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INVENTOR. bernard Ferear
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SLIP SHEETER ATTACHMENT FOR DUPLICATORS

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INVENTOR. BERNARD FERRAR Hover No.fuluider
Aug. 4, 1953
B. FERRAR
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# UNITED STATES PATENT OFFICE <br> 2,647,463 <br> SLIP SHEETER ATTACHMENT FOR DUPLICATORS 

Bernard Ferrar, Los Angeles, Calif.<br>Application May 10, 1949, Serial No. 92,280<br>6 Claims. (CI. 101—419)

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The present invention relates generally to slip sheeter attachments for stencil duplicators, and more particularly, to an attachment of this type which is adapted to have its operation discontinued automatically when the operation of the duplicator to which it is attached is discontinued.
Slip sheeters generally are well known in the art, and accordingly, do not need to be described in detail herein. The purpose of a slip sheeter attachment is to introduce a slip sheet or heavy sheet of cardboard or similar material, between each printed sheet ejected by the duplicator and the next successive sheet whereby to prevent transfer of ink between wet sheets. The usual practice is to provide a tray of slip sheets supported immediately above the receiving tray at the back of the duplicator, which slip sheet tray is constructed and arranged to drop the lowermost of the slip sheets in the stack down into the receiving tray on top of each printed sheet as it is ejected. One device adapted for this purpose is illustrated and claimed in my patent, No. $1,916,723$, issued July 4, 1933, and entitled Improvement in Slip Sheeters.
The particular problem dealt with herein is that of discontinuing the operation of the slip sheeter mechanism whenever the actual printing of sheets by the duplicator is interrupted. It is the usual practice in most duplicators, particularly those which are power-driven, to first start the drive mechanism which involves the printing elements, i. e., stencil and impression rollers, for the purpose of making various preliminary adjustments of the machine, and thereafter engaging the feed mechanism which feeds the blank sheets into the duplicator to receive their impression.
The slip sheeter attachment employed with such machines is mechanically linked to the aforesaid drive mechanism, and so conventionally, unless special means are provided, the slip sheeter mechanism operates immediately that the duplicator is started. Thus, the machine with its attachment will immediately commence the operation of the slip sheeter to drop slip sheets into the receiving tray whether paper is then being fed through the duplicator or not.

Accordingly, it is a major object of the present invention to provide a slip sheeter attachment in which the members linking the mechanical movement of the duplicator with the mechanical movement of the slip sheeter includes a disengageable element responsive to the paper feed
mechanism and/or the actual printing elements in the duplicator.

Another object of the invention is to provide a mounting for a slip sheeter attachment which permits easy and rapid detachment of the slip sheeter mechanism from the duplicator, and also permits the same to be lifted for the purpose of removing printed sheets and slip sheets from the receiving tray.

Still another object of the invention is to provide a slip sheeter attachment which may be readily attached to the duplicator without the use of special tools, and without substantial modification of the duplicator structure.
The foregoing and other objects and advantages of the invention will be apparent from the following detailed description of two forms thereof, such consideration being given likewise to the attached drawings, in which:
Figure 1 is a side elevational view of a stencil duplicator having attached thereto a slip sheeter mechanism embodying one form of the invention;

Figure 2 is a fragmentary, elevational view similar to the left-hand portion of the device shown in Figure 1, but showing the slip sheeter attachment in a raised position;

Figure 3 is an elevational sectional view taken on the line 3-3 in Figure 1;

Figure 4 is a fragmentary section taken on the line 4-4 in Figure 1, showing the means for supporting and feeding the slip sheets;

Figure 5 is an elevational view looking outwardly from inside the duplicator illustrated in Figure 1, and illustrating portions of the linkage mechanism connecting the duplicator and the slip sheeter attachment;

Figure 6 is a partially sectioned view taken on the line 6-6 in Figure 5;

Figure 7 is a fragmentary elevational view 0 similar to Figure 5 , but showing the parts in a disengaged position;

Figure 8 is a horizontal sectional view taken on the line 8-8 in Figure 7;
Figure 9 is a fragmentary elevational view of 5 a duplicator and slip sheeter attachment embodying a modified form of the invention, a part of the duplicator being broken away to reveal underlying parts;
Figure 10 is an elevational view looking outward 0 form inside of the duplicator of Figure 9, further illustrating the parts of the linkage interconnecting the duplicator and slip sheeter attachment; and

Figure 11 is a partially sectioned view taken on the line $11-11$ in Figure 10.

