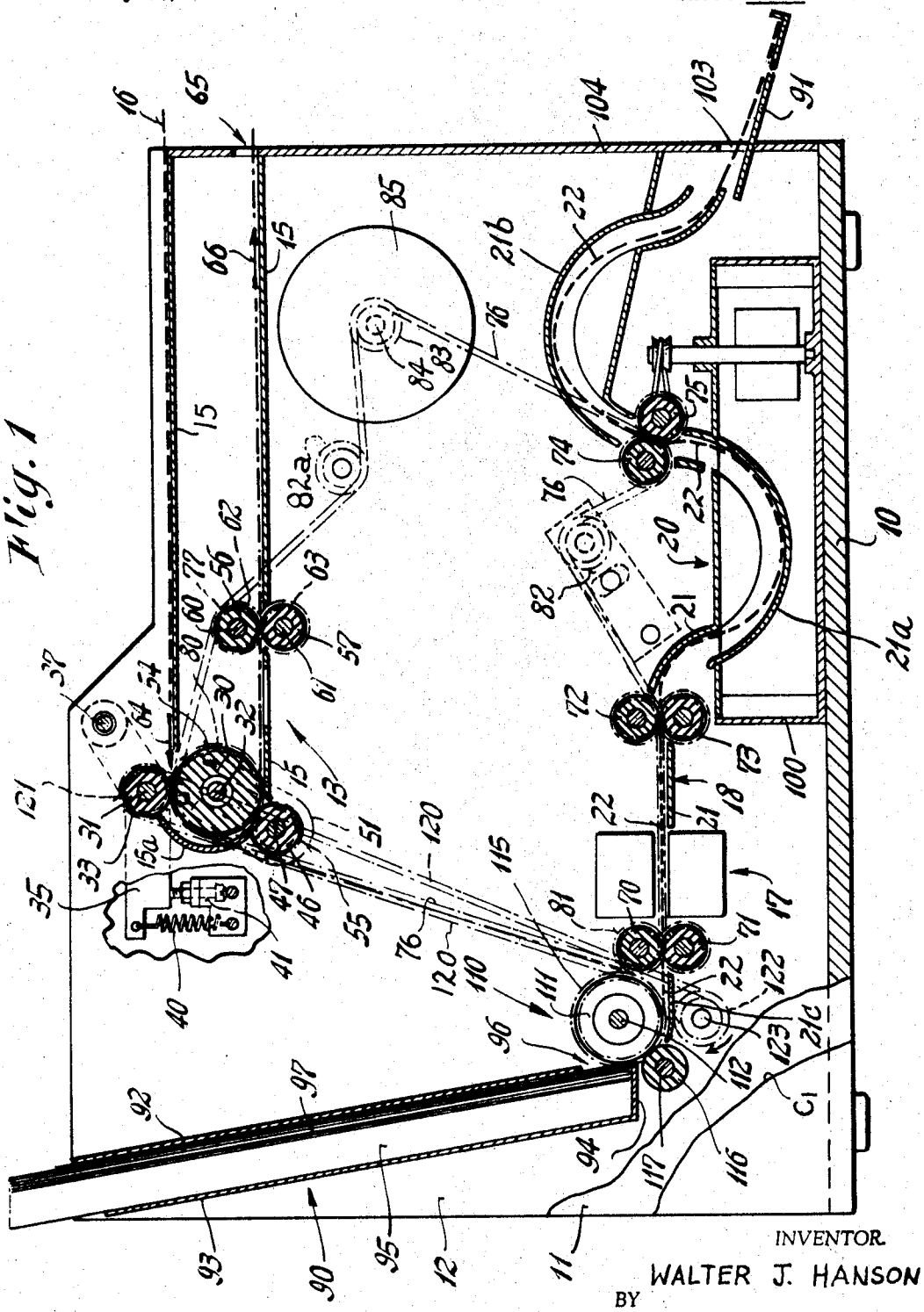
April 15, 1969 W. J. HANSON 3,438,707

SHEET FEED DEVICE FOR PHOTOCOPY MACHINE

Filed May 16, 1966 Sheet 1 of 2

Fig. 1



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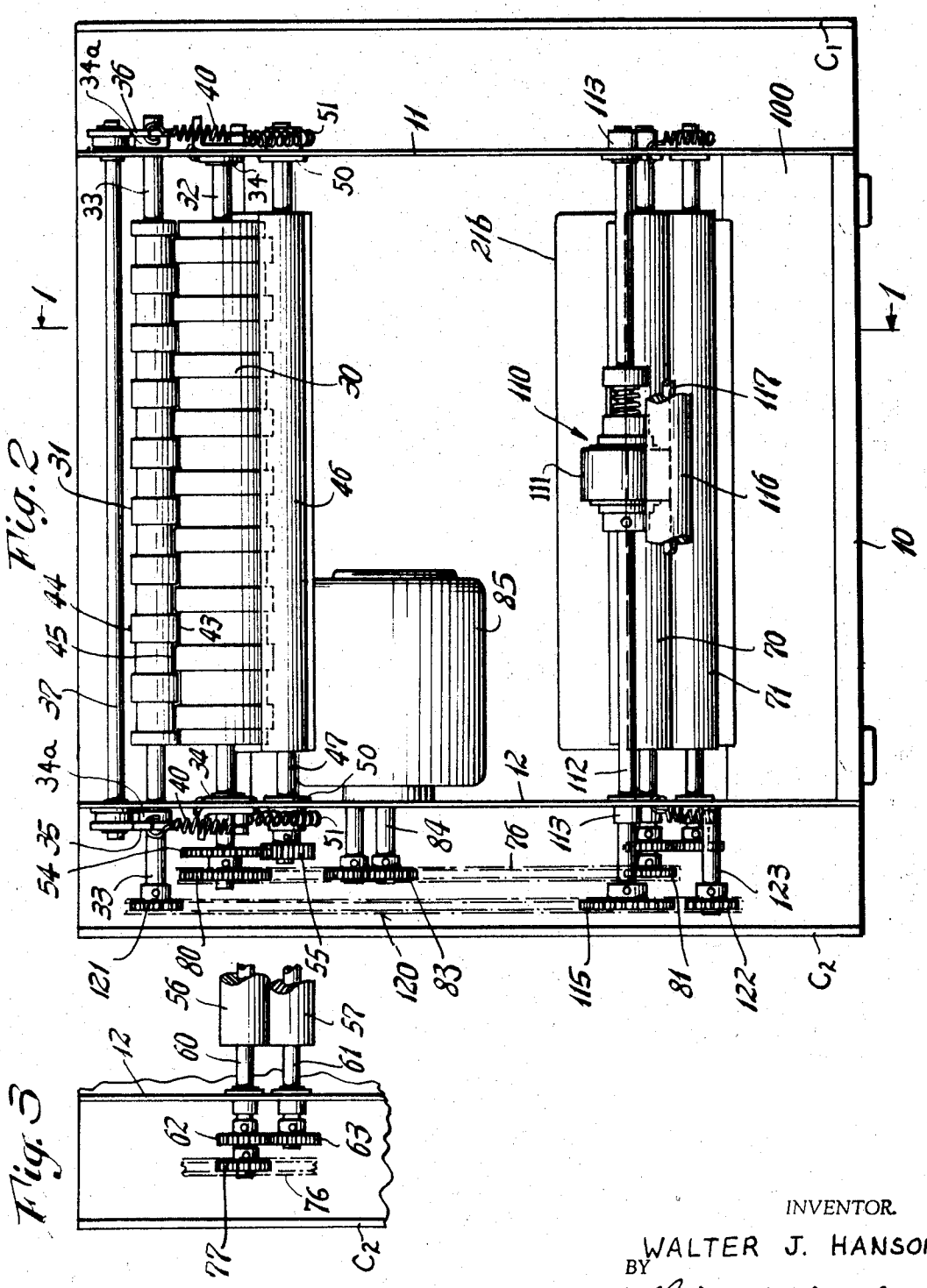

Fig. 2



Fig. 3

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# SHEET FEED DEVICE FOR PHOTOCOPY MACHINE

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U.S. Cl. 355—14 18 Claims

## ABSTRACT OF THE DISCLOSURE

A sheet handling arrangement for photocopy machines wherein the original sheet feeding means is adapted to actuate a separate copy sheet feeding means. The original sheet feeding means includes a pair of closely-spaced drive rollers, a first one of which is power driven while the second one of which is adapted to be frictionally driven by the first roller when an original is present therebetween. The second roller is coupled so as to actuate said copy sheet feeding means so as to thereby provide a simple demand copy sheet feed in response to the feed of an original into the photocopy machine.

