

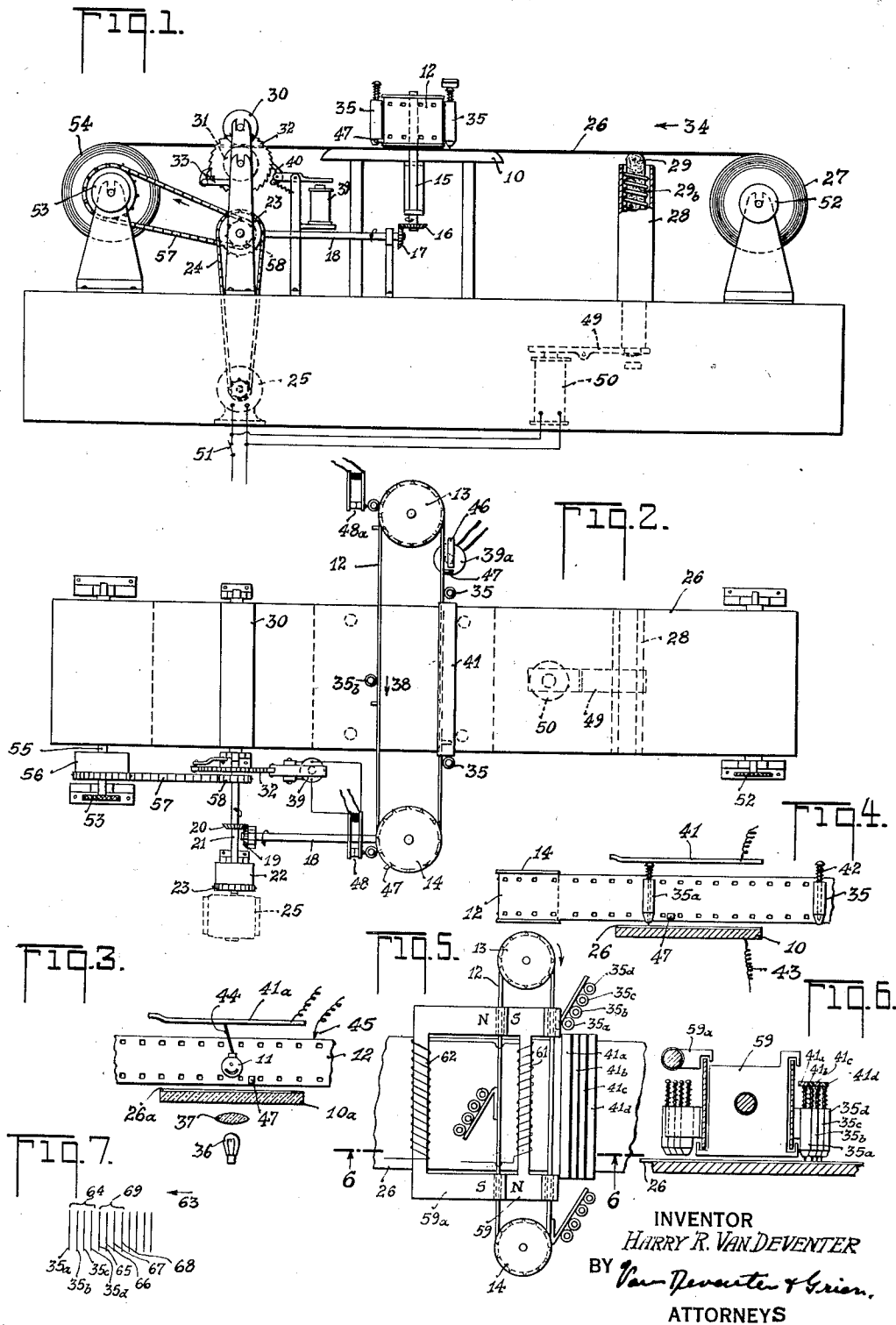
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APPARATUS FOR USE IN FACSIMILE TRANSMITTING SYSTEMS

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## APPARATUS FOR USE IN FACSIMILE TRANSMITTING SYSTEMS

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This invention relates to facsimile systems (commonly called picture transmission systems and hereinafter referred to as such) and more particularly to a mechanism that may be used at the transmitter or receiver of such systems.