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For the following detailed description of a first form of the invention, reference should be had to Figures 1 through 8, wherein it will be seen that a conventional stencil duplicator is identified by the reference character 20, and carries at the rear thereof a slip sheeter attachment identified generally by the reference character 21 . In Figure 3, it will be seen that the slip sheeter attachment 21 is formed with a pair of gussetlike brackets 26 by which it is supported on the rear of the housing 22 of the duplicator 20. The attachment brackets 26 are secured to the housing 22 by means of a pair of bolts 23 at the upper ends of brackets 26 , which bolts 23 are secured by nuts 24, and at the lower ends of the brackets 26, notches 21 are formed which engage a pair of studs 25 fixed in the housing 22. Thus, when it is desired to remove printed sheets from the tray 30 of the duplicator 20, the slip sheeter attachment 21 may be lifted to the position illustrated in Figure 2, whereby to provide easy access to the tray 30. When lifted, as just described, the attachment 21 pivots about the bolts 23.
In Figure 4, the principle of operation of the slip sheeter attachment 21 is illustrated. Here it will be seen that a stack of slip sheets 31 rests on a pair of longitudinal rods 32, each of which is notched, as indicated at 33 , the notches running the entire length of the rod 32 . When the two rods 32 are simultaneously revolved toward each other, as indicated by the arrows in Figure 4, the notches engage the edges of the lowermost slip sheet, causing the same to buckle downwardly, as indicated by dotted lines at 34, and thus eject the lowermost sheet downwardly into the tray 30 where it falls on top of the last sheet ejected from the duplicator 20.
The foregoing operation of the slip sheeter attachment is illustrated in my above-mentioned patent, and is briefly described herein for purposes of clarity in discussing the further operation of the device which involves the present invention.
As is well known in the art, each revolution of the stencil roller in the duplicator 20 ejects a printed sheet from the rear of the machine, when the paper feed mechanism is operated. When the paper feed mechanism is disengaged, however, the stencil roller continues to revolve and no sheets are fed through the device.
The means for transmitting the rotary motion of the stencil roller in the duplicator 20 to the slip sheeter mechanism 21 may be seen generally in Figure 1. Here is shown a large gear 36 conventionally mounted on a shaft of the stencil roller and the duplicator 20 meshed with an intermediate gear 31 which carries on a common shaft therewith, a second intermediate gear 38 which in turn is meshed with a crank drive gear 39. Thus, each revolution of the main drive gear 36 results in a single revolution of the crank drive gear 39 which drives a crank 40 connected by a connecting rod 41 to a driven crank 42 , which forms a part of the slip sheeter attachment mechanism. The nature and disposition of the just described gears can be seen best in Figures 1 and 6.

As can be seen best in Figure 1, the driven crank 42 is greater in length than the driving crank 40, whereby a complete revolution of the crank 40 results in only a partial arcuate reciprocation of the crank 42.

As illustrated in Figure 3, the crank 42 is keyed to a transverse shaft 45 journaled in a frame 46 of the slip sheeter attachment 21. Also keyed to
the transverse shaft 45 are bevel gears 41, each of which is meshed with a smaller bevel gear 48, each of the latter gears being secured to one of the rods 32.

Thus, each reciprocating motion of the crank 42 results in a reciprocal rotation of the shaft 45, and through the driving connection of the gears 47 and 48, results in reciprocal rotation of the rods 32. Accordingiy, each time the stencil roller in the duplicator 20 makes one revolution, the rods 32 are reciprocated to eject one slip sheet into the tray 30.

It will be noted that, unless other means were provided, the operation of the mechanism of the slip sheeter attachment 21 would continue as long as the stencil roller in the duplicator 20 revolved, regardless of whether or not paper was being pressed through the duplicator 20. To prevent this wasteful operation, a clutch mechanism, illustrated in Figures 5 through 8, is interposed between the transmission gear 39 and the crank 40. The clutch, just described, is indicated generally by the reference character 50, and will be seen to include an arm 51 secured to a rotary shaft 52 to the right end of which is keyed a gear 39 and on the left end of which the crank 40 is rotatably carried.

Other operative members of the clutch 50 include a sector member 5s, pivotally secured to the arm 54 by a pivot pin 54, and an actuating spring 55 anchored to a crosspin 56 in the arm 51 and attached at its lower end to the sector member 53 whereby to urge the same outwardly (to the left in Figure 6). An upstruck lug E7 is formed on the sector member 53 and positioned to engage the crank 40 when the sector member 53 is rotated by the gear transmission, including the gear 33. The direction of this rotation is clockwise as seen in Figure 5.
Thus, as the mechanism is rotated, the crank 40 is normally engaged for driving rotation by reason of the spring 5 urging the sector member 53 outwardly into engagement with the crank 80. In order now to disengage the cluteh 50 and permit the gear 35 to be rotated without rotating the crank 40, a disengaging roller 60 rotatably carried on a pivoted control member or bracket 61 may be moved inwardly to the position indicated in Figure 7, whereupon the roller 60 is positioned to engage the sector member 53 adjacent the periphery thereof whereby to force the same rearwardly against the action of the spring 55 and release the engagement of the lug 57 from the crank 40 , allowing the latter to remain stationary.