This invention relates to a novel control and actuating means for a sheet feeder. More particularly the invention relates to an improved sheet feeding device for a photocopy machine wherein the presence and movement of an original controls at least a portion of the movement of a copy sheet through the machine.

In most photocopy machines that use paper transport devices a considerable quantity of mechanical and/or electrical apparatus has been heretofore required to feed the original along one path through the machine and to synchronously feed a copy sheet along another feed path through the machine. Such transport devices account for a considerable portion of the production and maintenance costs of this type of machine. The instant invention contemplates the provision of a very simple arrangement for synchronously feeding an original and a copy sheet through a photocopy machine in an inexpensive and reliable manner.

One object of the invention is to provide a novel paper handling device wherein two separate sheet feeding means are used to feed two different sheets along two separate feed paths respectively, the presence and movement of one of said sheets along its associated feed path serving to transmit the motive force required for moving the other sheet along at least a portion of its associated feed path.

Another object of the invention is to provide an improved paper handling means for a photocopy machine whereby an original when in the original sheet feed path of the machine comprises one element in the drive linkage for moving a copy sheet along a separate copy sheet feed path.

Another object of the invention is to provide a novel paper handling device for photocopy machines whereby the operative forces for transporting an original an incremental distance along a first feed path are transmitted through said original and are then mechanically transmitted so as to supply the drive forces required for advancing an elongated second sheet a corresponding incremental distance along a second separate feed path.

A further object of the invention is to provide an exceptionally simple, low-cost copy sheet feeding device for photocopy machines whereby the passage of an original through the machine serves to control and transmit the drive forces required to initiate movement of a copy sheet along a copy sheet feed path.



Other objects of the invention will become apparent as the disclosure progresses.

In the drawings:

FIG. 1 is a side elevational view taken along section line 1—1 of FIG. 2.

FIG. 2 is a rear elevational view (as seen from the left side of FIG. 1) of the instant apparatus, some structure, such as the copy sheet hopper and a portion of the original guide means, being omitted for the sake of clarity.

FIG. 3 is a fragmentary view illustrating the geared interconnection between a pair of cooperating sheet feed rolls of the machine.

In that the general structural arrangement and the concept of operation for electrostatic type photocopy machines having liquid toner developing means are well known in the reprography art a discussion of the instant electrostatic type photocopy machine will be made only to the extent that it relates to the instant sheet handling system.

As shown in FIGS. 1 and 2 the general structural environment in which the instant paper handling system is incorporated comprises a frame that includes a base **10** on which is fixedly secured a pair of upstanding side plates **11** and **12** that support the machine side covers $C_1$ and $C_2$. Small portions of the machine side cover $C_1$, and the side plate **11** are shown in FIG. 1. An illuminating station **13** is provided in the machine for exposing an original to radiation from a suitable light source not shown. Suitable guide means such as **15** and **15***a*, are supported on and between said side plates for establishing a first sheet feed path **16** along which an original may be fed on the way to and through said illuminating station **13**. Also provided in the machine is a charging station **17**, an imaging station **18** and a developing station **20** for respectively charging a copy sheet, receiving a radiation image on the charged copy sheet from said illuminating station and developing the exposed copy sheet. Suitable guide means, such as **21**, are mounted on and between said side plates for establishing a separate second sheet feed path **22** along which a copy sheet is fed in successively passing said charging, imaging and developing stations. It will be particularly noted that there is no way for an original that is being fed along said first feed path **16** to move into said second feed path **22** and similarly that there is no way for a copy sheet that is being fed along said second feed path to move into said first feed path; said first and second feed paths thus being completely separate from one another.

