

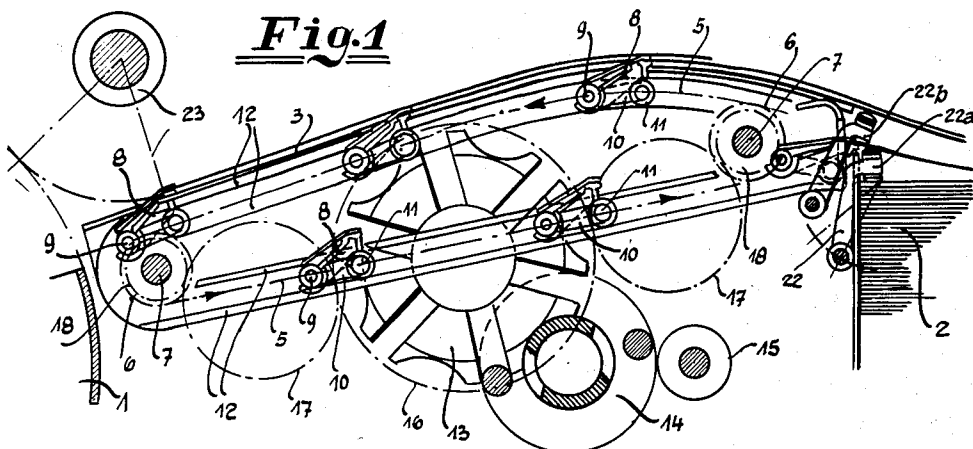
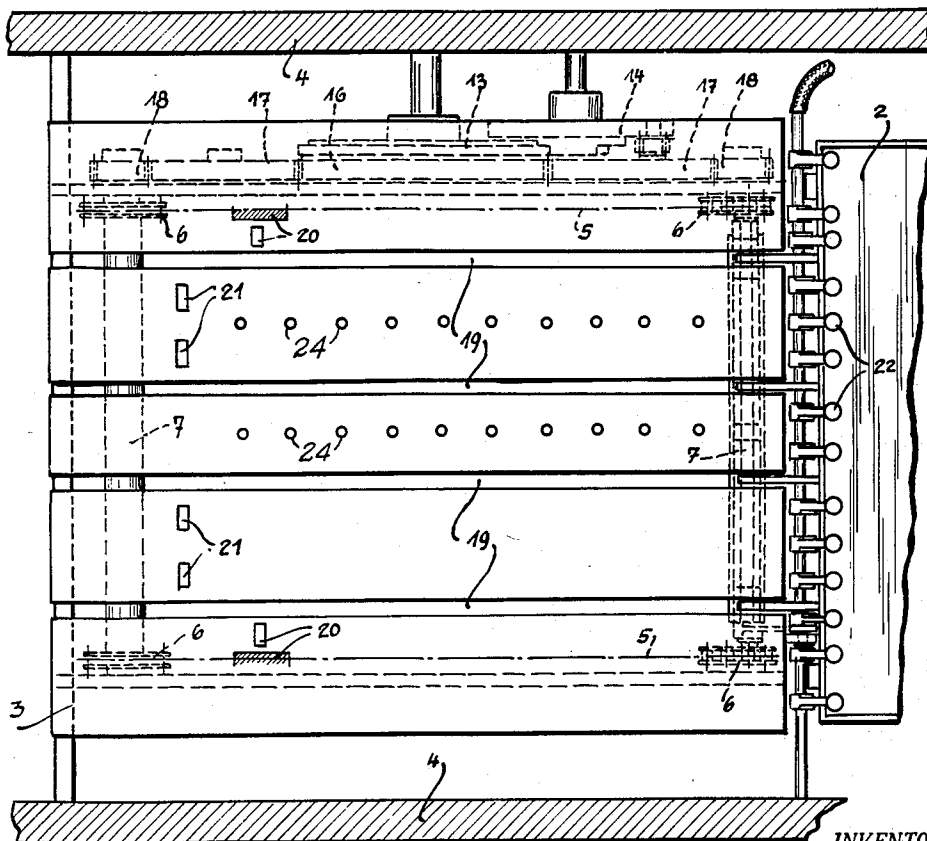
Aug. 19, 1958

