Nov. 11, 1969 F. HILPERT 3,477,626

PAPER FEED DEVICE

Filed Oct. 30, 1967 3 Sheets-Sheet 1

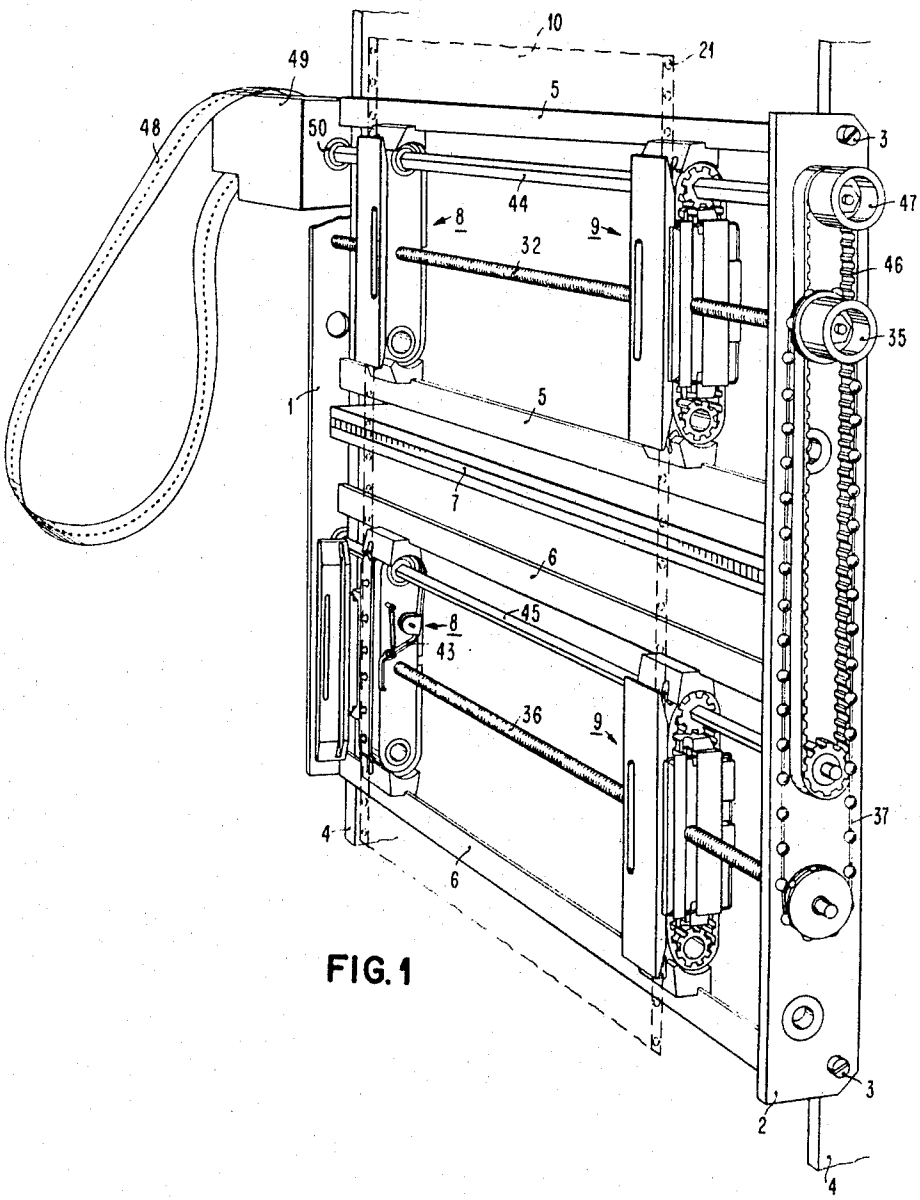


FIG. 1

INVENTOR

FRITZ HILPERT

BY Charles A. Mann

AGENT

Nov. 11, 1969 F. HILPERT 3,477,626

PAPER FEED DEVICE

Filed Oct. 30, 1967 3 Sheets-Sheet 2

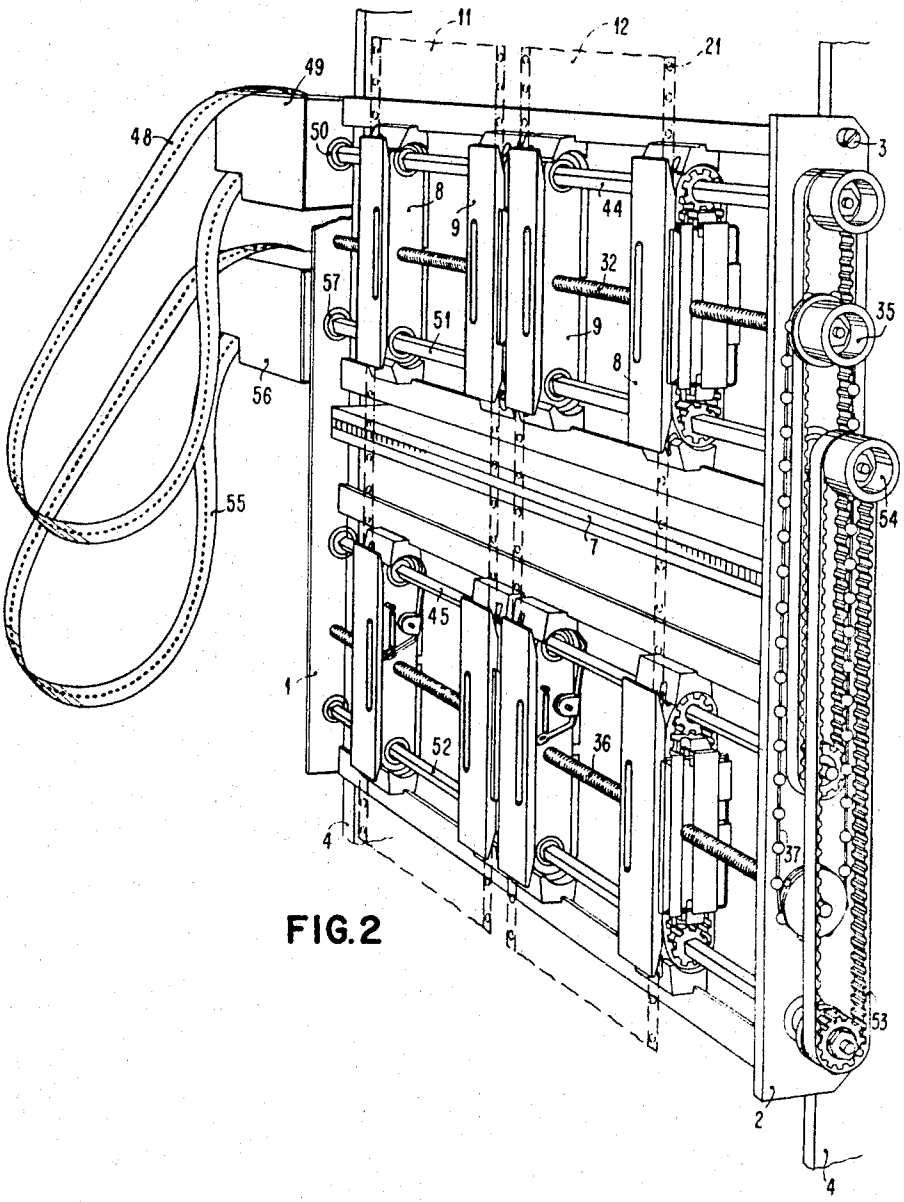


FIG.2

Nov. 11, 1969 F. HILPERT 3,477,626

PAPER FEED DEVICE

Filed Oct. 30, 1967 3 Sheets-Sheet 3