Transport means are provided for feeding an original along the said first feed path **16** and the effective output of a portion of this transport means is utilized to drive a portion of the copy sheet separating and transport means for initiating movement of a copy sheet along said second feed path **22** as will now be described in detail. The transport means for the original comprises a first pair of cooperating rolls **30** and **31** which are respectively secured on cross shafts **32** and **33**. Shaft **32** is rotatably mounted on the side plates **11** and **12** by means of suitable bushings **34**, while the cross shaft **33** is rotatably mounted by suitable bushings **34***a* that are carried on the intermediate portions of a pair of roll adjustment arms **35** and **36**, these arms permitting said upper roll **31** to be slightly vertically adjusted relative to the roll **32**. The right end, as seen in FIG. 1, of each arm is fixedly connected to the adjacent end of a cross shaft **37** that is rotatably mounted on and between said side plates **11** and **12**, while the opposite or free end of each arm is biased by means of a suitable spring **40**, FIG. 1, into engagement with a cooperating abutment screw **41** that is mounted on the associated side plate **11** or **12**. As will be apparent the adjusted vertical portion of the roll **31** and thus the effective gap between rolls **30** and **31**

is determined by the set position of the abutment screws **41**. The side plates **11** and **12** are appropriately slotted to accommodate any such vertical adjusting movement of the cross shaft **33** and bushings **34***a*. The outer peripheral surfaces of the rolls **30**, **31** are formed with shallow cooperating annular grooves, as illustrated in FIG. 2, so that mutually cooperating peripheral portions, such as **43** and **44**, of said rolls are effectively spaced from each other by a predetermined amount, the effective width of the gap **45** between said roll peripheries being such that when an original is introduced between the rolls **30**, **31** the original acts to frictionally couple the rolls for rotative drive purposes as will be discussed below.

Another feed roll **46** cooperating with said feed roll **30** is provided, roll **46** being secured to a cross shaft **47** that is in turn rotatably mounted on the side plates **11** and **12** by means of suitable bushings **50**, the latter being disposed in suitable slots formed in said side plates so as to be movable towards and away from the lower surface of the adjacent larger feed roll **30**. Any suitable means, such as springs **51** having ends secured to said side plates, operatively bias said bushings **50** upwardly so that the periphery of the feed roll **46** is pressed lightly into engagement with the adjacent operative periphery of said feed roll **30**. The shaft **32** for roll **30** has secured to an outer end thereof a gear **54**, FIG. 2, which meshes with a gear **55** secured to the adjacent end of shaft **47** whereby feed rolls **30** and **46** may be rotatably driven in unison. Another pair of cooperating feed rolls **56** and **57** are operatively disposed along the original feed path **16**, these feed rolls being respectively fixed to cross shafts **60** and **61** that are in turn rotatably mounted on said side plates **11** and **12** by suitable bushings in a manner similar to that just described for shafts **32** and **47**. The bushings for cross shaft **61** are mounted and spring biased in the same manner as that described for said bushings **50** so that the periphery of feed roll **57** is lightly pressed into engagement with the periphery of said feed roll **56**. The shafts **60** and **61** are interconnected by meshing gears **62** and **63** as illustrated in FIG. 3 so that rolls **56** and **57** may be rotatably driven in unison. As will be apparent when an original is fed along the initial portion of said feed path **16** and into the gap between feed rolls **30** and **31**, as indicated by arrow **64**, FIG. 1, the leading edge of the original will then be deflected generally around said roll **30** by guide means **15***a* and will move first between said rolls **30** and **46** and then between said feed rolls **56**, **57** and towards a suitable opening **65** in the front of the machine, the movement along the terminal portion of the feed path **16** being indicated by arrow **66**, FIG. 1.

The transport means for feeding copy sheets along said copy sheet feed path **22** and through said charging, imaging and developing stations **17**, **18** and **20** respectively, includes three cooperating pairs of feed rolls **70** and **71**, **72** and **73**, and **74** and **75**, each of these roll pairs being constructed and arranged in a manner similar to that for feed rolls **56**, **57**. These three pairs of feed rolls and also the above described pair of feed rolls **56** and **57** and the cooperating feed rolls **30** and **46** are adapted to be driven by a common endless chain **76**, FIGS. 1 and 2. Chain **76** is operatively entrained over a sprocket **77**, FIGS. 1 and 3, secured to said shaft **60**, a sprocket **80**, FIG. 2, secured to shaft **32**, a sprocket **81**, FIG. 1, secured to the shaft for feed roll **70**, and similar sprockets correspondingly secured to the shafts respectively associated with feed rolls **72** and **74**, an idler sprocket **82** that is adjustably mounted on the side plate **12** by any suitable means, a motor drive sprocket **83** and another suitable idler sprocket **82***a* and finally back over said sprocket **77**. The drive sprocket **83** is secured to the shaft **84** of a suitable electric motor **85** that is operatively mounted on the machine frame. It will be understood of course that all of the above mentioned sprockets are disposed in substantially coplanar relation so as to properly mesh with the chain **76** and that the function of the adjustably mounted sprocket **82** is to permit the endless chain to be maintained in an operatively taut condition.



