Aug. 28, 1945. H. J. LUEHRS ET AL 2,383,807

SHEET FEEDER

Filed April 22, 1944 4 Sheets-Sheet 1

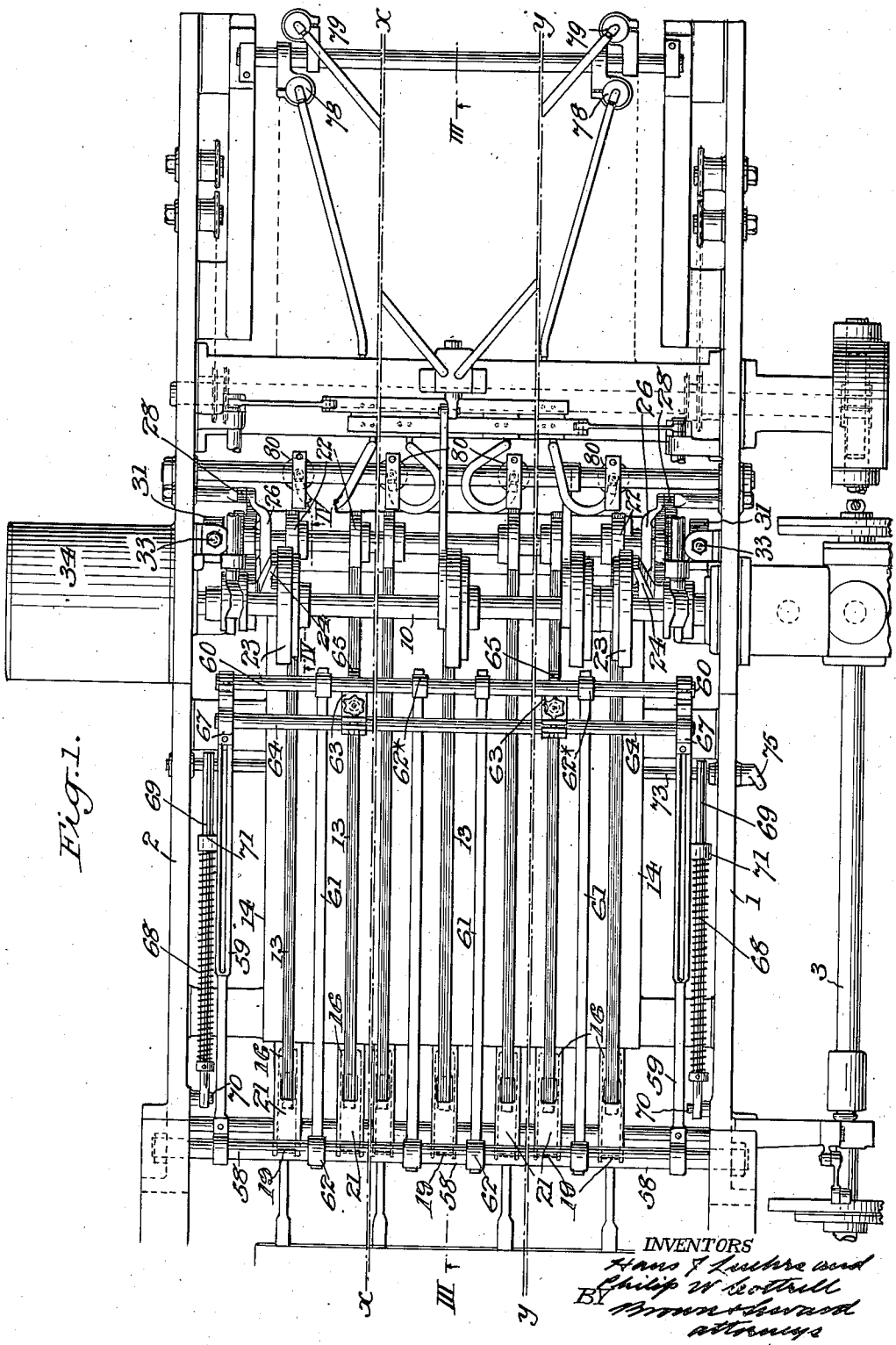


Fig. 1.