A typical facsimile transmitting system is described in Patent No. 1,759,303, dated May 20th, 1930, or in the pending application Serial No. 33,039, filed July 25th, 1935.

More specifically, the present invention relates to mechanism which may be used at the transmitter or receiver in the systems described in the aforesaid patent and application, or with other systems wherein the transmitter and receiver are operated in synchronism.

For the sake of brevity in the specification and claims, the material (a film, sheet of paper, foil or the like) to be scanned at the transmitter, and the material on which the reproduction is made at the receiver are termed a "sheet".

The element for scanning the sheet at the transmitter (a light sensitive tube, a stylus or the like) and the element for recording at the receiver (a lamp, stylus, pen, pencil or the like) are hereinafter termed "translating means".

The circuit including the translating means at the receiver and transmitter is hereinafter termed the "picture circuit"; and the circuit for controlling the operation of the transmitter and receiver is hereinafter termed the "operating circuit", or "control circuit".

It is customary to employ a transmitter having a rotary drum carrying the sheet. Hereinafter, for the sake of brevity, the matter to be transmitted from the sheet is termed a "picture", it being understood that this may be on a photographic negative or positive, or any other similar transparency, through which a light beam is projected, the emergent beam being received on a light sensitive cell or the like. The picture may be on opaque paper where it is scanned by reflected light. In some systems, a metal foil on which the picture is printed with insulating ink is used, so that the picture circuit is interrupted when a translating stylus passes over the ink.

At the receiver is a drum similar to that at the transmitter, means being employed to rotate the transmitting and receiving drums in synchronism. On this drum is wrapped the sheet on which the picture is to be received. This sheet may be a photographic film, which is acted upon by a suitable source of light, or it may be a paper adapted to be marked upon by a pen or pencil, or the paper may be treated so that it will react electrolytically to a conducting stylus contacting therewith, the latter method being employed when a metal sheet with insulating ink is used at the transmitter.

One of the objections to any of the systems of the foregoing general description is that the pictures are necessarily limited to the size of the

drums employed and the sheets must be put on the drum each time the transmitting drum has been scanned or when the complete picture has been received on the receiving drum.

One of the objects of the present invention is to eliminate this difficulty by arranging the sheets at the transmitter and receiver so they can be taken from a continuous delivery roll and this enables pictures of any length to be made without the necessity of using separate sheets or stopping the transmitting and receiving mechanisms regardless of the length of any individual or series of pictures or documents being transmitted.

Still another object of the invention is to increase the speed at which picture transmission systems may be operated, for the time lost in changing sheets with the existing systems is eliminated by this invention; and because the operation is continuous, the apparatus may be operated at higher speeds than known systems; and if a roll of paper or film sufficiently large is put on the machine it may be continuously operated throughout the day or night without attention, means being provided, if necessary, to stop and start the transmitters and receivers automatically.

Another object of the invention is to provide a picture transmission apparatus in which a translating means such as a light sensitive cell at the transmitter or a recording lamp at the receiver, either included in the picture circuit, is movable relative to the sheet being scanned or on which the picture is recorded.

A further object is to provide apparatus embodying a motor, a translating device of the picture circuit rotatably driven by said motor and means for moving a sheet relative to said translating device, said means being operated by said motor.

Another object is to provide apparatus embodying automatic means operative only when the apparatus is in use for moistening or applying chemicals to the sheet of paper used when the instrument is employed as a receiver.

Other objects of the invention will be apparent from the following specification, the invention consisting substantially in the construction, combination, location and relative arrangement of parts, all as will be more fully hereinafter set forth and as shown by the accompanying drawing and finally pointed out in the appended claims.

For the sake of illustration, the invention will now be described as applied to a two wire circuit connecting two instruments, over which wires is transmitted the operating current for synchronizing the transmitter and receiver and the picture current for causing the picture to be reproduced at the receiver. Obviously, one wire and ground may be used, or a radio link, by means well understood by those skilled in the art. The

present invention does not depend on the type of circuit or channel used to connect the instruments.