A. BUTTNER ET AL.
SHEET-SUPPLYING DEVICE FOR PRINTING AND
PAPER-WORKING MACHINES

2,848,226

Filed Oct. 14, 1953

3 Sheets-Sheet 1



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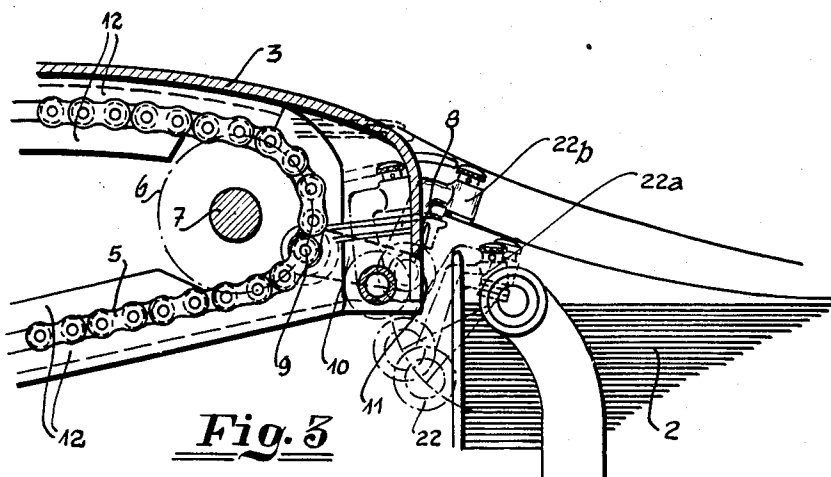
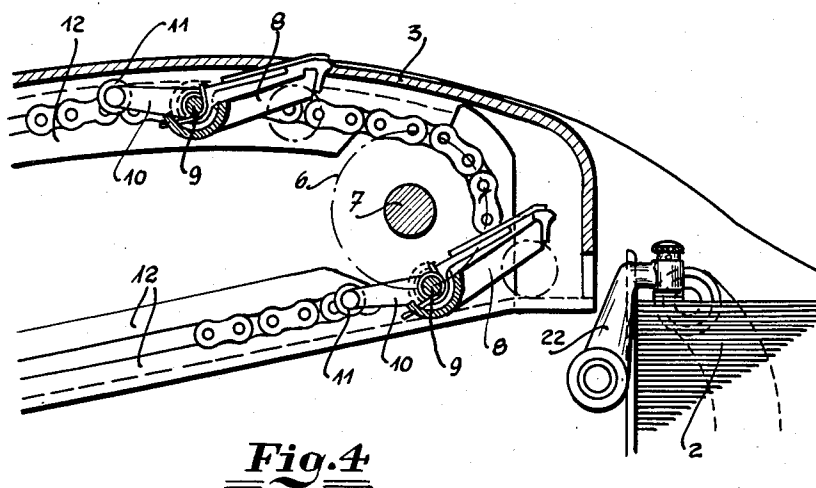
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3 Sheets-Sheet 3