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SHEET FEEDER

Filed April 22, 1944 4 Sheets-Sheet 2

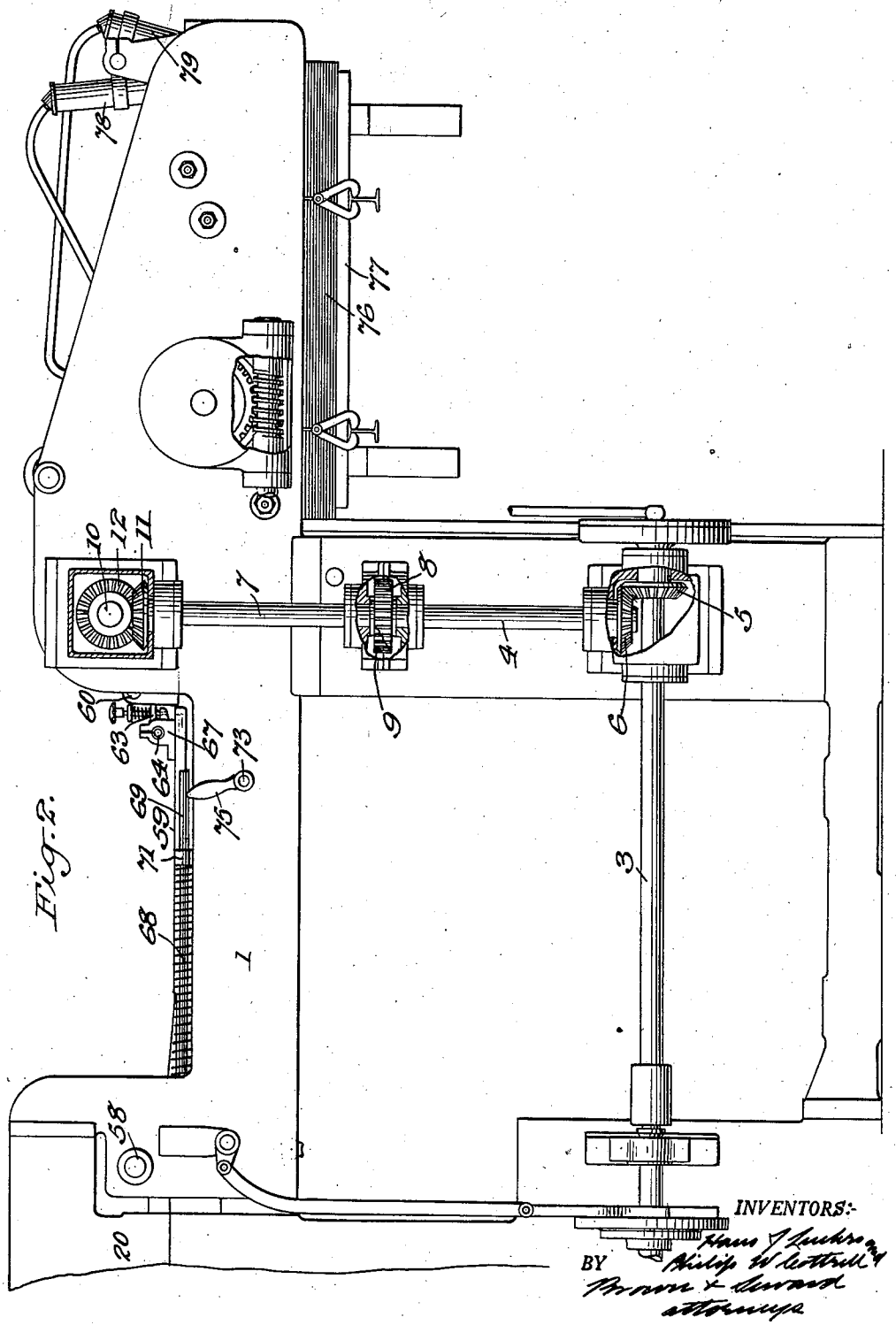


Fig. 2.