The bracket 61 is mounted by a pivot 62 to a stationary mounting plate 63 which also serves to carry one of the bearings 64 for the shaft 52. The other of the bearings 64 is carried in a mounting block 69 which, together with the plate 63, forms a clamp to secure the gear and clutch structure to a chassis plate $22 a$ which is part of the duplicator 20.
The upper end of the bracket 61 is bifurcated, as indicated by the reference character 65, and engaged with an actuating lever 66 which in turn is keyed to a shaft 67 which forms a part of the paper feed and impression roller mechanism of the duplicator 20 . The shaft 67 is included in the paper feed and impression roller mechanism of the duplicator 20, and since the aforesaid mechanism per se does not form a part of the present invention, such mechanism need not be described herein. Suffice it to say, however, that the shaft 67 and lever 66 thereon are
adapted for reciprocal rocking movement, as indicated by the arrow in Figure 5, and the lever 66 is in its lowermost position, as shown in Figure 5 , whenever paper is being fed through the duplicator 20. Insofar as the duplicator per se is concerned, the purpose of movement of the shaft 61 is to disengage the printing elements when no paper is being fed.

Whenever paper is no longer being fed through the duplicator 20 , the lever 66 is in its uppermost position, as illustrated in Figure 7. Such upward movement of the lever 66 moves the bracket 61 to carry the roller 60 inwardly into the position illustrated in Figure 7, whereupon it engages the sector member 53 to disengage the clutch, as previously described. When the roller 60 is moved inwardly into position to engage the sector member 53, the same may, of course, be in a portion of its path beyond the roller 60 in which case it will complete a revolution to a position of the roller 60, whereupon the sector member 60 will be moved rearwardly to "drop" the crank 40 which will remain stationary due to the fact that the sector member 53 will be pushed out of engaging position each time it revolves past the then position of the crank. During such disengagement, the shaft 52 will revolve freely in the crank 40 . It will be noted that the leading and trailing edges of the sector member 53 are formed with rearwardly bent tabs 63 whereby to form cam-like surfaces for engaging the roller 60.

Thus, it will be seen that the operation of the slip sheeter attachment 21 illustrated in Figure 1 is fully automatic and operates only when required. Furthermore, due to the pivotal attachment of the connecting rod 41 to the cranks 40 and 42 at the respective ends thereof, the attachment 21 may be lifted to the position shown in Figure 2 without disconnecting the drive mechanism.

An alternate form of drive mechanism is illustrated in Figures 9 through 11. Here it will be seen that the attachment 21 is secured to the rear of the duplicator 20 by the same brackets 26, bolts 23, and pins 25 , as in the previous embodiment. The linkage connecting the mechanism of the duplicator 20 and the attachment 21 differs in the second embodiment, however. In the modified form, the mechanical motion taken from the duplicator 20 is derived from a reciprocating bell crank 10 which forms part of the duplicator mechanism. The bell crank 70 is mounted to an internal chassis plate 71 of the duplicator 20 by a fixed pivot 72. Two connecting rods 73 and 76 involved in the operation of the duplicator 20 are connected to the ends of the crank 70. The operation of the duplicator 20 is such that the crank 70 makes one reciprocal movement for each revolution of the stencil roller.
The above described reciprocal movement of the bell crank 70 is transmitted to the slip sheeter attachment 21 by means of a mechanical linkage comprising a clamp 75 secured to the vertical arm of the bell crank 70 , a reciprocating connecting bracket 76, pivotally secured to the clamp 75 by a pin 17, and a connecting rod 78, pivotally secured to the bracket 76 by a pin 19. The rearward end of the connecting rod 18 is formed with a notch 80 which is positioned and adapted to engage the crank pin 81 of the crank 42 of the slip sheeter attachment 21. The connecting bracket 76 is provided with an additional pin 82 therein, and the pins 79 and 82 ride ing ton timed throush the machine. At all other it out of contact with the stencil.
Thus, it will be seen that the raising and lowering of the impression roller 97 concurrently raises and lowers the inner or forward end of the control lever : 90, producing the opposite movement of its rearward end projection 93. Thus, the connecting rod 18 is automatically disengaged whenever the impression roller 97 is lowered.
The rearward extremity of the connecting rod 78 is formed with a foot-like portion 100 so that if the connecting rod 78 is disengaged, and thereafter lowered when the notch 80 does not lie immediately above the crank pin 81, the connecting rod 78 will rest with the foot-like portion 100 on top of the pin 81 , and upon any reciprocation of the rod 78, the notch 80 will fall into engagement with the pin 81, as aforesaid.

