United States Patent

Schone et al.

[15] **3,647,205**

[45] **Mar. 7, 1972**

[54] METHOD AND APPARATUS FOR FEEDING OF SHEETS FITTINGLY ALIGNED TO A MACHINE

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[21] Appl. No.: **37,602**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 731,805, May 24, 1968, abandoned.

[52] **U.S. Cl.** **271/57,** 271/53

[51] **Int. Cl.** **B65h 43/08**

[58] **Field of Search** 271/53, 58, 60, 48, 57

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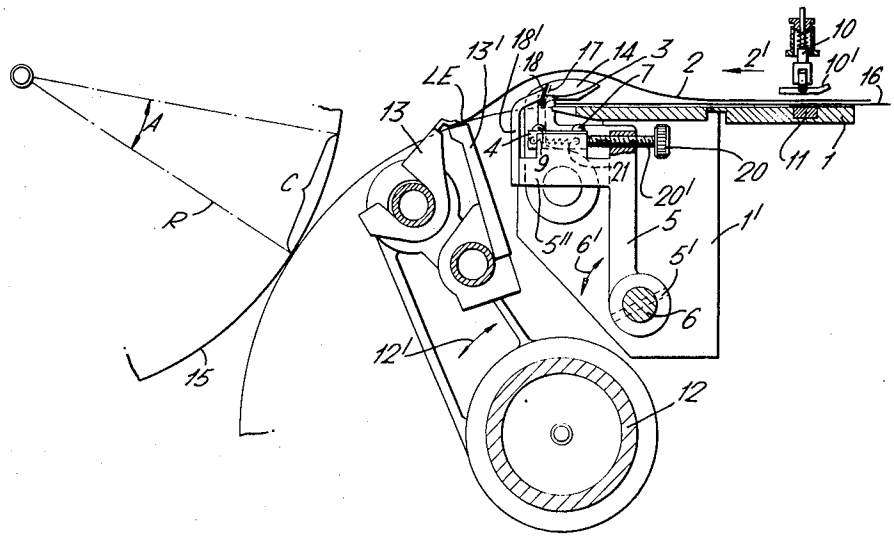
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[57] **ABSTRACT**

According to the method for feeding sheets fittingly aligned to a machine as taught by the invention, the sheet advancing, aligning, and controlling, as well as the moving of a control member is performed for a following sheet while the preceding sheet is still with its trailing edge upstream of a reference or control line thus overlapping the following sheet whereby the control member prevents erroneous indications for a following sheet by the preceding sheet. The present apparatus comprises journaled lever means which move said control member into and out of the path of a light beam to prevent a light reflection by a preceding sheet when a following sheet is out of alignment or absent.