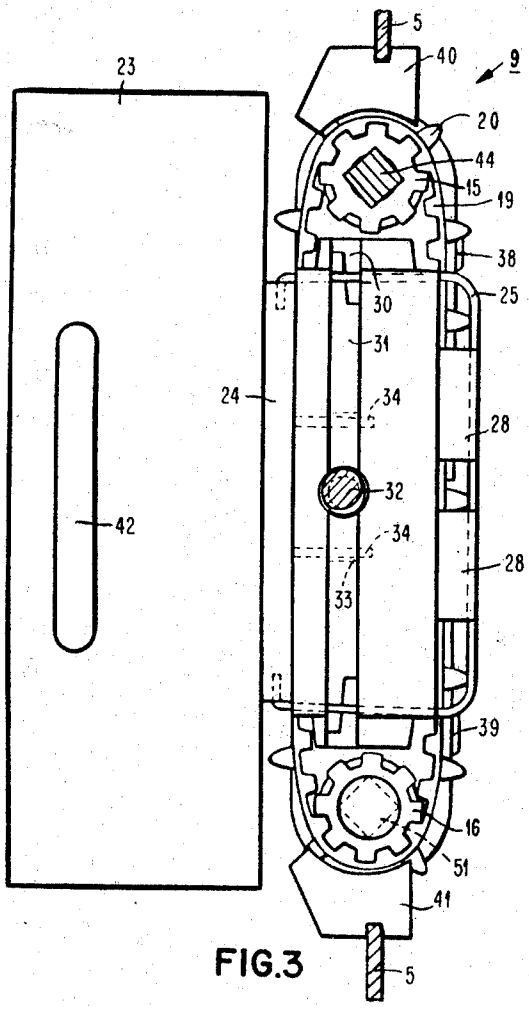


FIG.3

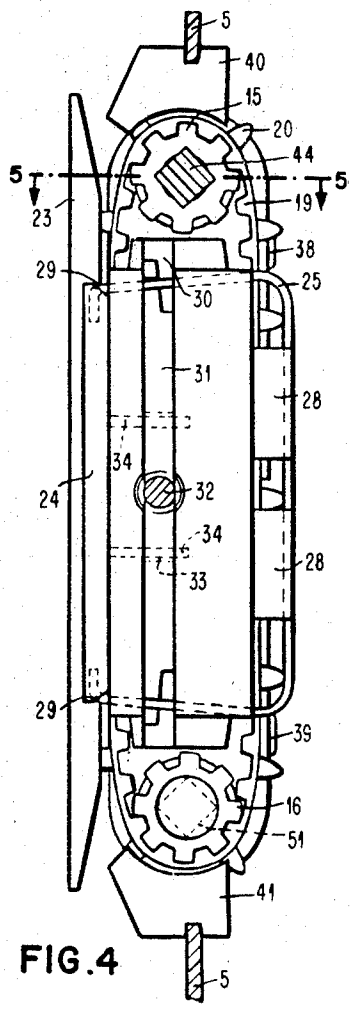
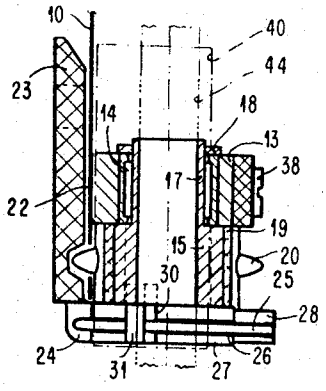


FIG.4

FIG.5



United States Patent Office 3,477,626 Patented Nov. 11, 1969

3,477,626

PAPER FEED DEVICE

Fritz Hilpert, Boblingen, Germany, assignor to International Business Machines Corporation, Armonk, N.Y., a corporation of New York

Filed Oct. 30, 1967, Ser. No. 678,880
Claims priority, application Germany, Dec. 24, 1966, J 32,630
Int. Cl. B65h 17/40
U.S. Cl. 226—9 7 Claims

ABSTRACT OF THE DISCLOSURE

A device for simultaneously advancing two paper webs, particularly in a record carrier controlled printer, by means of tractors driven by a square shaft, which are arranged on either side of the paper web and which comprise a continuous timing belt disposed over two sprocket wheels and provided with attachments fitting the transfer holes of the paper web.