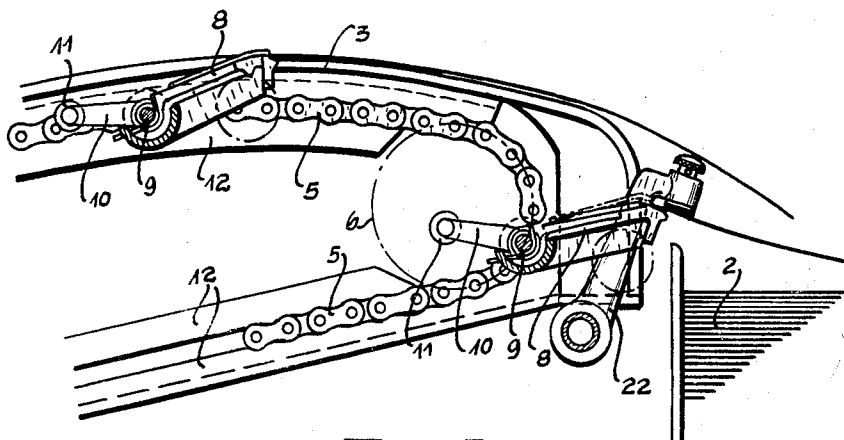


Fig. 5

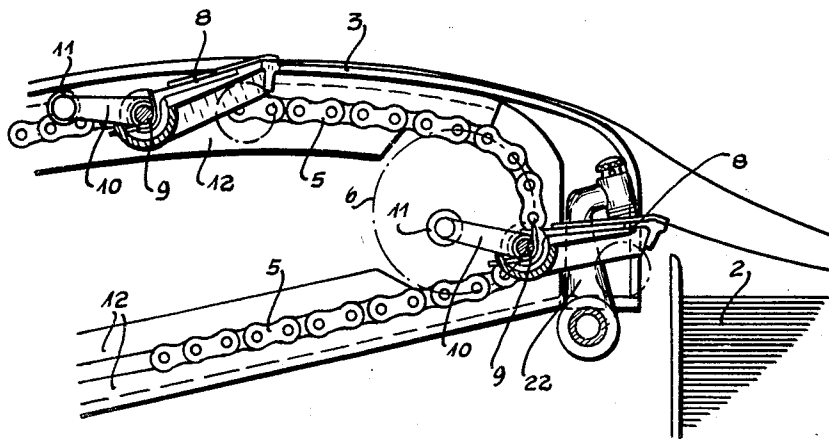


Fig. 6

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SHEET-SUPPLYING DEVICE FOR PRINTING AND
PAPER-WORKING MACHINES

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10 Claims. (Cl. 271—12)

The present invention relates generally to printing machines and more specifically to automatic feed or supply devices for paper sheets to be moved in a continuous course or path and partly in overlapping relation along a feed table. Supply of sheets in scale or squamiform fashion along a feed table offers the advantage, as compared with single paper sheet supply systems, that, caused by the relative reduced distance between successive paper sheets high working speeds for cylinder printing machines are feasible.

All heretofore known sheet supply systems carry out the transportation of the paper sheets along a feed table by means of transporting bands or rolls which run slowly and continuously below the path described by the paper sheets while above said path transporting rolls rotate which insure feed or advance of the paper sheets. A part of such latter transporting rolls are adjustable commensurate with the length of the sheets so that the transportation of the foremost or most advanced paper sheet will be immediately stopped as soon as such sheet arrives at corresponding forward markings or abutments.

During operations in the course of which the sheets are imprinted during several operational steps, the transporting bands, as well as the rolls, run over, and thus come in contact with, printed portions of these paper sheets. If the printing inks are insufficiently dried, smearing of the sheets may easily be had.

In order to overcome this disadvantage it was proposed to feed the sheets along a feed table without any transporting bands. In such case, however, the sheets are not disposed in scale-shaped or overlapping formation, but are rather singly or individually moved over the feed table. These bandless single-sheet transportation systems employ gripping devices which are supported by and are fixed to chains, to thereby remove the sheet from its suction means and transport the sheet directly toward the forward marking. These sheet feed devices are, however, not suitable when extremely high working speeds are desired, since the path is too long on which the sheet must be moved during each printing step.

The present invention overcomes these and other disadvantages and inconveniences and is directed to rotative means which either continuously or periodically run unidirectionally and lengthwise of the feed table in an endless path or course between a supply stack of paper sheets and the abutments or markings, said means being in the form of gripping devices or gripping systems, with said gripping devices successively arranged at a distance which is relatively shorter than the largest length of the respective paper sheet to be transported and serve to advance said paper sheets in partly overlapping position toward the abutment markings.

Suitably the moving gripping units are guided to the respective uppermost sheet of the paper stack which has been lifted from the latter by suction and other means, so that these grippers receive the raised paper sheets at their foremost edges, successively, to thereby bring

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about a scale-shaped formation therefor which these sheets maintain along a predetermined course or path.

It is well understood that for obtaining this scale-shaped sheet formation other devices may be used, which are independent of the continuously running gripping systems, so that the continuously running gripping systems serve only the purpose of transporting the sheets in the aforesaid formation in the direction of the abutment markings and along the feed table.

In this latter case, the motion of the gripping units is suitably caused by means of endless chains to which the grippers are attached, whereby the guidance of said gripping systems is so arranged that each time a gripping unit approaches the station for taking over or for receiving a sheet from a stack of sheets, another gripping unit is positioned at the station at which a respective sheet is released at the forward marking position. Between these aforesaid gripper units further gripping units or systems are disposed on the chains, the number and spacing of said further gripper units depending solely on the degree of overlap chosen for the respective single sheets.

