

June 1, 1937.

E. W. BELLUCHE ET AL

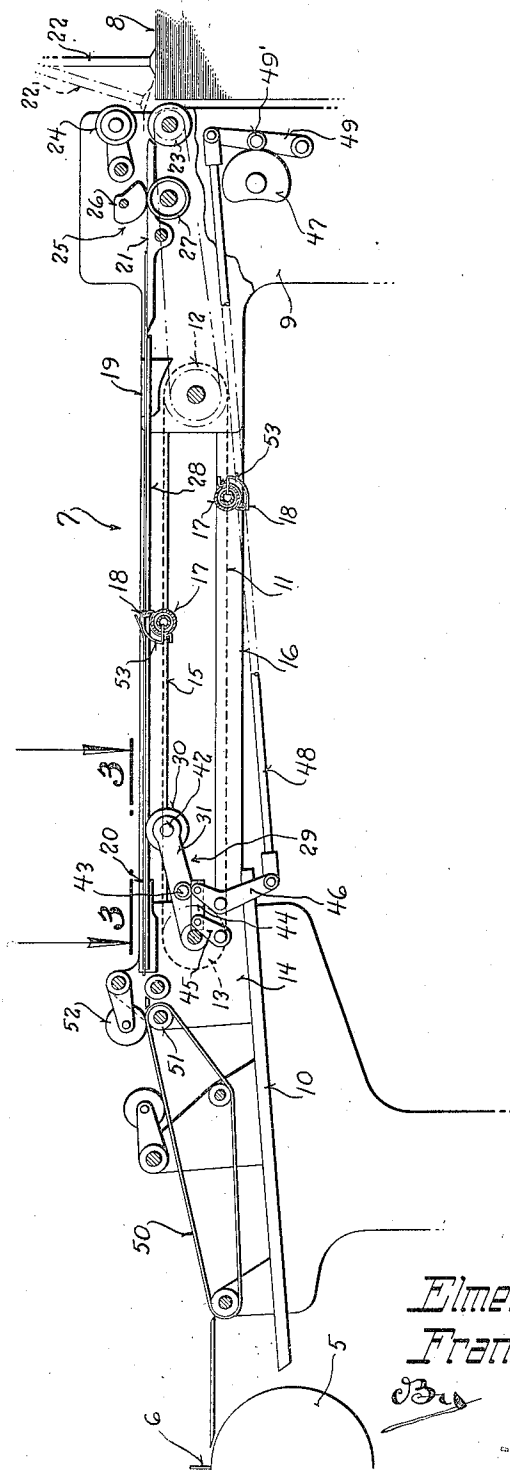
2,082,240

METHOD OF AND APPARATUS FOR FEEDING SHEETS

Filed Dec. 21, 1935

5 Sheets-Sheet 1

Fig. 1.