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SHEET FEEDER

Filed April 22, 1944 4 Sheets-Sheet 3

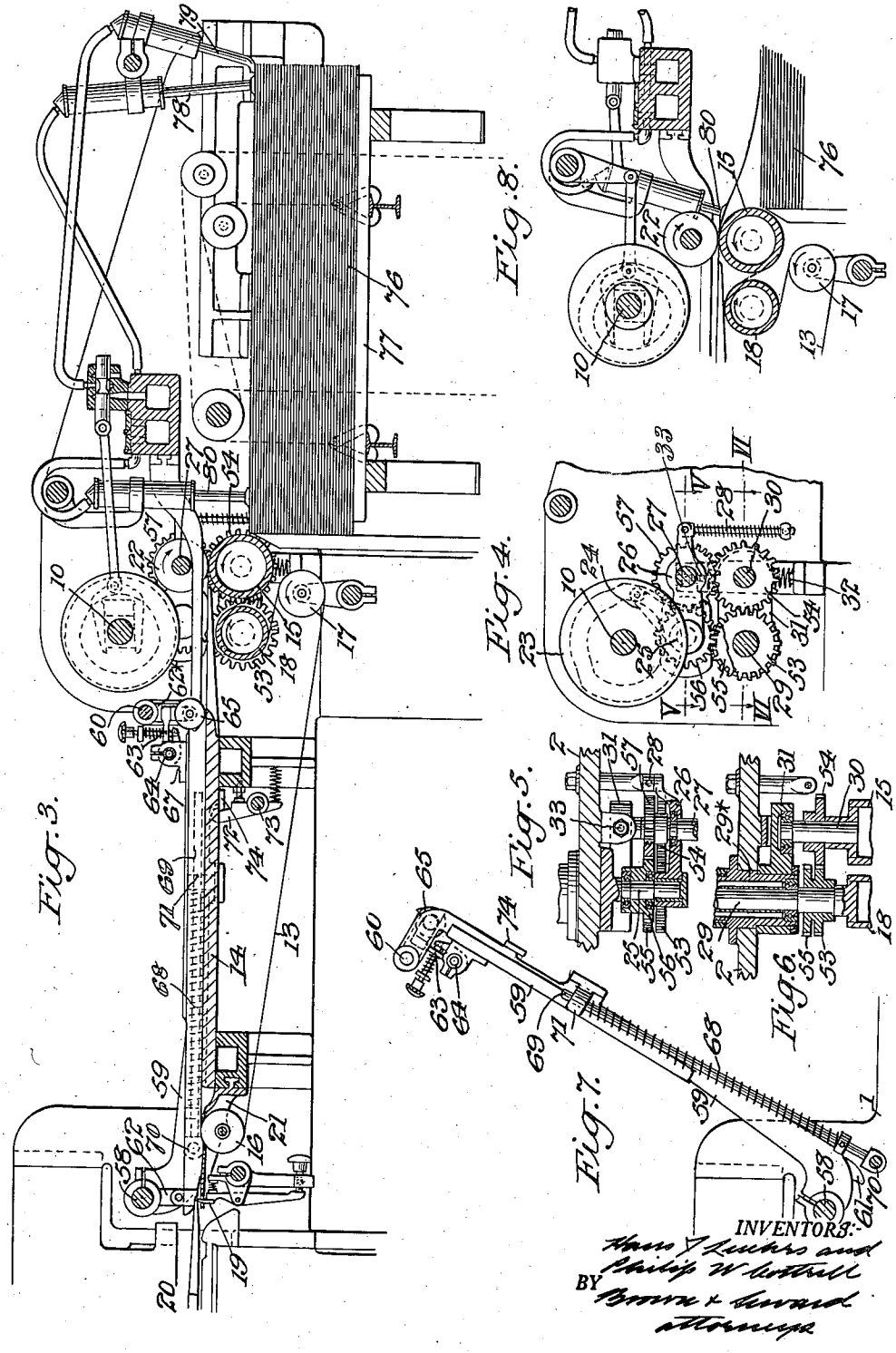


Fig. 3.