Referring to the drawing:

5 Figure 1 is a side elevation, showing the general assembly of the apparatus;

Figure 2 is a top view of the apparatus, Figure 1;

10 Figure 3 is a detail view of a portion of the apparatus, Figure 1 illustrating the arrangement of the translating element at a transmitter, said element comprising a light sensitive cell;

Figure 4 is a detail view of a portion of the apparatus, Figure 1, illustrating the arrangement 15 of a translating element at a receiver, said element comprising an electrolytic stylus;

Figure 5 is a modified form of carrier showing a guide therefor together with a plurality of translating elements thereon abreast as well as a 20 form of magnetic brake for the carrier;

Figure 6 is a view on the line 6-6 of Figure 5; and

Figure 7 is a diagram illustrating the operation of the carrier, Figure 5, in so far as the trans- 25 lating elements are concerned.

When the apparatus is used for transmitting and receiving pictures electrolytically, then the arrangement shown in Figures 1 and 2 is employed where the platen 10 is made of suitable 30 conducting material, or of any material having an upper conducting surface.

Positioned above the platen is a carrier 12 which may take the form of an endless steel or other strong and flexible band. This may be 35 smooth and engage the pulleys 13, 14, or the latter may be provided with sprocket teeth and the carrier may be perforated as shown to engage said teeth so as to be positively driven thereby.

Pulley 14 is mounted on a vertical shaft 15 and this shaft has a gear 16 thereon meshed with a 40 gear 17 on a shaft 18. This shaft has a gear 19 meshed with a gear 20 on shaft 21 one end of which connects to the driven member of a clutch 22. The other side or driving member of said 45 clutch is connected to the sprocket 23 which is driven by a chain 24 driven by a sprocket secured to the driving shaft of a motor 25.

The sheet 26 is taken off a delivery roll 27, passes over a moistener 28 (in the case of a receiver using electrolytic paper), a roller (not 50 shown) being employed if necessary to hold the sheet down against the moistener felt 29 if necessary. The arrangement should be such that no excess liquid is left on the sheet as it progresses 55 onward through the apparatus.

The moistener may be used to apply a sensitizer or developer or any other fluid to the sheet 26 in the event the sheet requires the application of such a fluid. The moistener may be 60 arranged on the left of the platen, Figure 1, so as to make application of the fluid after the translating means hereinafter mentioned has operated on the sheet.

The action of the moistener is made automatic, so that fluid will only be applied during the operation of the device, by having armature 49 65 press the wick assembly 29b upwards against the sheet when attracted by magnet 50 in circuit with motor switch 51. By this arrangement the wick is held against the sheet only when the motor is operating and the apparatus is in use.

Assuming that the sheet has passed the moistener, it then passes over the platen 10 against which it lies in smooth surface contact, suitable means such as spring-pressed clamps being em-

ployed to insure it will lie flat thereon. It then passes beneath the operating rollers 30, 31, the upper one of which may act merely as a weight although these rollers may be connected to roll 5 together and may be spring-pressed to insure their firmly gripping the sheet to move the same.

Roller 31 is provided with a ratchet wheel 32 which is engaged by a stop-pawl 33 the arrangement being such that when wheel 32 is revolved as hereinafter described, the rollers 30, 31 will 10 grip the sheet 26 and pull it across the platen 10 a definite distance determined by the pitch of the teeth on 32, the stop-pawl holding the sheet locked when wheel 32 is not in motion.

This arrangement together with certain other 15 actuating parts as hereinafter described, constitute a step-by-step feeding arrangement for the sheet 26.

By reason of the drag on the sheet caused by the delivery roll 27 and the moistener, the sheet 20 is held smoothly against the upper surface of the platen 10 but moves smoothly across the same in the direction of the arrow 34 when the step-by-step feeding mechanism operates.

The carrier 12 carries one or more translating 25 elements 35 which may be supported in insulating mountings thereon. These elements may comprise a light sensitive cell, a pen, pencil, lamp, stylus or the like, depending upon the system used and whether the apparatus is being used 30 as a transmitter or receiver.