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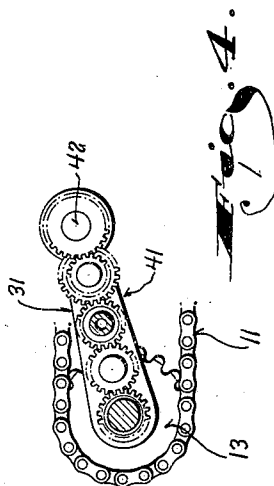
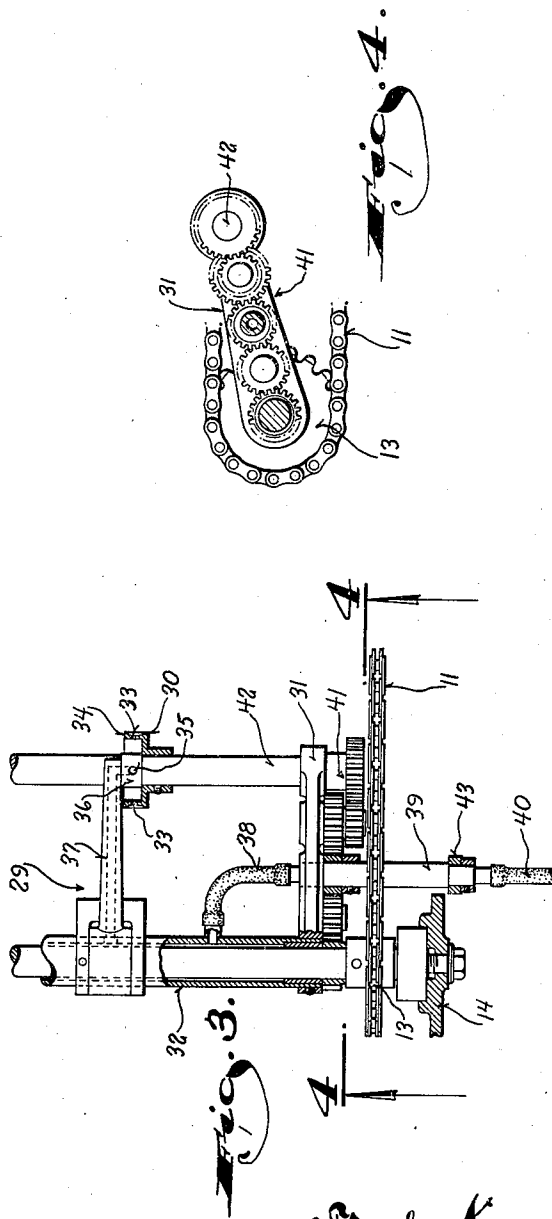
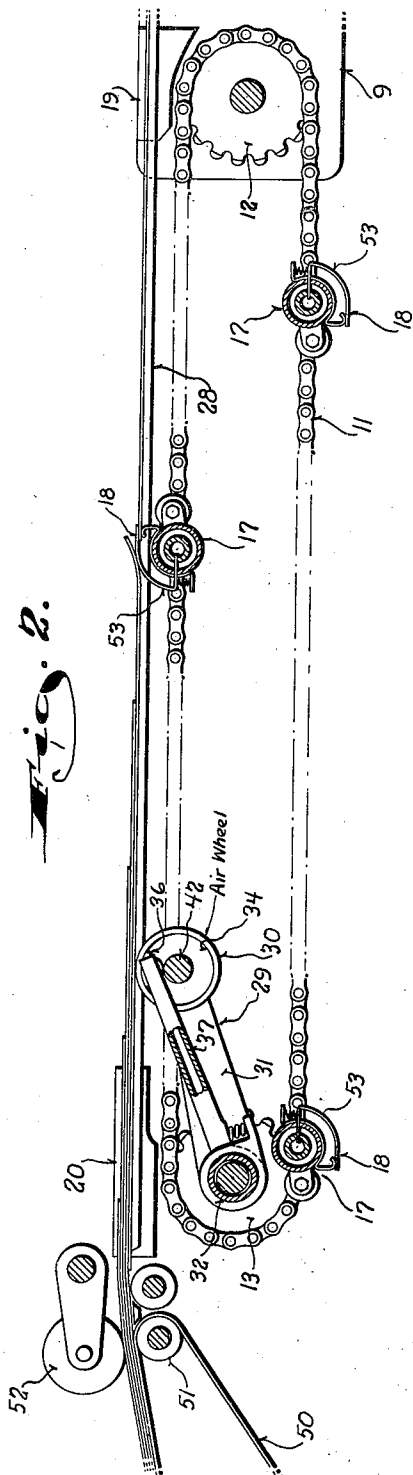
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5 Sheets-Sheet 2