Fig. 8.

Fig. 4.

Fig. 5.

Fig. 6.

Fig. 7.

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SHEET FEEDER

Filed April 22, 1944 4 Sheets-Sheet 4

Fig. 11.

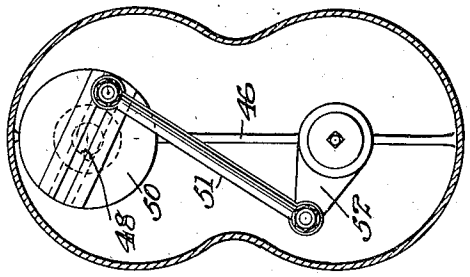


Fig. 12.

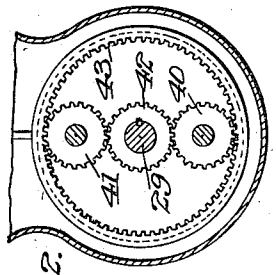


Fig. 9.

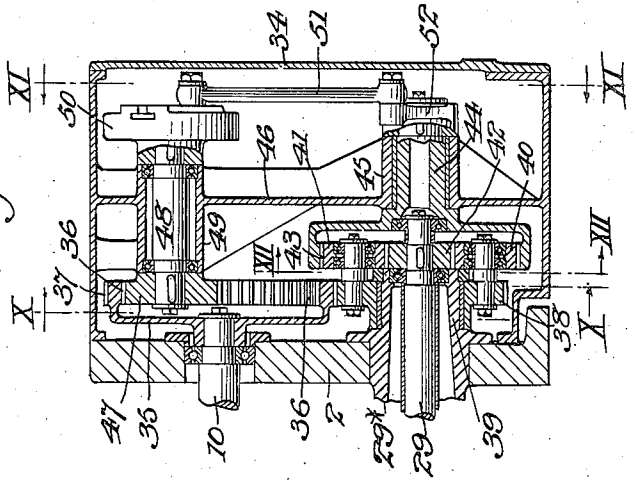
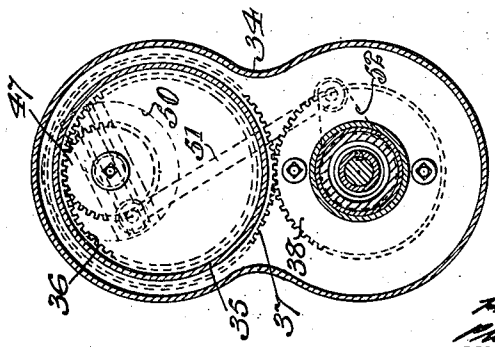


Fig. 10.



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Patented Aug. 28, 1945

2,383,807

UNITED STATES PATENT OFFICE

2,383,807

SHEET FEEDER

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Application April 22, 1944, Serial No. 532,292

14 Claims. (Cl. 271—12)

One object of our invention is to provide novel and efficient means including a change speed mechanism for forwarding sheets in spaced relationship from a source of sheet supply to the head guides of a sheet handling machine, as, for instance, a sheet cutter and creaser.

Another object is to provide an endless tape carrier and coacting pinch rollers driven at a variable speed from the change speed mechanism and operable to take a sheet while the rollers and carrier are at their lowest speed, then gradually increase their speed while the sheet is being forwarded toward the head guides, and finally gradually decrease their speed to the lowest point as the sheet reaches the head guides.

Another object is to provide variable speed pinch rollers which are positively driven synchronously with the tape carrier, which pinch rollers are caused to periodically coact at the feeding-in end of the endless carrier to take the sheet fed thereto from the source of sheet supply when the rollers and carrier are traveling at a low speed and to also provide frictionally driven web feed pressure rolls to keep control of the sheet after it has left the positively driven pinch rollers and until it reaches the front guides.