3 Claims, 5 Drawing Figures



PATENTED MAR 7 1972

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SHEET 1 OF 3

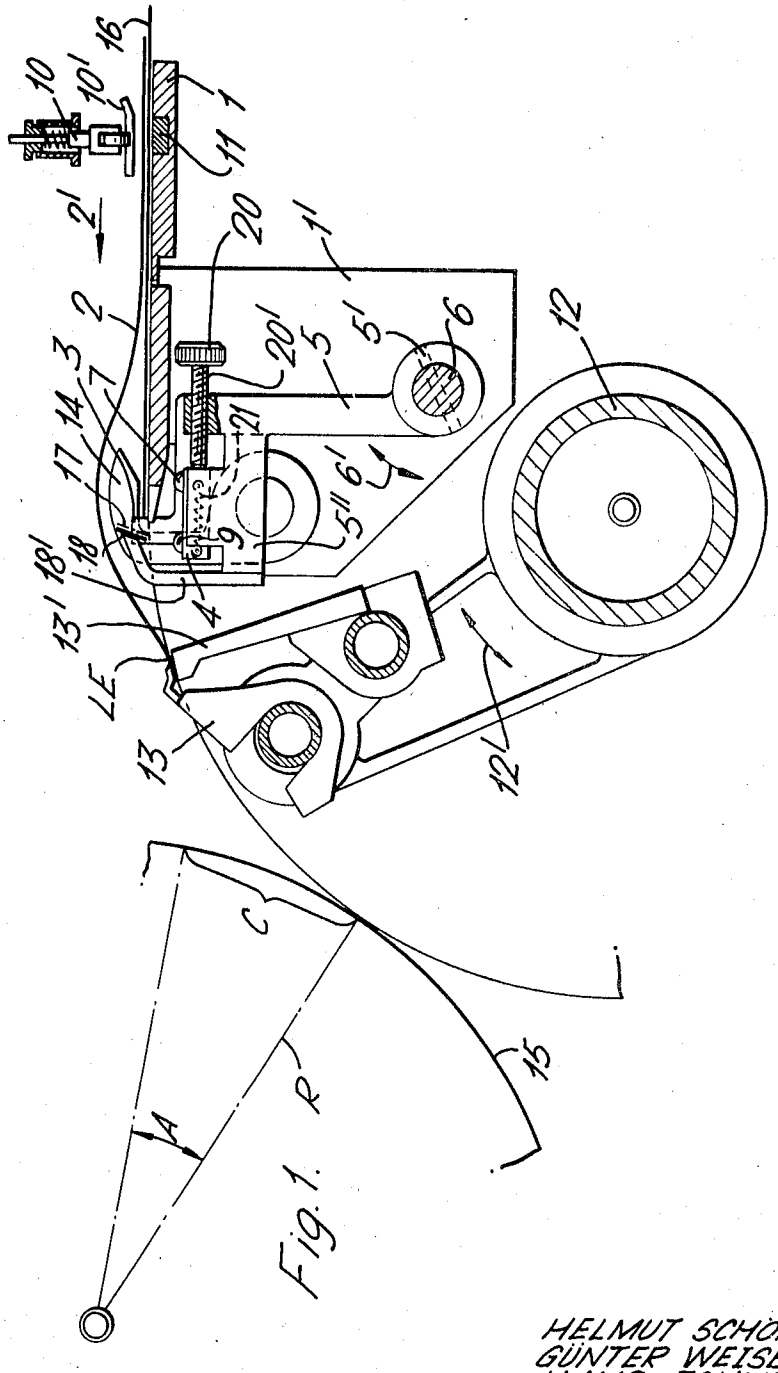


Fig. 1.

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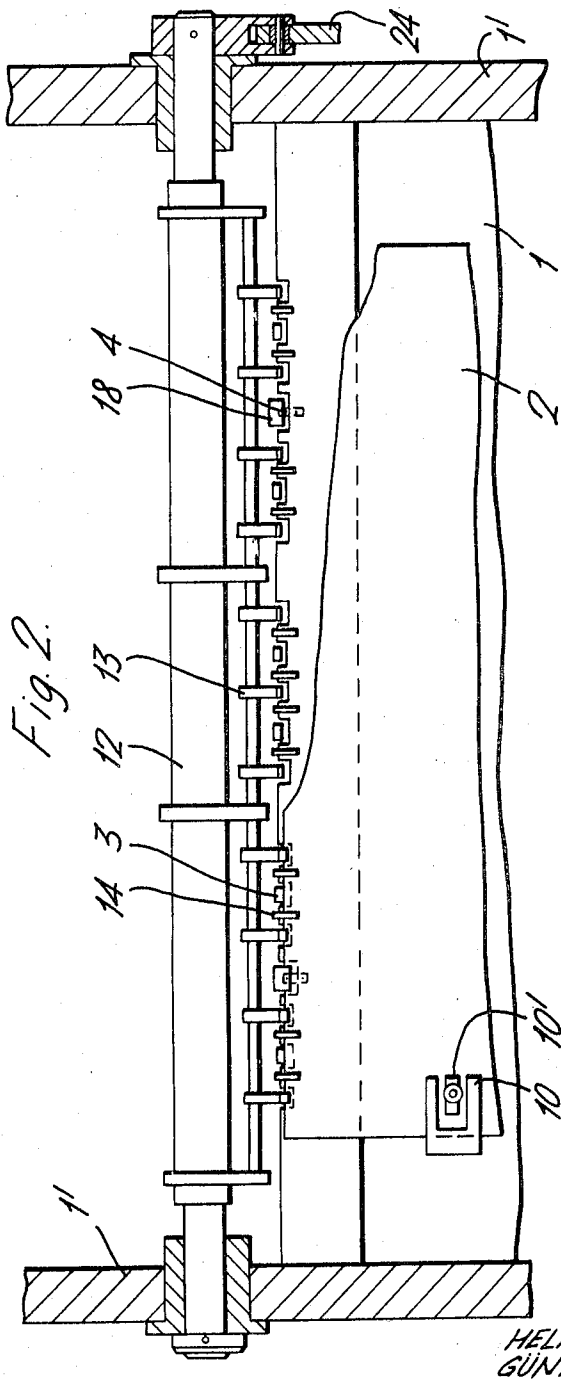


Fig. 2.