The above mentioned copy sheet feed path **22** extends through the machine from a copy sheet storage hopper **90**, FIG. 1, at the back of the machine to an output tray **91** at the front of the machine. The hopper **90** comprises front and rear plates **92** and **93**, a bottom plate **94** and side plates such as **95** which are mounted on the machine frame so as to form a box-like unit having an opening **96** extending along the entire lower front side thereof. As will be apparent a stack **97** of copy sheets is placed in hopper **90** so that the leading copy sheet may be withdrawn through said opening **96** and fed along said feed path **22**. Each successive copy sheet once advanced into the continuously driven feed rolls **70**, **71** is adapted to be fed through the charging unit **17**, the imaging station **18**, feed rolls **72**, **73** past the guide means **21***a* in the toner tank **100**, through feed rolls **74**, **75**, past guide means **21***b*, and finally into the downwardly inclined output tray **91**; the spacing between the successive sets of feed rolls for the original and/or the copy sheet being less than the sheet being transported. Tray **91** is mounted by any suitable means on the machine frame and is disposed in the lower portion of an appropriate opening **103** in the front wall **104** of the machine.

A copy sheet separating and feeding means **110** is provided for successively withdrawing the lead copy sheet from the said stack **97** in the hopper **90** and advancing the same into the nip of the continuously driven feed rolls **70**, **71**. This sheet separating and feeding means comprises a main separating roll **111** that is carried by a cross shaft **112** which in turn is rotatably mounted on the machine side plates **11** and **12** by means of suitable bushings **113**. Fixed to the outer end of shaft **112** is a sprocket **115**. A friction coupling or connection is provided between the separator roll **111** and the shaft **112**, this friction coupling being of the type illustrated in FIG. 4 of U.S. Patent 2,813,714 and if desired reference may be made to said patent for the structural details of the coupling. Briefly this connection is capable of transmitting sufficient torque from shaft **112** to the separator roll **111** so that the latter is capable of separating and advancing the lead copy sheet from the stack **97** when shaft **112** is rotated, however the coupling will permit an "overtravel" rotation of roll **111** relative to the shaft **112** when the shaft **112** is not being driven and the lead end of the separated lead sheet in being pulled past roll **111** by the downstream feed rolls **70**, **71** so as to thereby frictionally rotate said separator roll **111**.

As may be seen from FIG. 1 the left peripheral side portion of the separator roll **111** extends into said hopper opening **96** so as to frictionally engage the lead copy sheet in the hopper **90**. In the same general area the separator roll **111** also cooperatively engages the periphery of an idler roll **116**, FIG. 1, fixed on a cross shaft **117** that is rotatably mounted on said side plates **11**, **12** by any suitable bushing means. The means for intermittently rotatably driving the separator roll **111** comprises a second endless chain **120**, which is entrained over not only said separator roll sprocket **115** but also over a sprocket **121** fixed to the end of the said roll shaft **33**, and over a sprocket **122** rotatably mounted on the end of a chain return stud shaft **123**, FIG. 2, that is fixedly mounted by any suitable means on the side plate **12**. The sprockets **115**, **121** and **122** are disposed in substantially coplanar relation so as to permit the efficient drive interconnection therebetween by the chain **120**.

A description of the operation of the instant paper handling apparatus will now be made. The electrical circuit for motor **85** is closed and the endless chain **76** is thus actuated to continuously rotatably drive the cooperating feed rolls **30** and **46**, **56** and **57**, **70** and **71**, **72** and **73**, **74** and **75**. An original to be copied is then manually fed along the upper portion of the feed path **16** and