If the instrument is to be used as a photographic transmitter, then the translating or scanning element 35 could be a light sensitive cell as shown at 11, Figure 3, the sheet 26a would be a 35 photographic film, the platen 10a would be transparent, and a suitable lamp 36 would be placed below the platen formed by means of a suitable lens 37 so that the emergent beam of light would strike the cell 11 and thereby transmit current 40 over the picture circuit in the usual way. If desired a suitable lens system can be interposed between the sheet 26a and the cell 11.

If the instrument is to be used as a photographic receiver, the platen would be transparent, 45 and a suitable light source or recording lamp would be used instead of the cell 11, a lens being interposed between this lamp and the upper surface of the film on which the picture is to be recorded.

For transmitters for electrolytic systems, the 50 sheet may be of conducting foil or the like, having the picture to be transmitted written thereon in insulating ink so as to interrupt the picture circuit in the usual manner. At the receiver the sheet would be a strip of chemically treated 55 paper, as usual.

The number of translating elements 35 that are mounted on the carrier 12 will depend upon a number of factors: one or more such elements 60 may be used at the transmitter or receiver depending upon the speed of the apparatus, the number of lines per inch of linear travel of the sheet and the line across the sheet, which is the line scanned at the transmitter or on which the 65 recording is done at the receiver.

Assuming that the motor 25 is operating and the sheet 26 is free of any of the elements 35, the carrier 12 is moved in the direction of the arrow 38 by means of the gearing previously 70 described. The elements 35 engage an interrupter 48 and operate the same and this energizes a magnet 39, the armature of which carries an actuating pawl 40 engaging ratchet wheel 32 connected to feed roll 31. This moves the sheet 75

26 in the direction of arrow 34 a suitable distance say one hundredth of an inch if it is desired to make a picture having 100 lines to the inch.

By the time this motion of the sheet is completed and the sheet is at rest (the motion of the carrier having continued) one of the elements 35 passes over the sheet and—depending upon the character of this element—makes a line of the picture thereon, if the instrument is used as a receiver, or scans this line, if the instrument is a transmitter.

Assuming the instrument is being used as a receiver and is supplied with a chemically treated sheet, and that the element 35a, Figure 4 is a stylus, it will be seen that the picture current entering the instrument via the contact rail 41, passes (when an element such as 35a is below this rail) into the upwardly spring-pressed plunger 42, to the translating stylus 35a, passes through the moistened chemically treated sheet 26 causing the same to change color, flows into platen 10 and from there via conductor 43 to the picture circuit, and that this process is repeated as the carrier travels across the sheet, each successive stylus 35 engaging the sheet and translating the incoming current into a visible picture on the sheet, the latter being moved one hundredth of an inch between each engagement of the translating means.

It will be understood that when the translating elements cross the sheet on the non-operative side of the carrier, as shown at 35b, Figure 2, that they do not touch the sheet as there is no contact rail 41 on that side of the carrier to push the plungers 42 down, consequently the translating elements do not operate, although they obviously can be made to do so if desired.

When used on a photographic transmitter or receiver, as shown at Figure 3, the rail 41a serves merely to conduct one side of the picture circuit to the translating device 11 (a photocell for scanning or a recording lamp for a receiver), the device 11 has a sliding contact member 44 in contact with rail 41a, the other side of 11 connects to the frame of carrier 12 and the other side of the picture circuit may make sliding connection thereto as indicated at 45.

Synchronism between the carriers 12 at a transmitter and any number of receivers, can be obtained in any suitable manner, such, for example, as by the employment of synchronized motors for the motor indicated at 25, Figure 1, or by the employment of the magnetic clutches disclosed in the patent and pending application hereinbefore mentioned. If the arrangement shown in the patent is used the locking magnet 39a and its associated armature 46 and lugs 47 (to be presently described) can be omitted.