BACKGROUND OF THE INVENTION

Field of the invention

This invention relates to a device for simultaneously advancing two paper webs by means of tractors driven by a square shaft, which are arranged on either side of the paper web and which comprise a continuous timing belt disposed over two sprocket wheels and provided with attachments fitting the transfer holes of the paper web.

Description of the prior art

Paper feed devices comprising tractors are known. Such devices are often included in high-speed printers used as output units of data processing systems. On account of the high printing speeds of these printers, their paper feed devices have to meet exacting demands with regard to mechanical precision, form transfer speeds and mechanical loads. Devices using tractors have proven particularly suitable when employed under such conditions. The tractors consist in the main of a relatively short continuous timing belt disposed over two sprocket wheels. The timing belt has attachments engaging the transfer holes of the paper web. The tractors are arranged on either side of the paper web at suitable points in the feed path of the machine and are driven synchronously.

A further advantage of tractors is that they render the feed device suitable for a number of different form sizes since the tractors are normally driven by a square shaft and can be moved along their driving shaft and be adapted to the form width to be handled. This arrangement has the disadvantage that the full line length of some 132 printing positions is not utilized, since the line length of standard forms is considerably shorter, resulting in the printing capacity of the machine being only partly used.

The invention eliminates this disadvantage by means of an arrangement allowing the simultaneous and independent transfer of two paper webs without the cost of the feed device being increased unduly.

SUMMARY OF THE INVENTION

In accordance with the invention this is obtained with the help of symmetrical tractors each comprising a sprocket wheel with a circular axial bore and a sprocket wheel with a square axial bore and in that the sprocket

wheels of the tractors are arranged, with regard to the two paper webs, in opposite directions on two parallel square shafts which are coupled by means of an independent drive.

An embodiment of the device in accordance with the invention is so designed that the individual tractors are provided with paper guide plates which are pivotable and which in closed condition act as spring-loaded flaps. The paper guide flaps are hinged to the free ends of a bow spring which, when opening the flap, is tensioned by moving against an inclined face. Another advantage of the invention is that the bow springs supporting the paper guide flaps are provided with movable jaws engaging a threaded spindle arranged between the square shafts and disengaging the spindle when the flap opens tensioning the bow spring. The paper guide flaps are also provided with openings accommodating the paper contact levers.

For each paper web a synchronously driven pair of tractors is arranged in front of and behind the printing line as viewed from the direction of feed. The drive of the square shafts for each paper web is controlled by a punch tape.

The foregoing and other objects, features and advantages of the invention will be apparent from the following more particular description of a preferred embodiment of the invention, as illustrated in the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a diagram of the paper feed device in accordance with the invention showing the tractors for only one paper web, with opened paper guide flap;

FIG. 2 is a diagram of the paper feed device in accordance with the invention for two independently advanced paper webs;

FIG. 3 is a side view of a tractor with opened paper guide flap, comprising a belt rotating around two sprocket wheels;

FIG. 4 is a side view of a tractor in accordance with FIG. 3, however, with closed paper guide flap; and

FIG. 5 is a plan view (partly sectional view) of the tractor in accordance with FIG. 4, with top part removed.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The feed device for paper webs as shown in FIGS. 1 and 2 is designed as an independent unit and is attached with its side plates **1** and **2** to the printer frame **4** by means of the screws **3**. The plates **1** and **2** are connected to each other by means of the rail pairs **5** and **6**, the rail pair **5** being arranged above the printing line and the rail pair **6** below the printing line. The printing hammers **7** are arranged in the printing line in a row formed by the various printing positions of the line. The rail pairs **5** and **6** are aligned parallel to the printing hammers.