into the gap between the driven feed roll **30** and the spaced feed roll **31**. The original is thus advanced between rolls **30, 31** and the normally idle roll **31** is rotatably driven by the drive forces that are frictionally transmitted from the periphery of the driven roll **30** to lower surface of original and then frictionally transmitted from the upper side of the original to the periphery of said roll **31**. Roll **31** is thus rotatively driven as long as any part of the original is moving between said rolls **30, 31**. The leading edge of the original in encountering the arcuate portion **15***a* of the guide means is redirected into the nip of the feed rolls **30, 46** so as to be thereby progressively advanced towards and through the illuminating station **13**. Before the trailing end of said original leaves the rolls **30, 46** the leading edge thereof will be engaged by the continuously driven feed rolls **56, 57** so that the entire length of the original is fed past station **13** and along the terminal portion of the feed path **16**, as indicated by arrow **66**; the original finally emerging from said opening **65**, FIG. 1, at the front of the machine. As will be apparent when the feed roll **31** is frictionally driven by engagement with the original the separator roll **111** will be thereby driven through the chain **120**, the latter effectively operatively interconnecting said rolls **31** and **111**. Rotation of separator roll **111**, which is in frictional engagement with the lower end of the leading copy sheet in the stack **97**, will thus cause said leading sheet to be separated from the stack and advanced along the initial portion of the feed path **22** and into the nip of the continuously driven feed rolls **70, 71**. Feed rolls **70** and **71** then cause the copy sheet to be progressively advanced towards and through the imaging station **18**. Before the trailing edge of the copy sheet leaves rolls **70, 71** the leading end thereof will be engaged by the next pair of driven feed rolls **72, 73** so as to advance the exposed copy sheet along the guide means **21** and **21***a* and into the final set of driven feed rolls **74, 75**. From rolls **74, 75** the developed copy sheet moves past the guide means **21***b* and out onto the tray **91**.

The various gears and sprockets for driving the above described feed rolls are dimensioned so as to impart the same linear speed to all the roll surfaces that contact the original and copy sheet, hence each increment of movement of an original along the feed path **16** will be accompanied by a substantially equal increment of movement of a copy sheet along the feed path **22**. Further in order to properly correlate the phase of movement between the original and an associated copy sheet the original feed path distance between the nip of rolls **30, 31** to the center of the original illuminating station **13** is made substantially equal to the copy feed path distance between the leading edge of the lead copy sheet in the stack **97** and the center of the imaging station **18**. Because of the above noted correlation of incremental movement and the distances along said paths **16** and **22**, the leading edge of the copy sheet will enter the imaging station **18** at substantially the same time that the leading edge of the original enters the illuminating station **13** and the original and copy sheet will thereafter move in synchronism through their respective feed paths. Of course for any given machine operation the effective gap distance **45** between the feed rolls **30, 31** is adjusted so as to operatively accommodate the particular thickness and/or rigidity of the original to be copied.

A modification may be made in the drive linkage between the roll **31** and the separator roll **111**. Here instead of having a one to one ratio of linear speed for these two rolls the relative sizes of sprockets **121** and **115** may be altered so that the linear speed ratio between said two rolls is different than one to one. In this case a corresponding change is made in the operative distance between the leading edge of the lead sheet in stack **97** and the contact point between the cooperating feed rolls **70, 71**. If, for example, a two to one ratio is used here, that is if the operative peripheral speed of roll **31** is twice that for the separator roll, then said operative distance along path **22** is reduced by a factor of one-half. In this way the copy sheet in being fed to the feed rolls **70, 71** moves at half the speed over half the distance and thus enters said rolls **70, 71** in the same time that said original in moving twice the distance at twice the speed enters between rolls **30** and **46**. Further, in this modification the position of the separator roll **111** may be raised relative to the stack **97** so that the point of contact between the separator roll **111** and the lead copy sheet in said stack is located a distance above the leading edge of said lead copy sheet, this distance being such that the trailing edge of an original that is equal to or even slightly greater than the length of the copy sheet leaves the feed rolls **30, 31** before the trailing edge of the copy sheet leaves contact with the separator roll. This factor will prevent the possibility of an early or premature feeding of the next copy sheet in response to the movement of a trailing end portion of the original between said feed rolls **30, 31**.

In prior devices, such as those respectively illustrated in U.S. Patents 2,813,717, 3,218,060, and 2,695,782, sheets are successively fed along a single sheet feed path whereas in the instant paper handling system there is a coordination and drive interconnection between the two transport means for moving separate sheets along two separate and distinct sheet feed paths.