The periodic or timed movement of the gripping units may be effectuated by means of a Maltese-cross-drive which transmits its rotative motion to the shafts for the wheels or sprockets of the chains, whereby the step-wise movement derived from the Maltese-cross-drive always corresponds to the distance of the gripping systems from one another. The mouth openings of the respective gripping means or grippers of the gripping units are always directed during return motion, as well as during the entire run, toward the supply stack of the sheets.

In view of the arrangement and formation of the sheet transportation, all the advantages heretofore known in regard to the formation in echelons of the single sheets are completely maintained, in particular, the speed for moving toward the forward markings and the deficiencies of the heretofore known devices are thus overcome. The printed paper sheets with their respective printed surfaces remain out of contact with the transporting equipment so that smearing of fresh imprints on the sheets will be safely prevented.

In furtherance to the development of the inventive idea, the supply table is somewhat curved or arcuate in the direction of feed. Thus, suitable and desirable good transfer movement of the sheets from the stack thereof along the feed table is achieved, which also prevents smearing of fresh imprints when the sheets are fed along the feed table. Besides this, the advancing sheets will possess a greater degree of stiffness which is particularly important with respect to relatively thin papers to be handled.

The drive for the gripping systems occurs preferably periodically or intermittently so that the gripping means or gripping units are advanced step-by-step and will come to a standstill between the individual steps of advance.

During times of rest or stoppage of the gripping means, which run along a course for the sheets, the adjustment of the respective most forward and advanced sheet with respect to the forward or abutment markings takes place, as the gripping means are open. Thus, a particularly exact and accurate adjustment of the paper sheets in regard to the abutment markings will be obtained.

It is preferred to provide a plurality of blowing nozzles in the supply or feed table which are connected to a compressed air supply conduit, whereby air cushions will be produced between the upper surface of the feed table and the paper sheets which are transported in scale-shaped formation. This will give further assurance against possible smearing of freshly printed paper sheets when they move along the feed table.

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Consequently, it is an object of the present invention to provide means facilitating the disposition and transportation of the paper sheets from a stack of papers to the printing machine in a very efficient and speedy manner.

It is still another object of the present invention to provide means insuring the maintenance of the paper sheets in predetermined formation to each other while describing a predetermined path over a suitably shaped support or feed table whereby the sheets will not become disengaged from and need no adjustment with respect to each other.

Still another object of the present invention is to provide means conducive to a smooth and simplified operation which may be performed at extremely high speed, whereby the fed paper sheets to be applied to the impression cylinder are positively guided and moved along a predetermined path.

A further object of the invention is the provision of means for locating the most forwardly advanced paper sheet preparatory to its reception by the impression cylinder.

The above and other objects and features will become apparent from the following detailed description, reference being had to the accompanying drawings.

In the drawings, wherein a preferred embodiment of the invention is illustrated:

Fig. 1 shows schematically a side elevation of the transporting systems and feed table;

Fig. 2 is a top plan view of Fig. 1;

Fig. 3 is a fragmentary side elevational view of one end of Fig. 1 drawn to enlarged scale and seen partly in section; and

Figs. 4-6 are views similar to that of Fig. 3 but illustrated in different positions.

Referring now more particularly to the attached drawings, there is disclosed an impression cylinder 1 between which and a supply stack of paper sheets 2 there is disposed a sheet transporting or feed device 3, the latter being curved in the direction of travel of the sheets and supported by a frame 4. Below the feed device or table 3 there extend endless chains 5 spaced from each other in accordance with the width of the feed device or table 3. These chains 5 run over sprockets 6, which are fixed in pairs on common axles 7, the latter being rotatably journaled below the underface of the feed table.

To the chains 5, which run in the direction of the arrows, as indicated in Fig. 1, there are attached at equidistantly spaced locations gripping units 8, the distance between adjacent units being smaller than the largest length of sheet to be fed; for example, one-quarter of the paper sheet length or less. The chain links, which are suitably shaped, support said gripping units and are simultaneously connected with rotary axles 9 of the gripping units or systems. On each axle 9 several grippers are joined to form a gripping system.