Tractors **8** and **9** advancing the paper by means of revolving continuous belts are movable between the rail pairs **5** and **6**. Tractors **8** and **9** arranged to the left and the right of the paper web **10** (FIG. 1) and/or the paper webs **11** and **12** (FIG. 2) and in front of and behind the printing line are symmetrical so that in the following design of only one tractor is described.

The tractor **9** guided between the rails **5** is described. The oblong tractor body **13** has two bores accommodating the sprocket wheels **15** and **16** by means of the pin bearings **14**. The bearing shafts **17** of the sprocket wheels

are held in place by the spring washers **18**. The continuous belt **19** of flexible material is disposed over the sprocket wheels **15** and **16** and has teeth on its inside engaging the teeth of the sprocket wheels. The conical attachments **20** engaging the transfer holes **21** of the paper webs **10** and/or **11** and **12** protrude from the outside of the belt **19**. The front face **22** of the tractor body **13** forms the paper support face. The paper web is forced against this face by the pivotable paper guide flap **23** supporting itself on the end of the bow spring **25** extending from above and below into its hinge base **24**. The pretensioned bow spring **25** is guided in the groove **26** of the tractor body base **27** and on the back side in two tensioning pieces **28** which are movable, thus allowing the spring tension to be changed. The hinge base **24** supporting the paper guide flap **23** is provided at its ends with the inclined faces **29**, against which the bow spring **15** rests tangentially. As the paper guide flap opens, the rising inclined face so moves against the bottom part of the bow spring **25** that the latter is expanded and the spring tension increased. Therefore, the closed paper guide flap is subject to a certain spring tension which can be varied by moving the tensioning pieces **28**. With the paper guide flap **23** being open, the expanded bow spring **25** rests against the top edge of the inclined face **29** so that the opened flap **23** in a certain angular range assumes a stable position.

Expansion of the bow spring **25** also serves another purpose. In a vertical groove **30** of the tractor base **27**, the movable jaws **31** are arranged by means of which the tractor is connected to the threaded spindle **32** which extends over the full width of the paper feed device and is guided on the side plates **1** and **2**. At their lower ends, the jaws **31** are guided by means of pins **34** engaging the oblong holes **33**. Their upper ends are provided with a horizontal groove accommodating the crosspiece of the bow spring **25**. As the paper guide flap opens, the crosspieces of the bow spring and the jaws **31** are raised so that their lower threaded ends disengage the threaded spindle **32**. When the paper guide flaps **23** are open, the tractors can be moved at random, whereas with the flaps in closed condition, they are firmly connected to the pitches of the threaded spindle **32**. In the latter case, for alignment of the paper webs to the printing positions, the tractors are accurately adjusted by means of the handwheel **35** fixed to the threaded spindle. Another threaded spindle **36** similar to the threaded spindle **32** is arranged below the printing line for guiding the tractors located below the printing line. The bottom spindle **36** and the top spindle **32** are synchronously driven by means of the bead-type drive **37**.

The tractors **8** and **9** are guided on the rail pairs **5** and **6** by means of the guides **40, 41** which are connected to the tractor bodies **13** by the screws **38, 39**. The guides **40, 41** also serve to protect the sprocket drives of the tractors. The paper guide flaps **23** are provided with the recesses **42** accommodating the paper contact levers **43**. If a paper web is stopped for any reason, at least one of the contact levers **43** penetrates the recess **42** opening a contact (not shown) by means of which the drive is stopped.

As mentioned previously, the tractors **8** and **9** are of symmetrical design with regard to the paper webs **10** and/or **11** and **12** advanced by them. The two tractor types differ in that their paper guide flaps **23** are opened to the left or the right and that their paper support face is on the left or the right of the conveyor belt. For both tractor types the axial bores of the upper sprocket wheels **15** are square, whereas the axial bores of the lower sprocket wheels **16** are circular. The drive shaft **44** which is supported on the side plates **1** and **2** extends through the square bores of the sprocket wheels of the tractors arranged above the printing hammers. The tractors below the printing line are driven by means of the shaft **45** extending through their square bores and supported on the plates **1** and **2**. The two drive shafts **44** and **45** are linked with each other by means of the timing belt drive **46**. Their initial position can be adjusted by turning the handwheel **47**. The shaft **44** is driven by means of the punch tape **48** controlled step motor **49** to which the former is connected by the connector coupling **50**.