As will be apparent the rotative coupling between the separator roll **111** and the shaft **112** may comprise a one-way clutch arrangement such as a wrap spring device or a ratchet type means whereby roll **111** may be driven by shaft **112** but may also override said shaft when rotatably driven by a copy sheet that is being pulled by rolls **70, 71**.

Since many changes could be made in the embodiments of the invention as particularly described and shown herein without departing from the scope of the invention, it is intended that these embodiments be considered as exemplary and that the invention not be limited except as warranted by the following claims.

What is claimed is:

**1.** In a paper handling arrangement for a photocopy machine having an original illuminating station and a copy sheet imaging station:

a frame;

a pair of feed rolls rotatably mounted on said frame for advancing an original towards said illuminating station, said rolls having a predetermined operative spacing between the cooperating surfaces thereof, said spacing being such that when an original is introduced into the operative gap between said rolls a rotation of one of said rolls will produce a rotation of the other one of said rolls;

a first drive means for rotatably driving said one of said rolls;

a copy sheet advancing means for initiating an advancing movement of a copy sheet towards said imaging station; and

a drive linkage operatively connected between said other one of said feed rolls and said copy sheet advancing means whereby an initiation of a copy sheet advancing movement is produced by the passage of an original through said gap between said pair of rolls.

**2.** Apparatus as defined by claim **1** wherein said copy sheet advancing means includes a separator roll that is rotatably driven by said one of said feed rolls through said drive linkage.

**3.** Apparatus as defined by claim **1** wherein the effective speed ratio of said drive linkage is such that the effective peripheral speed of said copy sheet advancing means is different than that for said other one of said feed rolls.

**4.** Apparatus as defined by claim **2**: additionally comprising

a first additional roll means for transporting said orig-

inal along a first feed path to said illuminating station; and

a second additional roll means for transporting said copy sheet along a second separate and distinct feed path to said imaging station.

5. Apparatus as defined by claim 1 wherein said drive linkage has a gearing ratio such that said copy sheet moves at substantially the same speed as said original.

6. Apparatus as defined by claim 3 wherein said drive linkage is adapted to cause said copy sheet to be advanced at a lower linear speed than the linear speed of said original.

7. A paper handling system for a photocopy machine: comprising

means effectively defining a copy sheet feed path leading to an imaging station;

copy sheet transport means for advancing a copy sheet along at least a portion of said feed path;

means for effectively defining a separate feed path for an original leading to an illuminating station;

original transport means including a pair of cooperating drive elements for transporting an original along at least a portion of said separate feed path, said pair of cooperating drive elements being effectively spaced a predetermined distance apart at their peripheries, one of said drive elements being adapted to be power driven while the other one of said drive elements is frictionally driven by said original when the latter is between said drive elements;

drive means for operating one of said said elements of said original transport means; and

an interconnecting drive linkage operatively coupled between said other one of the said drive elements of said original transport means and the said copy sheet transport means whereby said copy sheet transport means can be driven by forces applied to an original by said one element of said original transport means.

8. Apparatus as defined by claim 7 wherein said copy sheet transport means is disposed so as to normally engage said copy sheet at a distance from the leading edge of the latter such that said original effectively leaves said original transport means before said copy sheet ends its contact with said copy sheet transport means.

9. A photocopy paper handling apparatus for feeding two separate sheet lengths respectively along two separate non-coextensive feed paths: comprising

a frame;

a first sheet length feeding device for feeding a first sheet length along a first one of said feed paths, said first sheet length feeding device including a pair of feed rolls, said pair of feed rolls being effectively spaced a predetermined distance apart at their peripheries, one of said feed rolls being adapted to be power driven while the other of said feed rolls is frictionally driven by said first sheet length when the latter is between said feed rolls;

means for driving said one of said feed rolls so that said first sheet length may be fed along said first one of said feed paths;

a second sheet length feeding device mounted on said frame, said second sheet length feeding device including an advancing roll adapted to move a second sheet length along at least a portion of the second one of said two feed paths; and

linkage means driven by said second one of said feed rolls for rotating said advancing roll whereby said second sheet length is moved along said second feed path only when said first sheet length is moved along said first feed path by said first sheet length feeding device.

10. Apparatus as defined by claim 9 wherein

said linkage means includes an endless drive member, and wherein the operative periphery of said first and second feed rolls are formed with a plurality of annular grooves.