The rotary movement of the grippers or gripping units 8, by means of the chains 5, takes place in such manner that the grippers always assume automatically an approximate parallel position with respect to each other, which entails that the gripping or mouth openings in each position of travel or run are directed toward the supply stack 2 of the paper sheets. This position of the grippers, which will always be maintained, is achieved by steering or guide means 10 which are operatively connected to the rotary axles 9. These steering or guide means are guided by means of rollers 11 along guide ways or tracks 12. At the stations at which reversal of movement takes place, the guide tracks are interrupted, whereby the guide means 10 of the grippers 8 glide at the forward station during reversal of movement in front of the impression cylinder 1, due to their own weight, along a lower guide way or track, while at the opposite station of reversal of movement, namely in front of stack 2, lifting means (not shown) are provided which, in a well known manner, are actuated and controlled so that the gripping means dur-

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ing movement in upward direction are raised and the aforesaid guides 10 and rollers 11 thereof are brought into contact with the upper guide track. For the motion during reversal in downward direction controlled sinker or lowering means may be also proposed.

The drive of the chains and of the gripping systems linked thereto may be had by a Maltese-cross-drive 13, 14, the stepping wheel 14 thereof being driven by a gear or wheel 15. Co-axially to the Maltese-cross 13 and intermittently moved by the same is a gear 16, whose unidirectional movement, via intermediary gears 17 and gears 18 fixed to the axles 7 of the sprockets, is imparted to the chains 5 together with the gripping units thereof in step-by-step fashion.

The upper guides 12 are conformed to the curvature of the feed table so that the grippers are guided in parallel relation to and along said feed table.

The feed table is provided over its whole length with slots 19 through which extend four grippers 8 of each gripping unit, which grippers are seated on a common axle.

At opposite ends of the feed table 3, there are provided the movable and adjustable lateral markings 20 for laterally adjusting the paper sheets. The forward feed markings are designated by numeral 21.

In front of the stack of sheets 2 there is disposed a suction rod 22 which serves to lift the respective uppermost sheet, whereby said suction rod is constructed to be raised and tilted.

Fig. 1 shows the suction rod in its lower position 22a in which the suction cups are in contact with the forward edge of the uppermost sheet, while in its upper position 22b the transfer of a sheet to the gripping systems is effectuated.

The operation of the device is as follows:

Subsequent to application of suction onto the forward edge of the uppermost sheet of the stack of sheets 2 by means of the suction cups of the suction rod 22, the latter will be lifted while being simultaneously swung or tilted from position 22a to position 22b. In this latter position the grippers 8 are synchronously moved with the suction rod movement in open position caused by the transporting chains and are guided toward the sheet which was held and lifted at its front edge. Thereafter, upon closing of the grippers the sheets are grasped at the front edges thereof and are pulled along the ensuing continuation of travel, by the grippers which extend through the slots 19 of the feed table 3 (Fig. 2), so that these grasped sheets are moved along the upper side or surface of the feed table. This operation is repeated during each passage of each one of the gripping systems past the supply stack of sheets to which is coordinated a corresponding tilting and lifting action of the suction rod. In view of the short distance of the grippers from each other relative to the length of each sheet, a more or less large overlap of the sheets during displacement thereof takes place in a well known manner whereby the sheets disposed to each other in scale-shaped formation on the feed table are grasped at their forward edges by a corresponding number of gripping units and are pulled along the surface of the feed table toward the forward marking abutments 21.

As soon as the most forward sheet abuts against markings 21, the respective gripping units are opened and release the respective foremost sheet, while simultaneously a standstill of the grippers or gripping units occurs in view of the step-wise drive of the chain by means of the Maltese-cross-drive. Thus, the movement of the sheets and their transporting means is momentarily stopped. In such position of rest of the sheets, and in particular of the foremost sheet, the latter will then be adjusted in a well known manner in forward direction while it abuts against the movable abutment markings 21 and in lateral direction while in contact with markings

20. Through schematically shown pre-gripping devices

23, the sheets are subsequently transferred to the printing cylinder 1. Thereafter a further step-wise movement of the gripping chains takes place, during which, on the one hand, a fresh or new sheet is taken off the stack of sheets 2 and is pulled toward the feed table while, on the other hand, the sheet now positioned foremost is advanced and placed against the aforesaid abutment markings.

Through blowing of air underneath the course of travel of the sheets by means of small openings or nozzles 24 (Fig. 2) provided in the feed table 3, there may be readily produced an air cushion below the sheets, whereby a possible smearing of freshly imprinted sheets otherwise caused by contact with table surface, may be effectively prevented.