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Fig. 3.

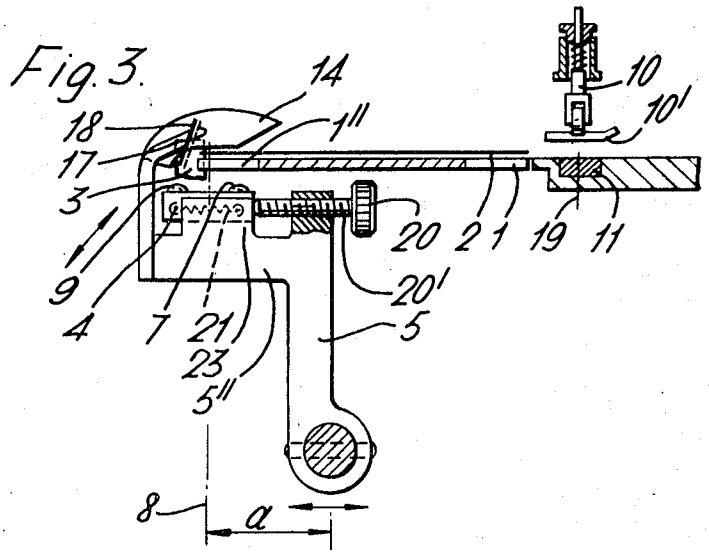


Fig. 4.

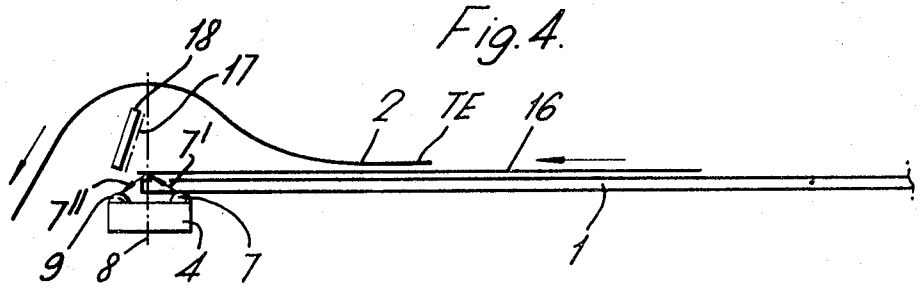
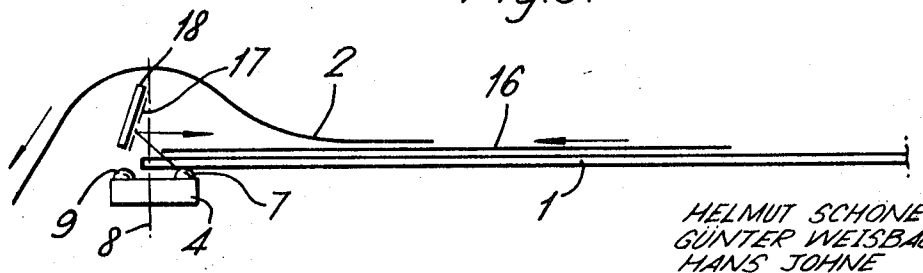


Fig. 5.



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METHOD AND APPARATUS FOR FEEDING OF SHEETS FITTINGLY ALIGNED TO A MACHINE

The present application is a continuation-in-part application of Ser. No. 731,805 filed on May 24, 1968 and now abandoned.

BACKGROUND OF THE INVENTION

The present invention relates to a method and apparatus for feeding sheets fittingly aligned to a machine, for example a sheet-processing machine or a sheet-handling machine such as a printing press.

The term "fitted" or "fittingly" when used in the following text means that the sheet are properly aligned and adjusted for high-speed feeding into a sheet handling or processing apparatus.

A method for such feeding of sheets in a fitted manner to a sheet-handling machine comprises the advancing of the sheets until they abut front stop means, the alignment of a sheet relative to its leading edge, the lateral pulling and alignment of a sheet relative to a lateral edge, the controlling of the sheet to ascertain whether it has a fitted position, as well as the controlling of the so-called blocking time. The blocking time is a time duration required for performing certain functions such as the interruption of the sheet feeding, the stopping of the printing, the interruption of the color supply as well as of the wetting water in response to an unfitted or nonaligned position of a sheet or in response to the absence of a sheet.