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METHOD OF AND APPARATUS FOR FEEDING SHEETS

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5 Sheets-Sheet 3



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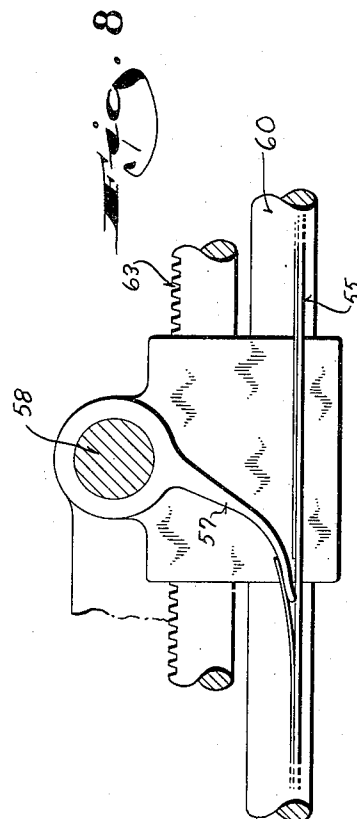
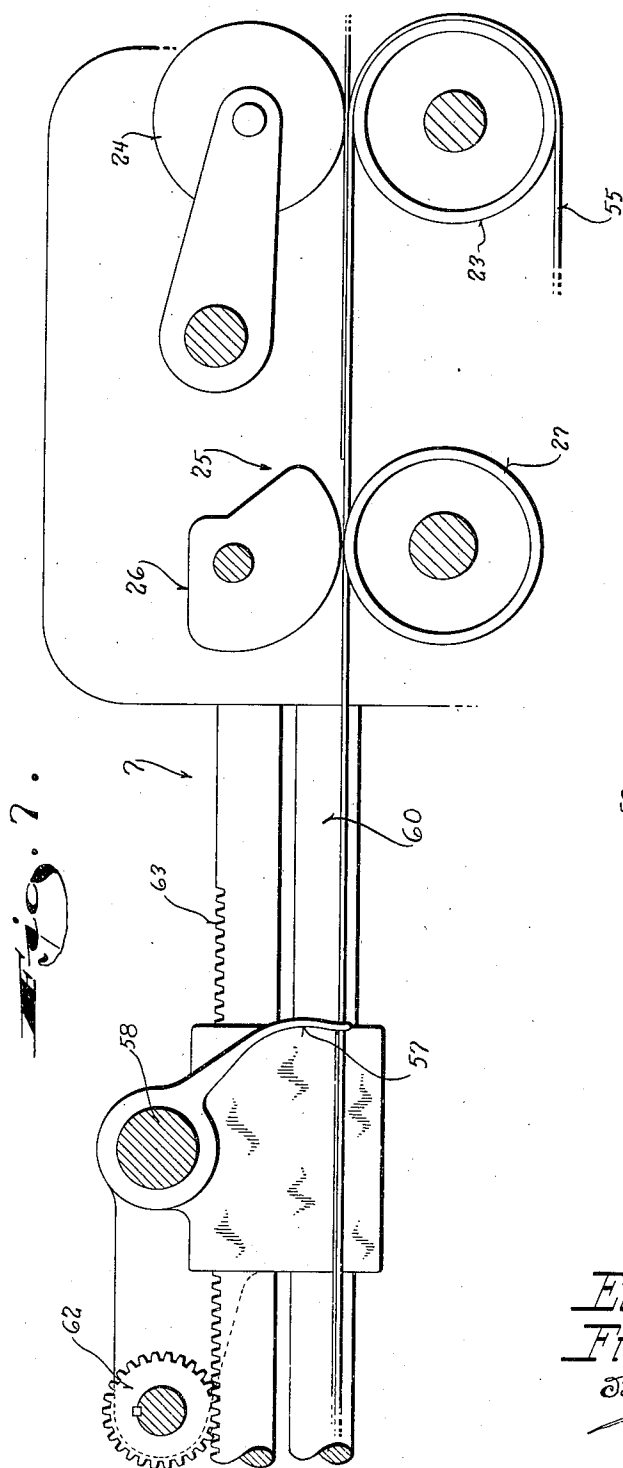
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METHOD OF AND APPARATUS FOR FEEDING SHEETS