The means disclosed in said application, briefly, comprises an ordinary friction clutch for the clutch 22, interposed between the motor 25 and the other moving parts. This operates the carrier 12 continuously, but the carrier is stopped at appropriate places by means of the locking magnet 39a connected in the control circuit of the system, said magnet operating an armature 46 which engages suitable lugs 47 properly spaced on the carrier 12. While the carrier is locked, the clutch 22 slips. This insures that no carrier can get out of time with any other carrier by more than the error that might occur during the passage of a single translating element 35 across the sheet 26 as such errors are constantly corrected and do not become accumulative as is

the case if the carriers are continuously operated by non-synchronous or spring motors.

The locking magnets 39a of all receivers operating from a single transmitter are, of course, under the control of suitable apparatus at the transmitter (such as the contacts 48a to be presently described) and are connected in a control circuit which, in some systems is the same circuit as that carrying the picture current, or which may be a separate circuit.

The contacts 48a are insulatedly supported adjacent the path of travel of the carrier 12 so as to open the control circuit on the distant instrument, and are opened and closed at predetermined points during the operation of the carrier in order to effect control. Suitable lugs or cams, or the supports for 35 may operate these contacts.

The delivery roll is provided with a shaft having a knob 52 thereon whereby the roll may be turned. A similar knob 53 is provided for the takeup roll 54 and the shaft 55 thereof has a friction clutch 56 thereon, driven by chain or belt 57 driven by a sprocket or pulley 58 on shaft 21. This clutch 56 keeps a suitable tension on sheet 26 at all times and keeps it smooth over platen 10 which can be raised slightly above the plane occupied by the horizontal sheet 26 so the sheet may drag slightly downward over the edges of the platen.

Figure 5 shows further modifications that can be made in the transmitting or receiving apparatus previously described.

The first modification consists in providing a guide for the carrier 12, this comprising a slotted member 59 in which the upper and lower edges of the carrier run. This member 59 is positioned around the edges of the carrier so as to keep same in line during operation.

The second modification is to have the member 59 comprise the core of an electro-magnet which cooperates with another core 59a to form poles N—N, S—S, and by connecting the windings 61, 62 to the control circuit instead of the magnet 39a, the movement of the carrier 12 can be arrested magnetically. The core can, of course, perform the double purpose of guiding the carrier and stopping same, the latter action being the same as that described in connection with magnet 39a except the stops 47 need not be employed, as the large opposed poles of the core 59, 59a will, by magnetic attraction instantly stop the movement of the carrier.

The third modification shown in Figure 5 consists in an alternate form of construction of the carrier 12 whereby a group of translating elements are mounted thereon abreast at an angle to the face of the carrier so that at each passage of each group over the sheet, a plurality of lines are scanned or recorded, say one hundredth of an inch apart. Here the carrier 12 may carry one or more groups of translating elements abreast—for example four electrolytic pens or styli 35a, 35b, 35c, 35d. These sweep over the sheet 26 and are each separately insulated and connected with separate picture circuits via a separate conductor for each stylus or a single circuit can be employed with suitable synchronous switch mechanism at the transmitter and receiver, several of which are known in the art; or suitable filters can be employed in circuit with each stylus (or scanning means if the apparatus is used at a transmitter).

It will be understood that when the arrangement shown in Figure 5 is used at a transmitter, that the same number and arrangement of suit-

able translating devices are used at the associated receiver, which may have the recording pens or styli 35a, 35b, 35c, 35d.

This arrangement permits of scanning as many lines as there are scanning means mounted abreast at the transmitter, and recording these lines at the receiver.

The rails 41a, 41b, 41c, 41d are placed so as to operate all the translating elements abreast, and are separately and insulatedly supported in any suitable manner in case it is desired to use a separate circuit to each stylus. If desired, the platen below the track of each stylus can have a conducting strip insulatedly supported therein whereby a separate circuit for each stylus through the sheet and out through the bottom individually insulated strip is provided. Usually it is customary to have the platen common to all styli which may be connected to the picture circuit in any suitable manner.

This multiple stylus arrangement will be further understood by reference to Figure 7 which illustrates either scanning or recording with a group of translating elements or styli as shown in Figure 5.

