiding sheet 183 being arranged above the lifting rollers 107, 108 is directed towards the interspaces.

It is disclosed clearly in FIGURE 7 that the axes of the rollers 108 which pivot freely are orientated in the vertical plane perpendicular to the oblique movement of the bar 150, i.e. are also orientated obliquely.

The form and the arrangement of these rollers 108 is illustrated on larger scale in FIGURE 9. A fixed shaft 180*a* which pertains to the frame 180 and which is orientated in a horizontal direction via a guiding bar 162 supports successively, cylindrically and obliquely perforated bearing bodies 184 which can be screwed tightly in the desired position by means of adjusting screws 185 on the shaft 180*a*.

On the peripheral area of said bearing bodies 184 the lifting rollers 108 which are performed as annular rollers bear freely, whereby said rings can be formed as roller bearings.

According to FIGURE 10 into machine-tight, fixed pivots 171 are placed obliquely offset pivots 170, the axes of which are parallel to the center of rotation of the rollers 108.

On these pivots 171 rollers 107 are freely revolving to which obliquely indented pinions 172 are connected. The correlated driving pinions 191 which are driven by the shaft 192 mesh with the pinions 172, so that the rollers 107 are positively driven. Their number of revolutions is so chosen that they also impart to the lifted sheets of paper an advanced speed from the right towards the left (FIGURE 7), which is equal to the advancing speed on the conveyer device.

FIGURE 11 shows clearly on larger scale the cooperation of the driving pinions 191 with the rollers 107 and rollers 108.

It has to be mentioned that the protuberances 151 of the bar are arranged always between two pairs of rollers 107 and 108, in order that the bar, when lifting, can supply the sheets securely into the range of the rollers.

While I have described herein and illustrated in the accompanying drawings what may be considered a typical and particularly useful embodiment of my said invention, I wish it to be understood that I do not limit my self to the particular details and dimensions described and illustrated, for obvious modifications will occur to a person skilled in the art.

I claim:

1. A conveyer apparatus having a motor for driving folded sheets of paper comprising a pair of sprocket

chains, a guiding bar having a longitudinal slot, grippers carried by said chains in a vertical plane under said guiding bar, a correlated lifting device comprising a lifting bar arranged below said longitudinal slot, driven rollers, free wheeling rollers cooperating with said driven rollers, means urging said free wheeling rollers against said driven rollers, an actuating system correlated with said lifting bar which is coupled to the drive of the conveyer device to lift it periodically, with a movement inclined upwardly and forwardly in the feeding direction through said longitudinal slot in said guiding bar to lift sheets of paper on said guiding bar and slide them between said driven rollers and said free wheeling rollers, the axes of rotation of said rollers being positioned in the movement plane of said lifting bar.

2. An apparatus as set forth in claim 1 wherein said driven rollers are mounted on obliquely oriented, successively fixed pivots and each is connected rigidly with correlated obliquely positioned gears, a driving pinion is correlated with each of said gears, and a driven shaft has said pinions fixed thereto.

3. An apparatus as set forth in claim 1 wherein said freewheeling rollers are formed as ring rollers which bear on a supporting cylinder, each of said supporting cylinders being placed obliquely on a common supporting bar whereby said supporting bar is pulled by spring effect

against said driven rollers so that the peripheral area of each driven roller rolls on the peripheral area of a correlated ring roller.

4. An apparatus as set forth in claim 1 wherein a bent guiding sheet is arranged above said rollers with its free edge directed towards the interspaces between the driven and the free-wheeling rollers so that it reroutes the lifted sheets of paper out of the apparatus.

5. An apparatus as set forth in claim 1 wherein said lifting bar is provided with a protuberance between two pairs of rollers.

6. An apparatus as set forth in claim 1 wherein the oblique orientation of the movement of the lifting bar and of the rollers as well as the driving connections of the lifting bar and of the driven rollers is so proportioned for the drive of the conveyer sprocket chains that the sheets maintain their horizontal feeding speed when lifted.

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