11. In a photocopy paper handling device:

a first transport means for transporting a first sheet along a first predetermined feed path;

a second transport means for advancing additional sheet material along a separate second predetermined feed path;

a first drive means for operating said first transport means;

a second drive means for operating said second transport means, said second drive means being connected to and driven by the operation of said first drive means in response to an actual frictional feeding movement of said first sheet by said first transport means, said first sheet when moving an incremental distance along said first feed path serving to thereby operate said second transport means so as to advance said additional sheet material a corresponding incremental distance along said second feed path;

said first transport means including a pair of cooperating feed rolls that are effectively spaced a predetermined distance apart at their peripheries, one of said feed rolls being power driven while the other of said feed rolls is frictionally driven by said first sheet when the latter is between said feed rolls;

said second transport means including a roll which is operatively coupled with and driven by said other feed roll.

12. Apparatus as defined by claim 11 wherein said second drive means is arranged so as to cause said additional sheet material to be advanced at a different linear speed than the linear speed at which said first sheet is transported along said first feed path.

13. Apparatus as defined by claim 12 wherein said linear speed of said additional sheet material is less than the linear speed of said first sheet.

14. In a photocopy machine having an original illuminating station and a copy sheet imaging station:

a frame;

first guide means on said frame defining a first feed path along which an original may move in advancing towards said illuminating station;

a first transport means for transporting an original along said first feed path, said first transport means including a first pair of closely spaced feed rolls rotatably mounted on said frame, the spacing between the operative surfaces of said rolls being such that when an original is passed between said rolls a rotational driving of one of said rolls will frictionally produce a rotation of the other one of said rolls;

second guide means on said frame defining a second feed path along which a copy sheet may move in advancing towards said imaging station;

a separator roll rotatably mounted on frame and adapted to initiate movement of a copy sheet along said second feed path;

a second pair of cooperating feed rolls rotatably mounted on said frame, said rolls being disposed along said second feed path so as to be capable of receiving said copy sheet and transporting the latter along the associated portion of said second feed path;

drive means for continuously rotatably driving said one roll and said second pair of feed rolls; and

torque transmitting means operatively interconnecting said separator roll and the other one of said first pair of cooperating feed rolls.

15. Apparatus as defined by claim 14: additionally comprising

additional continuously driven feed rolls operatively mounted on said frame and disposed at a point along said first feed path so as to receive said original as the latter is being fed along said first feed path by said first pair of feed rolls.

16. In a photocopy machine:

a frame;

guide means mounted on said frame for establishing a first predetermined feed path for an original;

a first pair of feed rolls rotatably mounted on said frame and operatively disposed along said feed path, the peripheries of said feed rolls being effectively spaced a predetermined distance apart in accordance with the nature of the original that is to be fed along said feed path, one of said rolls being rotatably driven so that when an original is passing between said rolls the other of said rolls will be rotatably driven by the forces fractionally transmitted through said original;

a second pair of feed rolls rotatably mounted on said frame and operatively disposed along said first feed path so as to receive said original from said first pair of feed rolls;

a hopper mounted on said frame and adapted to hold a stack of copy sheets;

guide means mounted on said frame for establishing a second predetermined feed path along which said copy sheets may serially move, said second feed path being separate and distinct from said first feed path;

means including a rotatable separator roll mounted on said frame and being adapted to separate the leading copy sheet from said stack of copy sheets in said hopper and to initiate a feeding movement of said leading copy sheet along said second feed path;



a third pair of feed rolls rotatably mounted on said frame and being operatively disposed along said second feed path at a point downstream from said separator roll;

a unitary drive means for rotatably actuating said second pair of feed rolls, said third pair of feed rolls and said one roll of said first pair of feed rolls; and

transmission means driven by the said other roll of said first pair of feed rolls for rotatably actuating said separator roll in response to the passage of an original between said first pair of feed rolls.

**17.** Apparatus as defined by claim **16** wherein said unitary drive means comprises a first chain and sprocket means, wherein said separator roll is mounted for rotative overtravel, and wherein said transmission means comprises a second sprocket and chain means.

**18.** Apparatus as defined by claim **17** wherein the cooperating peripheries of said first pair of feed rolls are formed with annular grooves, and wherein said second and third pairs of feed rolls are continuously rotatably driven.

No references cited.

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