Another object is to ensure a positive and uniform control of the sheet throughout its travel by providing driving and actuating means for the sheet forwarding mechanism at both sides of the endless tape carrier, whereby torsional delays and inaccurate pinch action is avoided.

A practical embodiment of our invention is represented in the accompanying drawings in which:

Fig. 1 represents a top plan view of a sheet feeder embodying our invention as applied to a sheet cutter and creaser, two interior portions along the feeder and sheet cutter and creaser being removed as indicated by the broken lines x—x and y—y;

Fig. 2 represents a front elevation of the feeder with certain parts broken away;

Fig. 3 represents a vertical section taken in the plane of the line III—III of Fig. 1;

Fig. 4 represents a detail vertical section taken in the plane of the line IV—IV of Fig. 1;

Fig. 5 represents a detail horizontal section taken in the plane of the line V—V of Fig. 4;

Fig. 6 represents a detail horizontal section taken in the plane of the line VI—VI of Fig. 4;

Fig. 7 represents a detail vertical section showing the sheet guide frame swung upwardly to gain easy access to the endless tape carrier and adjacent parts;

Fig. 8 represents a detail vertical section showing the parts in the positions they assume when the head end of a sheet has been fed from a pile to the positively driven pinch rollers;

Fig. 9 represents an enlarged detail vertical central section of the speed changing mechanism for imparting a variable speed to the tape carrier and its pinch rollers;

Fig. 10 represents a cross section taken in the plane of the line X—X of Fig. 9;

Fig. 11 represents a cross section taken in the plane of the line XI—XI of Fig. 9; and

Fig. 12 represents a cross section taken in the plane of the line XII—XII of Fig. 9.

The front and rear side frames of the feeder are denoted by 1 and 2. The constant speed horizontal main drive shaft 3 of the sheet cutter and creaser is shown as driving the vertical shaft 4 of the feeder through angle gears 5, 6, which shaft 4 drives the second vertical shaft 7 through the spur gears 8 and 9. This shaft 7 drives the cross shaft 10 through angle gears 11, 12. The main drive shaft 3 and the shafts 4, 7 and 10 are all designed to be driven one to one with the cutter and creaser, a portion only of which is illustrated in the accompanying drawings.

The tapes 13 of the variable speed endless carrier pass from around the tape drive roller 18 to and around the pinch roller 15 and from thence along the top of the feed table 14 to and around the rollers 16 at the delivery end of the carrier. From these rollers 16 the tapes pass under the table 14 to and around the compensating rollers 17 and thence to the tape drive roller 18.

Head guides 19 for the sheet cutter and creaser 20 are located adjacent the brackets 21 which carry the tape rollers 16 at the delivery end of the endless tape carrier.

Pinch rollers 22 are arranged to intermittently coact with the pinch roller 15 at the feeding-in end of the carrier. These pinch rollers 22 are raised and lowered to open and close the space between them and the pinch roller 15 for receiving and gripping the leading end of a sheet by providing the constant speed cross drive shaft 10 with two cams 23 engaging studs or rollers on arms 24 of rock levers pivoted on stud shafts 25, the other arms 26 of which rock levers having the corresponding ends of the pinch roller shaft 27 journaled therein.

Springs 28 engaging the lever arms 26 may be employed for removing any back-lash between the cams 23 and the rock levers, thus ensuring an accurately timed contact between the pinch

rollers 22 and 15 at both sides of the endless carrier.

It will be understood that the ends of the shaft 29 of the tape feed roller 18 are rotatably mounted in studs 29* carried by the frames 1 and 2 of the feeder, and that the ends of the shaft 30 of the pinch roller 15 are rotatably mounted in rock arms 31 pivoted on the studs 29*. Springs 32 serves to yieldingly support the rock arms 31 against the adjustable stops 33 to take care of any over-travel of the pinch rollers 22 in their closing movement and to provide a safety device if more than one sheet should be inadvertently fed to the endless carrier.