As in the case of the previous embodiment, the pivotal connection of the connecting rod 78 permits the slip sheeter attachment 21 to be tilted upwardly in order to get at the tray 30 without interfering with the connection of the operating mechanism, or requiring the disconnection of any mechanical parts.

While the attachments shown and described 75 herein are fully capable of achieving the objects
and providing the advantages hereinbefore stated, it will be realized that they are capable of considerable modification without departure from the spirit of the invention. For this reason, I do not mean to be limited to the forms shown and described, but rather to the scope of the appended claims.

I claim:

1. In combination with a duplicator of the type having driven printing elements adapted to print sheets and eject the same from between said printing elements into a receiving tray of said duplicator, and a paper feed mechanism connected to operate synchronously therewith to feed sheets thereto, and in which said paper feed may be interrupted while said printing elements are rumning, a slip sheeter attachment comprising: a rectangular frame adapted to receive a stack of slip sheets; a pair of brackets secured to said frame and attached by pivots arranged on a transverse axis adjacent the rear of said duplicator above said receiving tray whereby said slip sheets are normally positioned to drop into said receiving tray on top of printed sheets therein and whereby said frame may be tilted upwardly about said axis to remove printed sheets and slip sheets from said receiving tray; a pair of longitudinal rods rotatably mounted in said frame and positioned to support said slip sheets thereon adjacent the lower edges of said stack, said rods being iongitudinally grooved whereby concurrent rotation thereof buckles the lowermost of said slip sheets downwardiy to eject the same into said receiving tray; a pair of bevel gears, one mounted on each of said rods; a transverse shaft having a second pair of bevel gears thereon, each meshed with one of said first gears whereby a partial rotation of said shaft efiects concurrent partial rotation of said rods; a crank on said shaft having a crank pin parallel to and adjacent said axis; a disengageable connecting member connected between said printing elements and said crank pin to actuate the latter each time a sheet is printed; and a control member operativeiy connected between said paper feed mechanism and connecting member to disengage the latter when said paper feed is interrupted.
2. In combination with a duplicator of the type having driven printing elements adapted to print sheets and eject the same from between said printing elements into a receiving tray of said duplicator, and a paper feed mechanism connected to operate synchronously therewith to feed sheets thereto, and in which said paper feed may be interrupted while said printing elements are running, a slip sheeter attachment comprising: a rectangular frame adapted to receive a stack of slip sheets; a pair of brackets secured to said frame and attached by pivots arranged on a transverse axis adjacent the rear of said duplicator above said receiving tray whereby said slip sheets are normally positioned to drop into said receiving tray on top of printed sheets therein and whereby said frame may be tiited upwardly to remove printed sheets and slip sheets from said receiving tray; an ejector mechanism in said frame adapted upon one actuation thereof to eject a slip sheet from said stack into said receiving tray, said ejector mechanism including a reciprocating actuating crank having a crank pin parallel to and closely adjacent said transverse axis; a disengageable member pivotally connected between said printing elements and said crank pin to actuate the
ejector mechanism each time a sheet is printed; and a control member operatively connected between said paper feed mechanism and connecting member to disengage the latter when said paper feed is interrupted.
3. In combination with a duplicator of the type having power-rotated printing elements adapted to print sheets and eject the same from between said printing elements into a receiving tray of said duplicator, and having a paper feed meohanism connected to operate synchronously with said printing elements to feed sheets thereta, and in which said paper feed may be interrupted while said printing elements are rotating, a slip sheeter attachment comprising: a rectangular frame adapted to receive a stack of slip sheets; a pair of brackets secured to said frame and pivotally attached to the rear of said duplicator above said receiving tray whereby said slip sheets are normally positioned to drop into said receiving tray on top of printed sheets therein and whereby said frame may be tilted upwardly to remove printed sheets and slip sheets from said receiving tray; a pair of longitudinal rods rotatably mounted in said frame and positioned to support said slip sheets thereon adjacent the lower edges of said stack, said rods being longitudinally grooved whereby concurrent rotation thereof buckles the lowermost of said slip sheets downwardly to eject the same into said receiving tray; a pair of bevel gears, one mounted on each of said rods; a transverse shaft having a second pair of bevel gears thereon, each meshed with one of said first gears whereby a partial rotation of said shaft effects concurrent partial rotation of said rods; a crank on said shaft; a drive member rotatably mounted in said duplicator and operatively connected to be driven by said rotating printing elements; a rotary clutch having a drive element connected to be