In Figure 6, the lines 35a, 35b, 35c, 35d represent the path of the first sweep of the group 64 of styli over the sheet. The sheet then moves in the direction of the arrow 63. At this point if the sheet merely moved one line, stylus 35a would retrack over line 35b which cannot be permitted, so when this position is reached, the sheet feed mechanism is so arranged that when stylus 35d leaves the sheet, the paper is moved four lines and stylus 35a will on the next sweep, track at line 65, 35b at line 66, 35c at line 67 and 35d at line 68 of the group 69 and the operation just described is repeated.

To accomplish this it is only necessary to make simple changes in the feed mechanism for the sheet, which changes are readily perceived by one skilled in the art.

The picture circuit and the control circuits which may be used with the apparatus herein disclosed, vary so widely in their nature and operation that it is not deemed necessary to show an illustrative circuit here, as it will be obvious to those skilled in the art how this apparatus may be employed either at the transmitter or receiver with any of these circuits and systems.

Although the invention has been disclosed in connection with the specific details of preferred embodiments thereof, it must be understood that such details are not intended to be limitative of the invention except in so far as set forth in the accompanying claims.

What is claimed is:

1. In a facsimile scanning device, a stationary platen, a sheet supported thereby, an endless belt moving in a plane above said sheet, a plurality of translating devices secured to and moved with said belt, each device being moved in a path across the sheet from one side to the other and moved in a second path spaced apart from said first path in the opposite direction thereby successively returning said devices to said first-mentioned side, a rail conductor spaced apart from said platen and extending parallel to said first path, means carried by each device adapted to contact said conductor as its associated device is traversing said sheet along said first path, means for advancing said paper along said platen in increments in a direction angular with respect to said paths after each traversal of said

first path by one of said devices, and means connecting said conductor and said platen to a picture circuit.

2. Apparatus according to claim 1 including an electric motor, in which said sheet is linear and formed in rolls carried on supporting shafts and in which fluid applying means is provided between said platen and one of said rolls and effectively engages said sheet under control of electromagnetic means energized only while said motor is operating.

3. Apparatus according to claim 1 in which step-by-step means including a pawl and a magnet for actuating the same is provided for advancing said sheet along said platen, a circuit for said magnet including a switch, and means carried by said belt for actuating said switch, thereby effecting the advance of said sheet in time with the movement of the translating devices.

4. In facsimile scanning apparatus, the combination of a sheet, an endless belt carrier adapted to move transversely over the sheet in predetermined straightforward and reverse paths, a translating device carried by said belt, and a rail conductor positioned to contact said translating device only while said straightforward paths are being traversed by the translating device, said conductor being adapted to be connected to a picture circuit.

5. Apparatus according to claim 4, in which said translating device comprises a plurality of translating elements which collectively traverse said sheet along areas of substantial width, and in which a separate rail is provided for each of said elements, whereby the latter may only be energized while traversing said straightforward paths.

6. Apparatus according to claim 4 in which the means for defining the movement of said carrier along said predetermined straightforward path comprises a guide member having slots formed therein engaging the upper and lower edges of said carrier.

7. In facsimile scanning apparatus, the combination of a delivery roll, a sheet wound thereon, a platen adapted to support said sheet, stationary means located between said roll and platen for applying fluid to the sheet including a fluid applicator, means for moving said sheet over the platen, and means independent of said sheet for moving said applicator into and out of said engagement with said sheet.

8. In facsimile scanning apparatus, a sheet, a carrier of magnetic material adapted to traverse said sheet, and means including a magnetic element positioned adjacent said carrier whereby the same may be stopped by an increase in magnetic flux in said means.

9. In facsimile scanning apparatus, a carrier comprising a flexible magnetic member, a magnet having polar extensions engaging the edges of said carrier to guide the same, and a translating device on the carrier.

10. In facsimile scanning apparatus, a carrier comprising a flexible magnetic member of endless belt-like formation and having a translating device thereon, an electromagnet positioned between the parallel sides of said carrier, and a second magnet positioned outside said carrier.

11. The combination as claimed in claim 4 wherein said rail comprises a cam to depress said translating device to cause said device to contact said sheet as said device sweeps thereover along said straightforward path to scan said sheet.

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