A change speed mechanism is employed between the constant speed drive shaft 10 and the tape feed roller shaft 28, as follows: One end of the shaft 10 projects into a housing 34 where it is provided with a gear 35 having internal teeth 36 and external teeth 37. The external teeth 37 of this gear 35 mesh with a spur gear 38 rotatably mounted on an extension of one of the hollow studs 29* concentric with the tape feed roller shaft 29, which gear 38 carries eccentrically two small spur gears 40, 41 which mesh with a spur gear 42 keyed to the shaft 28 of the tape drive roller 18. These small spur gears 40, 41 also mesh with the teeth of an internal gear 43, the hollow shaft 44 of which is pivoted to rock in a suitable hollow bearing 45 of the partition 46 in the housing 34.

The internal teeth 36 of the gear 35 mesh with a spur gear 47 fast on one end of a shaft 48 rotatably mounted in a suitable bearing 49 of the said partition 46 of the housing. The other end of this shaft 48 carries a crank disc 50 adjustably connected to the upper end of a rod 51, the lower end of which rod is connected to an arm 52 fast on the shaft 44 which carries the internal gear 43.

Both ends of the pinch roller 15 which coacts with the pinch rollers 22 are positively driven from the tape drive roller 18 through two pairs of spur gears 53, 54 on the roller shaft 29, 30 respectively. Both ends of the pinch roller shaft 27 are driven from the shaft 29 of the tape drive roller 18 through the two sets of gears 55, 56, 57 at both sides of the endless carrier.

The sheet guide frame located above the endless tape carrier comprises the following elements: A rock shaft 58 is pivoted to swing in the frames 1 and 2 adjacent the delivery end of the endless tape carrier. Two side arms 59 extend from the rock shaft 58 and are connected at their uprising free ends by a crossbar 60. Sheet guides 61 extend between the hangers 62 on the rock shaft 58 and hangers 62* on the crossbar 60. Spring pressed arms 63 are pivoted on the tubular crossbar 64 which arms carry the additional sheet feed rollers 65 in position to coact with their endless carrier tapes 13 to be frictionally driven thereby. These feed rollers 65 are adjustable toward and away from the head guides 19 for different lengths of sheets by mounting their supporting crossbar 64 in two brackets 67 adjustable along the side arms 59. Springs 68 are mounted on rods 69 which are pivoted on studs 70 projecting from the frames 1 and 2 and slidable in lugs 71 on the arms 59. These springs 68 serve to counterbalance the sheet guide frame so that it may be easily swung from its closed position to its open position. This sheet guide frame is locked in its closed position by spring pressed latches 72 fast on a crossbar 73, which latches engage keepers 74 on the side arms 59. A handle 75 on the operator side of the feeder serves as a means for rocking the rod 73 to release the latches 72 and thereby the sheet guide frame.

Sheets may be fed from a pile 76 on an elevating table 77 to the endless tape carrier between the pinch rollers 15 and 22 by any well known or approved means, such, for instance, as suction lifting, blowing, and feeding devices 78, 79 and 80, the operation of which forms no part of the present invention.

In operation: A sheet is taken from the pile 76 in the usual manner and fed into the space between the positively driven variable speed pinch rollers 15 and 22 while the pinch rollers 22 are in their raised position. The pinch rollers 22 are then lowered to grip the sheet against the pinch rollers 15 and endless carrier tapes 13, thereby causing the sheet to be forwarded with the tape carrier at a low speed. The head of the sheet then passes between the frictionally driven feed rollers 65 and their tapes 13, the tape carrier and the rollers being speeded up gradually to the maximum and thereafter slowed down until the sheet reaches its lowest speed as it reaches the head guides 19 of the sheet handling machine 20.

It will be understood that the feed rollers 65 are adjusted toward and away from the head guides 19 to a position that will cause the leading end of the sheet to reach the head guides just after the tail end of the sheet has left the rollers.

It will also be understood that the above feeding operation occurs during one-half of the cycle of the sheet handling machine, i. e., one-half of a rotation of the drive shaft 10. During the other half of the cycle it is intended that no sheet be forwarded to the machine by the endless carrier.