The device as described is suitable for independently advancing two paper webs without the cost of the paper feed device being noticeably increased. With the help of this device the capacity of the high-speed printer can be utilized more fully, since in a number of cases small forms are to be printed, the line length of which is shorter than the one available.

In cases such as these, the circular axial bore of the upper sprocket wheels **16** of the tractors **8** and **9** above the printing line for advancing the paper web **11** is provided with another drive shaft **51**. On the drive shafts **44** and **51** another tractor pair is arranged in reverse order and direction so that the shafts **44** and **51** are accommodated by the sprocket wheels **16** with circular bore and the sprocket wheels **15** with square bore respectively. The shaft **51** thus serves to drive the paper web **12** advanced by the additional tractor pair. Another drive shaft **52** extends through the circular bores of the lower sprocket wheels of the tractors below the printing line for advancing the paper web **11**. As above the printing line, two further tractors are arranged in reverse order and direction on the shafts **45** and **52**. The shafts **51** and **52** are linked with each other by means of the timing belt **53**. Adjustment to the initial position required is effected by means of the handwheel **54** on the shaft **51**. The shafts **51** and **52** are driven by the punch tape **55** controlled step motor **56**, to which the shaft **51** is connected by the connector coupling **57**. The two paper webs **11** and **12** can thus be advanced independently of each other in a device requiring the same space as a feed device for one paper web and using only two types of tractors which are symmetrically the same.

While the invention has been particularly shown and described with reference to a preferred embodiment thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein.

I claim:

1. A paper feed device for simultaneously advancing two paper webs, particularly in a record carrier controlled printer, by means of tractors driven by a square shaft, which are arranged on either side of each of the two paper webs and which comprise a continuous timing belt disposed over two sprocket wheels and provided with attachments fitting the transfer holes in each of the two paper webs, characterized in that the symmetrical tractors (**8, 9**) each comprise a sprocket wheel (**16**) with a circular axial bore and a sprocket wheel with a square axial bore and in that the sprocket wheels (**16**) of the tractors are arranged, with regard to the two paper webs, in opposite directions on two parallel square shafts (**44, 51** and/or **45, 52**) which are coupled by means of an independent drive.

2. A paper feed device in accordance with claim **1**, characterized in that the individual tractors are provided with paper guide plates which are pivotable and which in closed condition act as spring-loaded flaps (**23**).

3. A paper feed device in accordance with claim **2**, characterized in that the paper guide flaps (**23**) are hinged to the free ends of a bow spring (**25**) which, when opening the flap, is tensioned by moving against an inclined face (**29**).

4. A paper feed device in accordance with claim **3**, characterized in that the bow springs (**25**) supporting the paper guide flaps are provided with movable jaws (**31**) engaging a threaded spindle (**32**) arranged between the square shafts and disengaging the spindle when the flap opens tensioning the bow spring.

5. A paper feed device in accordance with claim **4**, characterized in that the paper guide flaps are provided

with openings (42) accommodating the paper contact levers (43).

6. A paper feed device in accordance with claim 5, characterized in that for each paper web a synchronously driven pair of tractors is arranged in front of and behind the printing line as viewed from the direction of feed.

7. A paper feed device in accordance with claim 6, characterized in that the drive of the square shafts (44, 51) for each paper web is controlled by a punch tape (48, 55).

References Cited

UNITED STATES PATENTS

3,006,520 10/1961 House ..... 226—75

ALLEN N. KNOWLES, Primary Examiner

U.S. Cl. X.R.

226—74, 89, 109