The size or diameter of a roller such as an impression roller in a printing press, is substantially determined by the size or length of the sheet format in order to accommodate the sheet development on the surface of the roller, and by the time duration required for the fitted feeding of a sheet. To accommodate such time duration it is necessary that there is a circumferential roller length in addition to the sheet development on the roller surface, which additional length will pass a fixed point during such fitted feeding of sheets. This additional circumferential length is referred to as the "channel angle" which is one of the factors to be considered in determining the diameter of the roller.

Furthermore, it is a fact that a substantial proportion of the functions necessary for the fitted feeding of the sheets takes place during a time interval which is independent of the printing capacity. Therefore, when such time interval is increased the respective circumferential length on the roller or the so called "channel angle" is increased accordingly. As a result, the diameter of the roller must be increased accordingly. However, large roller diameters are inefficient because the feed through speed of a sheet to be printed cannot be increased above a certain limit.

PRIOR ART

The prior art discloses a method for the fitted feeding of sheets in which the alignment of the succeeding or following sheet begins at a time when the preceding sheet in an advancing succession of sheets, still partially overlaps the following sheet. However, the sheet alignment and control cannot be completed until after the preceding sheet has completely passed the Following sheet. The apparatus for performing the just-mentioned method comprises an additional gripping mechanism which seizes the leading edge of a following sheet while the latter is still partially overlapped by a preceding sheet. The gripping mechanism thus moves the following sheet slowly toward front stop means while the preceding overlapping sheet is still being pulled off a sheet aligning mechanism. In this apparatus the front stop means are effective from above the sheet. This feature of the known apparatus has the disadvantage that the following sheet can abut the front stop means only after the preceding sheet has been pulled completely off the following sheet. Accordingly it is not possible to shorten or reduce the time required for the fitted feeding of the sheets because the individual fitting and adjusting steps must be performed sequentially rather than at least partially in s simultaneous fashion.

In another known apparatus a control mechanism is provided for controlling the fitted position of the sheets. This known control mechanism is adapted to be moved along with the front stop means from underneath the feed table into a control position at the feed table. The control of the fitted position of the sheet is accomplished in this known apparatus by means of several electric contacts and/or through a reflection measuring or sensing device which is arranged in a fixed position underneath the feed table. The reflection measuring device cooperates with a mirror which in its control position is arranged above the sheets to be controlled and which is moved as by tilting along with the front stop means into its control position. This known apparatus is intended for ascertaining missing sheets, for ascertaining the correct position of fitted sheets and for controlling target-missing sheets, that is, sheets which pass over the front stop means.

For ascertaining the absence of sheet by means of the known apparatus the light beam emitted by the light source is reflected in the mirror and thus directed toward the photocell. This feature has the disadvantage that the mirror is covered in due course by paper dust which cannot be avoided. A dust-covered mirror cannot provide exact reflections and as a result it is possible that a sheet is being registered as present and properly fitted whereas in fact a sheet is missing.

On the other hand the control of the presence of a properly fitted sheet is accomplished by the fact that the sheet covers the outlet opening of the light beam as well as the inlet opening of the photocell whereby light reflection from the mirror to the photocell is prevented. This has the drawback that the range in which all sheets are registered as properly fitted is rather large due to the structural arrangement of the light source, the mirror, and the photocell. Such large size arrangement makes it impossible to assure an exact control of the fitted position of a sheet.

Furthermore, when controlling sheets while one sheet has passed over the front stop means, the mirror raises such a sheet on its may into the mirror control position. Therefore, at the instant of control there is no sheet present in the range of the control means. As a resulting a missing sheet is registered.

Yet another disadvantage is seen in the fact that where there is partial overlap of a subsequent sheet by a preceding sheet, the target-missing sheet is pressed by the mirror moving in to its control position, against the overlapping sheet which is presently being pulled off so that the target-missing sheet is taken along and fed into the machine along with the preceding sheet. This makes it impossible to provide for an overlapped sheet control and alignment.

OBJECT OF THE INVENTION

In view of the foregoing it is an object of the invention to remove the above drawbacks.

Yet another object of the invention is to assure quality fitted feeding of sheets whereby the control steps may be carried out simultaneously while a preceding sheet is still overlapping a subsequent sheet.

A still further object of the invention is to reduce the amount of time necessary for controlling and adjusting a sheet in order to assure a high-speed feeding operation and thus also a high-speed sheet processing and handling operation.