When it is desired to gain ready access to the feed board, head guides, tape carrier, etc., the handle 75 may be manipulated to unlock the sheet guide frame and thereby permit it to be swung to its open position as shown in Fig. 7.

It will also be seen that the positive control of the sheet is maintained throughout its forwarding variable speed movement, at both sides of the sheet thereby ensuring absolute accuracy in the movement thereof.

The change speed mechanism shown and described but not claimed per se herein, forms the subject matter of our divisional application filed February 22, 1945, its Serial No. being 579,172.

It is evident that various changes may be resorted to in the construction, form and arrangement of the several parts without departing from the spirit and scope and our invention and hence we do not intend to be limited to the particular embodiment herein shown and described, but what we claim is:

1. In a sheet feeder, a constant speed drive shaft, head guides, an endless tape carrier, means for feeding successive spaced sheets thereto, a tape drive roller and its shaft, and a change speed mechanism operatively connecting the constant speed drive shaft with the tape drive roller shaft to drive the carrier at a minimum speed for forwarding the sheets thereon slowly as they start, then increasing the speed of the carrier and sheets to a maximum and finally decreasing the speed of the carrier and sheets to a minimum so that the sheets will reach the head guides at a low speed, said change speed mechanism being operable to impart to the endless

tape carrier one cycle of its variable speed movement each one-half rotation of the constant speed drive shaft, and the said sheet feeding means serving to feed a sheet to the endless tape carrier each rotation of the drive shaft.

2. In a sheet feeder, a constant speed drive shaft, head guides, an endless tape carrier, means for feeding successive spaced sheets thereto, a tape drive roller and its shaft, upper and lower pinch rollers and their shafts, a change speed mechanism operatively connecting the constant speed drive shaft with the tape drive roller shaft and the pinch roller shafts to positively drive the carrier and pinch rollers at a variable speed for forwarding the sheets slowly as they start, increasing the speed of the sheets and finally decreasing the speed of the sheets so that they will reach the head guides at a low speed, and operative connections between the constant speed drive shaft and both ends of the upper pinch roller shaft for periodically raising the upper pinch rollers to permit the insertion of the sheets between the pinch rollers.

3. In a sheet feeder, a constant speed drive shaft, head guides, an endless tape carrier, means for feeding successive spaced sheets thereto, a tape drive roller and its shaft, upper and lower pinch rollers and their shafts, operative connections between both ends of the tape drive roller shaft and both ends of the upper and lower pinch roller shafts, a change speed mechanism operatively connecting the constant speed drive shaft with the tape drive roller shaft for forwarding the sheets slowly as they start increasing the speed of the sheets and finally decreasing the speed of the sheets so that they will be traveling at a low speed as they reach the head guides, and operative connections between the constant speed drive shaft and both ends of the upper pinch roller shaft for periodically raising the upper pinch rollers to permit the insertion of the sheets between the pinch rollers.

4. In a sheet feeder, a constant speed drive shaft, an endless tape carrier, means for feeding spaced sheets thereto, a tape drive roller shaft, upper and lower pinch rollers and their shafts operatively connected to the tape drive roller shaft, rocking supports for the upper pinch roller shaft, cams on the constant speed drive shaft for periodically rocking the upper pinch roller supports, and a change speed mechanism operatively connecting the constant speed drive shaft to the tape drive roller shaft and pinch roller shafts to drive the endless carrier and pinch rollers at a variable speed.

5. In a sheet feeder, a constant speed drive shaft, an endless tape carrier, means for feeding spaced sheets thereto, a tape drive roller shaft, upper and lower pinch rollers and their shafts operatively connected to the tape drive roller shaft, rocking supports for the upper pinch roller shaft, cams on the constant speed drive shaft for periodically rocking the upper pinch roller supports, yielding supports for the lower pinch roller, and a change speed mechanism operatively connecting the constant speed drive shaft to the tape drive roller shaft to drive the endless carrier and pinch rollers at a variable speed.