Although a specific embodiment of the invention has been described and shown in the drawings, it should be noted that the invention may be realized in modified form and adaptations of the arrangements herein disclosed may be made, as may readily occur to persons skilled in the art without constituting a departure from the spirit and scope of the invention as defined in the objects and in the appended claims.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent, is:

1. A device for feeding from a supply stack paper sheets along a predetermined path with said sheets in overlap formation to each other toward abutment markings adjacent a cylinder printing press and like paper working machine; comprising a plurality of paper sheet gripping units comprising grippers arranged at a predetermined distance from each other, a support for sheets when fed from said stack to said markings, said support being located between said stack and said press, endless transporting means located beneath said support and disposed to extend between said stack of paper sheets and said abutment markings, drive means for intermittently and unidirectionally moving said transporting means along said support, and means connecting said transporting means with said gripping units, whose distance from each other is smaller than the length of each paper sheet to be fed, said gripping units being respectively engageable with said sheets from said stack and extending through said support when said grippers are moved past said stack by said transporting means in a manner disposing said sheets in overlap formation on said support, and so that when one of said gripping units is positioned at said abutment markings, another gripping unit receives a sheet from said supply stack.

2. A device according to claim 1, said drive means comprising Maltese-cross-drive means for intermittently moving said grippers relative to said stack of paper sheets.

3. A device according to claim 1, including means guiding said gripping units toward said stack, and suction means operatively synchronized with said gripping units for removing the uppermost paper sheet from said stack upon arrival of each one of said grippers at said stack.

4. In a device for supplying paper sheets in the direction of and along a feed table toward abutment markings thereon which are placed adjacent an impression cylinder of a printing and like paper working machine; a plurality of paper sheet grippers, endless chain means located beneath said table and disposed to extend between a stack of paper sheets and said abutment markings, a step mechanism for intermittently and unidirectionally moving said chain means relative to and along said table, and means connecting said chain means with said grippers, the distance of said grippers from each other being shorter than the length of the respective paper sheet to be fed, said grippers being respectively engageable with said sheets from said stack when moved past the latter by said chain

means, said table being provided with elongated slots through which said grippers extend from said chain means and in which said grippers move.

5. In a device according to claim 4, said step mechanism including Maltese-cross-drive means for intermittently moving said grippers relative to said stack of paper sheets and to said abutment markings.

6. In a device according to claim 5, including suction means operatively synchronized with movement of said grippers for removing always the uppermost paper sheet from said stack upon arrival of a gripper at said stack, to thereby place said paper sheets along said table in overlap formation.

7. In a device according to claim 4, including nozzle means supported by said table and adapted to project a fluid against said paper sheets to space same from the surface of said table.

8. In a device for arranging paper sheets in predetermined fashion to each other and for moving same lengthwise of a feed table toward abutment markings, thereon, which latter are placed adjacent an impression cylinder of a printing and like paper working machine; a plurality of paper sheet grippers, endless chain means disposed to extend between a supply stack of said paper sheets and said abutment markings, a mechanism for intermittently moving said chain means unidirectionally and lengthwise of said table, means connecting said chain means with said grippers, the distance of said grippers from each other being shorter than the length of the respective paper sheets, said grippers being respectively engageable with sheets from said stack and extending above and through said table when said grippers are moved past said stack by said chain means, said table being provided with an arcuate surface extending from said stack toward said impression cylinder, and means operatively connected to said chain means for guiding said grippers in substantially parallel relation to each other.

9. In a device according to claim 8, said mechanism including Maltese-cross-drive means, and means engaging said chain means and in driving relation with said Maltese-cross-drive means for moving said grippers relative to said stack of paper sheets and to said abutment markings.

10. In a printing and like paper working machine including an impression cylinder, a feed table provided with abutment markings adjacent said cylinder; a device for supplying from a stack paper sheets in overlap formation in the direction of and along said feed table toward the abutment markings, gripping means for gripping said paper sheets, conveyor means beneath said table and connected to said gripping means through a slot provided in the surface of said table for conveying said sheets in said overlap formation on said table surface toward the abutment markings, and means for spacing the sheets from the surface of said table while these are being conveyed, said means comprising a plurality of nozzles in said table adapted to project a fluid from below said table against said paper sheets.

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