Yet another important object of the invention is to provide efficient roller dimensions whereby undesirably large roller diameters are to be avoided.

It is yet another object of the invention to assure that target-missing sheets are avoided.

Yet another object is to feed but one sheet at a time into any sheet handling or processing machine.

A very important object of the invention is to avoid error indications by reflections on a preceding sheet.

SUMMARY OF THE INVENTION

The method according to the invention comprises the following steps:

advancing the sheets so that they abut against front stop means,

moving or tilting a photoelectronic reflection measuring device and/or a disc which is provided with a light absorbing or reflecting surface for the purpose of avoiding a disturbing reflection from the preceding sheet, out of a rest position underneath a feed table into a control position and controlling the fitted position of the sheets whereby the just enumerated steps take place in a time period during which the trailing edge of a preceding sheet has not yet passed a reference line and/or a position correction line.

The apparatus for performing the above method is characterized in that a photoelectronic reflection measuring mechanism and/or a disc is/are tiltably attached to lever means arranged underneath an infeed table for moving the reflection measuring mechanism and/or the disc into the control position, said disc being provided with a light absorbing or reflecting surface for any disturbing reflections. The light reflecting or absorbing surface is arranged in such a position between the photoelectric reflection measuring mechanism and the sheet being pulled off the infeed table that the beam emitted from the transmitter such as a light source is deflected or absorbed when a sheet is missing or when a sheet is not in its properly adjusted position whereby any reflection of the beam by the sheet which is just being pulled off the infeed table, toward the receiver such as a photocell, is eliminated.

SHORT FIGURE DESCRIPTION

In order that the invention may be clearly understood it will now be described, by way of example, with reference to the accompanying drawings, wherein:

FIG. 1 is a side view of a sheet feeding mechanism for a printing press comprising sheet alignment means as well as control means for the sheets;

FIG. 2 is a top view of the mechanism shown in FIG. 1;

FIG. 3 is a partial side view similar to that of FIG. 1 but emphasizing the sheet control mechanism;

FIG. 4 is a schematic representation of the sheet control wherein a sheet is shown in its properly adjusted position;

FIG. 5 is a schematic representation of the sheet control wherein a sheet is shown as not having yet reached its properly adjusted position which is registered by the control mechanism as an absent sheet.

DETAILED DESCRIPTION OF AN EXAMPLE EMBODIMENT

FIG. 1 shows a feed-in table 1 supported on a frame structure 1'. A preceding sheet 2 is shown in a position in which sheet 2 overlaps substantially the following or succeeding sheet 16. The feeding of sheets is accomplished by well-known mechanisms not shown but which would be positioned to the right-hand side of FIG. 1.

Just prior to the sheet position shown in FIG. 1, the sheet 2 is advanced in the direction indicated by arrow 2' until the leading edge of the sheet 2 abuts against the front stop means 3. The leading edge of the sheet is then aligned relative to the front stop means 3. Subsequent to the alignment the sheet is checked or controlled by means of the photoelectronic reflection measuring device 4 to ascertain whether the sheet has a properly fitted position.

Sheet position control means in the form of said photoelectronic reflection measuring device 4 is supported underneath table 1 on a lever 5 which is rigidly secured at its lower end, for example, by means of crosspins 5' to a shaft 6. The shaft 6 is journaled in the supporting structure or frame 1' so that rotation of the shaft back and forth in the direction of the arrow 6' will tilt the lever 5 for moving at least one member of the control means from a rest position underneath the table 1 into a control position above the table. FIG. 1 illustrates the control position. To bring the control member into its rest position the ever 5 would move in the counterclockwise direction.

The sheet position control means comprise a light source 7 and a photocell 9 supported on a common support member which in turn is carried by a sidearm 5'' forming part of or attached to lever 5.

The left-hand end of the infeed table is provided with light-transmitting apertures 1'' as best seen in FIGS. 3 and 4. In the checking or control step the light source 7 emits a light beam 7' as shown in FIG. 4. If at this instance the leading edge of a sheet 2 or 16 is properly aligned against the front stop means 3, the emitted light beam 7' will be reflected by the lower surface of the sheet. Thus the reflected beam 7'' shown in FIG. 4 will be directed toward the photocell 9.