driven by said drive member, a driven element, and an interengaging element movably carried by said drive element and movabie selectively to a position in which said drive and driven elements are interengaged for concurrent ratation, or to a position in which said drive and driven members are disconnected for independent rotation of said drive element; a drive crank positioned and connected to be driven by said clutch; a connecting rod pivotally connected at one end to said drive crank and at the other end to said crank on said slip sheeter shaft whereby normally to operate said slip sheeter in synchronism with said printing element, the pivotal connection of said rod at said slip sheeter end having its axis parallel to, and adjacent the pivotal axis of said brackets whereby said frame may be tilted without disconnecting said rod; and a control member for said clutch cperatively connected to said paper feed mechanism, said control member having a portion adapted to be interposed in the path of said movable clutch element whereby to strike the same upon rotation of said drive element of said clutch and move said movable element out of engagement to disconnect said drive and driven clutch members whereby to stop the operation of said slip sheeter attachment when said paper feed is interrupted.
4. In combination in a duplicator of the type in which sheets are automatically fed between printing elements therein and delivered into a receiver tray therein, and a slip sheeter attachment of the type from which slip sheets are introduced between successive printed sheets in
said tray, and in which said duplicator includes means to disengage said printing elements to interrupt the printing of said sheets while leaving the drive mechanism of said duplicator running, means interconnecting said duplicator and attachment including: means mounting said attachment above said tray in position to drop said slip sheets into said tray, said mounting means including pivot connections arranged on an axis adjacent an end of said tray to permit uptilting of said attachment for removal of printed and slip sheets from said tray; a drive crank mounted in said duplicator and driven by said drive mechanism of said duplicator; a connecting rod connected at an inner end to said drive crank; a driven crank in said attachment adapted to actuate said attachment upon reciprocation of said driven crank, a pin of said crank being connected to the outer end of said connecting rod to be reciprocated thereby, said crank pin being parallel to and closely adjacent said connecting pivot axis whereby to permit said uptilting of said attachment without interference from said connecting rod; linkage operatively associated with, and including said connecting rod and having a disengaging member therein to disconnect said linkage to interrupt operation of said attachment while said drive mechanism remains running; and a. control member connected between one of said printing elements and said disengaging element to operate the latter when said printing element is disengaged whereby to discontinue operation of said attachment whenever said printing is interrupted.
5. In combination in a duplicator of the type in which sheets are automatically fed between printing elements therein and delivered into a receiver tray therein, and a slip sheeter attachment of the type from which slip sheets are introduced between successive printed sheets in said tray, and in which said duplicator includes means to disengage said printing elements to interrupt the printing of said sheets while leaving the drive mechanism of said duplicator running, means interconnecting said duplicator and attachment including: means mounting said attachment above said tray in position to drop said slip sheets into said tray, said mounting means
including pivot connections arranged on an axis adjacent an end of said tray to permit uptilting of said attachment for removal of printed and slip sheets from said tray; a drive crank mounted in said duplicator and driven by said drive mechanism of said duplicator; a connecting rod connected at an inner end to said drive crank; a driven crank in said attachment adapted to actuate said attachment upon reciprocation of said driven crank, a pin of said crank being connected to the outer end of said connecting rod to be reciprocated thereby, said crank pin being parallel to and closely adjacent said connecting pivot axis whereby to permit said uptilting of said attachment without interference from said connecting rod; a rotary clutch intercoupled between said drive mechanism of said duplicator and said drive crank; and means including a control member for said clutch operatively connected to one of said printing elements whereby disengaging movement of the latter disengages said clutch to stop the operation of said attachment when said printing is interrupted.
6. The construction of claim 5 further characterized in that said clutch includes a drive element, a driven element, and an interengaging element movably carried by said drive element and movable selectively to a position in which said drive and driven elements are interengaged for concurrent rotation or to a position in which said drive and driven members are disconnected for independent rotation of said drive element, and in which said control means includes a member adapted to be interposed in the path of said movable clutch element whereby to strike the same upon rotation of said drive element and move said movable element out of engagement to disconnect said drive and driven members.

## BERNARD FERRAR.

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