6. In a sheet feeder, head guides, a variable speed endless tape carrier, means for feeding spaced sheets thereto, a sheet guide frame located above the endless tape carrier and adapted to be swung between its closed and opened positions independently of the tape carrier, and sheet forwarding rollers carried by the frame in position to be frictionally driven by the endless tape carrier.

7. In a sheet feeder, head guides, a variable speed endless tape carrier, means for feeding spaced sheets thereto, a sheet guide frame located above the endless tape carrier and adapted to be swung between its closed and opened positions independently of the tape carrier, and sheet forwarding rollers carried by the frame in position to be frictionally driven by the endless tape carrier and adjustable into position to release the tail ends of the sheets just before their leading ends reach the head guides.

8. In a sheet feeder, head guides, a variable speed endless tape carrier, means for feeding spaced sheets thereto, a sheet guide frame located above the endless tape carrier and adapted to be swung between its closed and opened positions independently of the tape carrier, and spring pressed sheet forwarding rollers carried by the frame in position to be frictionally driven by the endless tape carrier.

9. In a sheet feeder, head guides, a variable speed endless tape carrier, means for feeding spaced sheets thereto, a sheet guide frame located above the endless tape carrier and adapted to be swung between its closed and opened positions independently of the tape carrier, and spring pressed sheet forwarding rollers carried by the frame in position to be frictionally driven by the endless tape carrier and adjustable along the frame into position to release the tail ends of the sheets just before their leading ends reach the head guides.

10. In a sheet feeder, head guides, a variable speed endless tape carrier, means for feeding spaced sheets thereto, a sheet guide frame located above the tape carrier and adapted to be swung between its closed and opened positions independently of the tape carrier, and sheet forwarding rollers carried by the frame in position to be frictionally driven by the endless tape carrier and adjustable toward and away from the head guides and means for counterbalancing the sheet guide frame.

11. In a sheet feeder, a constant speed drive shaft, an endless tape carrier, its tape drive roller, a change speed mechanism connecting the drive shaft with the carrier roller for driving the carrier at a minimum speed as the sheet starts and finishes its movement and at a maximum speed between said start and finish, and pinch rollers at the feeding-in end of the carrier positively driven from both ends of the tape drive roller.

12. In a sheet feeder, a constant speed drive shaft, an endless tape carrier, its tape drive roller, a change speed mechanism connecting the drive shaft with the carrier roller for driving the carrier at a minimum speed as the sheet starts and finishes its movement and at a maximum speed between said start and finish, pinch rollers at the feeding-in end of the carrier positively driven from both ends of the tape drive roller, and means for periodically separating the pinch rollers to receive a sheet between them.

13. In a sheet feeder, a constant speed drive shaft, head guides, an endless tape carrier, means for feeding spaced sheets thereto, a tape drive roller, its shaft, a change speed mechanism operatively connecting the constant speed drive shaft and the tape drive roller shaft for driving the carrier slowly as the sheet starts therewith, then faster and slower so as to cause the sheet to reach the head guides at a low speed, said change speed mechanism including an externally

and internally toothed gear on the drive shaft, a spur gear on the tape drive roller shaft, a spur gear concentric with the tape drive roller shaft and meshing with the external teeth of the drive shaft gear, a rotary crank shaft, a spur gear thereon meshing with the internal teeth of the drive shaft gear, an oscillating shaft having an arm operatively connected to the crank shaft, an internal gear on the oscillating shaft, and spur gears carried by the said concentric gear and meshing with the said internal gear on the oscillating shaft and said spur gear on the tape drive roller shaft.

14. In a sheet feeder, head guides, a constant speed drive shaft, an endless tape carrier, means for feeding spaced sheets thereto, a tape drive roller, its shaft, and a change speed mechanism operatively connecting the constant speed drive shaft and the tape drive roller shaft for driving the carrier slowly as the sheets start therewith, then faster and slower so as to cause the sheet to reach the head guides at a low speed, said speed change mechanism being operable to impart to the endless tape carrier one cycle of its variable speed movement each one-half rotation of the constant speed drive shaft, and the said sheet feeding means serving to feed a sheet to the endless tape carrier each rotation of the drive shaft.

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