The points of reflection along the leading edge of a sheet define a reference line or plane 8 which extends vertically and perpendicularly through the plane of the sheet. Thus, if at the instant of control a sheet is abutting with its leading edge against the stop means 3 the reflected light beam 7'' will reach the photocell 9 and a signal will be generated indicating the proper position of the sheet whereby the signal is employed to release the further feeding of the sheet into the sheet handling or processing apparatus.

However, if at the instant of control or checking no leading edge of the sheet has reached the control line 8 as shown in FIG. 5, the light beam emitted from the light source 7 will not be reflected at the lower surface of the sheet and thus will not reach the photocell 9. No signal will be generated and the absence of the signal will be evaluated to represent the absence of a properly positioned and aligned sheet. Such evaluation is used to activate a stopping or locking mechanism not shown which stops the further feeding of sheets to the printing press.

When a sheet is present the leading edge of which is properly aligned the sheet will further be aligned relative to one of its lateral edges by means of a well-known so-called "-pulling mechanism" 10. The pulling mechanism 10 has a presser foot 10' which may be lowered and raised in response to a signal from the photocell 9. By lowering the presser foot 10' the sheet 16 as shown in FIG. 4 will be pressed against a laterally movable alignment bar 11. The alignment bar 11 moves in a direction perpendicularly to the direction of sheet advance whereby the sheet is adjusted relative to one of its lateral edges.

Subsequent to the alignment and control steps a rocking mechanism 12 shown in FIG. 1 which is provided with sheet gripping means 13 is moved to seize the leading edge LE of the sheet 2 for transporting the sheet from the infeed and alignment mechanism to a roller 15, which may be the feed-in roller on a printing press. The rocking mechanism 12 is rocked back and forth in the direction of the arrow 12' As soon as the gripping member 13 and 13' have seized the leading edge LE in the right-hand end position of the rocking mechanism 12 adjacent to the left-hand edge of the feed-in table 1, the front stop means 3 as well as upper markers 14 and the reflection measuring device 4 are rocked downwardly from the control position to the rest position underneath the feed-in table 1. Just as soon as the rocking mechanism 12 starts moving away from the position adjacent to the feed-in table 1 in the counterclockwise direction, the upper markers 14 and the control mechanism 4 are moved back into their control position underneath the first sheet 2 and above the second sheet 16 although the first sheet has not yet left with its trailing edge the feed-in table 1 thus still overlapping the second sheet 16 which is now advanced against the front stop means 3 and checked by the reflection measuring device 4 to ascertain its properly fitted position as well as its lateral alignment. Accordingly, the alignment and control steps for the second sheet are carried out at a time during which the trailing edge of the first sheet 2 is still well above the alignment and control means.

If the second sheet 16 is in a properly fitted position the just-described control step is carried out while the first sheet 2 is being pulled off by the gripper rocking mechanism 12, 13. This is an important time saving advantage of the invention.

If the leading edge of the second sheet **16** would not be properly aligned with the front stop means **3** it would be possible that the light beam emitting from the light source **7** is reflected from the lower surface of the first sheet **2** as such first sheet is being pulled off by the rocking and gripping mechanism. Thus, the light beam reflected by the first sheet **2** would reach the photocell **9** although the second sheet **16** is not in a proper aligned position relative to the front stop means **3** and the result would be a signal representing the presence of a properly aligned sheet which is in fact not present. The invention eliminates this difficulty by means of the lever **5** and a disc **18** attached to the lever sidearm **5''** by means of a rod **18'** as seen in FIG. **1**. The disc **18** is provided with a light reflecting or absorbing surface **17**. The disc **18** which is also shown in FIG. **2** is rocked by means of the lever **5** into such a position between the photoelectronic reflection measuring device **4** and the first sheet **2** which is being pulled off, that when a sheet is absent or when the leading edge of the sheet is not properly aligned and fitted, the light emitted from the light source **7** will be deflected or absorbed so that the reflection of the light beam at the lower surface of the first sheet **2** toward the photocell **9** is avoided. This works well even if the disc **18** should be covered with dust because there is no reliance on light reflection. The lateral adjustment of the position of the second sheet **16** takes place as soon as the trailing edge TE of the first sheet **2** has cleared the lateral adjustment means **10, 10'**.

Incidentally the lateral adjustment means **10, 10'** define a lateral correction line **19** as shown in FIG. **3**. It is in keeping with the teaching of the present invention that at least some of the alignment, control and adjustment steps may be carried out while the trailing edge TE of a preceding sheet is still upstream of the correction line relative to the direction **2'** of movement of the sheets. As mentioned, the lateral adjustment as distinguished from the leading edge adjustment may take place as soon as the trailing edge of the preceding sheet has cleared the correction line **19**.

For the purpose of adjusting the reference line or control line **8** back and forth relative to the direction of sheet advance, there is provided adjustment means adjustably supported by said lever **5** for cooperation with the common support member of the reflection measuring device **4**. The adjustment means comprise a threaded screw **20'** extending through an upper threaded end of the lever **5** said screw having a knurled knob **20** at one end thereof while the opposite end bears against the common support member of the reflection measuring device **4**. The sidearm **5''** of the lever **5** is provided with guide means **23** in which the support member can move back and forth against the resiliency of a resilient member such as a compression spring **21** one end of which is attached to the support member of the reflection measuring device **4** whereas the other end is attached to a fixed point on the lever **5**, preferably to the guide means **23** on the sidearm **5''** of the lever **5**.

The left-hand end of the adjustment screw **20'** bears against the support member of the reflection measuring device **4**. Therefore rotation of the adjustment screw which moves the screw leftwardly will push the support member to the left. Rotation of the screw in the opposite direction will cause the support member to follow the end of the screw under the force of the resilient compression spring **21**. Thus, it is possible to adjust the position of the control line **8** precisely relative to the edge of the feed-in table **1**. This is especially so where the adjustment screw **20'** is provided with a very fine thread.

Referring to FIG. **2** the rocking mechanism **12** is rocked back and forth as previously described by a driven member **24**. Such rocking mechanism with its drive means is well known in the art.

FIG. **1** shows the so called "channel angle" A discussed above. The channel angle A together with the radius R of the impression roller **15** define a width C which must be provided as a circumferential length on the surface of the impression roller **15** in addition to the length required for accommodating the particular sheet size development of the format length development. The circumferential length or width C is substantially determined by the time duration required for the sheet adjustment and control as well as the sheet alignment in the feed-in mechanism. It is an advantage of the invention that such width can be held small whereby the radius or diameter of the impression roller **15** may also be held small.

While specific example embodiments have been described it is intended to cover the teaching of the invention with all its modifications and equivalent within the scope of the appended claims.

What is claimed is:

1. An apparatus for feeding sheets fittingly aligned to a machine, comprising:

a. an infeed and aligning mechanism including an infeed and a supporting structure for said infeed table.

b. a shaft supported underneath said infeed table adjacent to a discharge edge of said table,

c. lever means rigidly supported on said shaft for rocking movement therewith, between operative and inoperative positions,

d. a photocell and alight source, constructed and arranged for reflection of light form the source by a properly aligned sheet and response to the reflected light by the photocell,

e. a sidearm attached to said lever,

f. guide means on said sidearm, and

g. a movable support member for said light source and photocell, said support member being guided by said means for back and forth movement along the guide means, along the feeding direction of the sheet whereby the photocell and light source, in the operative position of the shaft and lever means, accurately prevents a preceding sheet from causing an erroneous indication of presence or alignment of a sheet.

2. The apparatus according to claim **1** further comprising adjustment means adjustably supported by said lever for cooperation with said support member to adjust the position of the support member relative to the lever for properly adjusting the position of a reference line along a discharge edge of said infeed table.

3. The apparatus according to claim **2**, further comprising resilient means connected to said support member and to fixed point for urging said support member against said adjustment means.

* * * * *

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,647,205 Dated March 7, 1972

Inventor(s) Helmut Schone et al.

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

On the cover sheet [73] "Veb Polygraph Leipzig, Kombinat fuer Polygraphiche Maschinen und Ausrustugen, Leipzig, Germany" should read -- Veb Polygraph Leipzig - Kombinat fuer Polygraphische Maschinen und Ausrustungen, Leipzig, Germany --.

Signed and sealed this 25th day of July 1972.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents

FORM PO-1050 (10-69)

USCOMM-DC 60376-P69
☆ U.S. GOVERNMENT PRINTING OFFICE : 1969 O—366-334.

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,647,205 Dated March 7, 1972

Inventor(s) Helmut Schone, et. al.

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Claim 1, line 3, "an infeed", second occurrence, should read -- an infeed table -- .

Signed and sealed this 19th day of December 1972.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
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FORM PO-1050 (10-69)

USCOMM-DC 60376-P69
* U.S. GOVERNMENT PRINTING OFFICE : 1969 O—366-334.