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5 Sheets-Sheet 4



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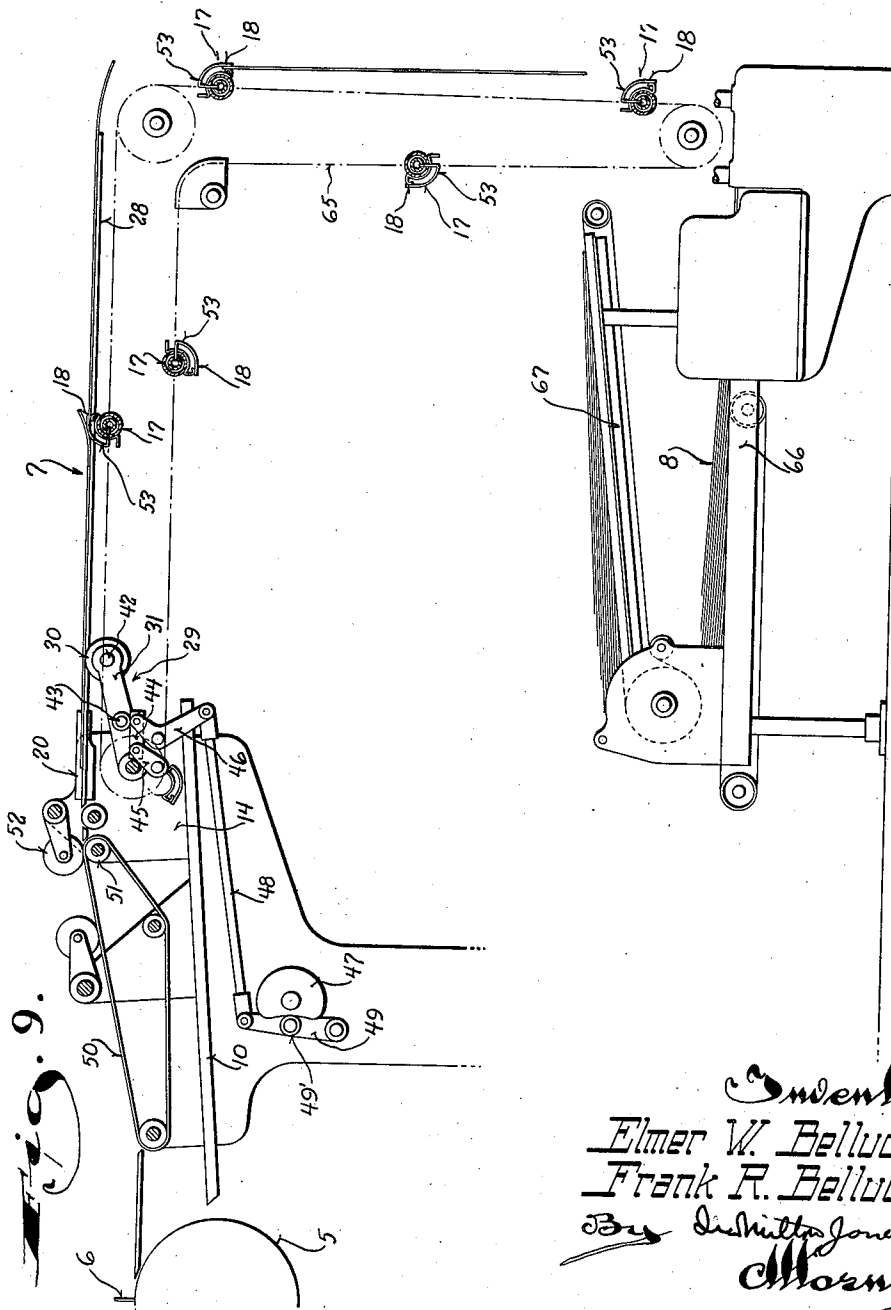
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METHOD OF AND APPARATUS FOR FEEDING SHEETS

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5 Sheets-Sheet 5



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2,082,240

METHOD OF AND APPARATUS FOR
FEEDING SHEETSElmer W. Belluche and Frank R. Belluche,
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Application December 21, 1935, Serial No. 55,593

21 Claims. (Cl. 271—46)

This invention relates to sheet feeders for printing presses and kindred machines.

As is well known there is a constantly increasing demand for greater speed in the operation of printing machines. In general modern presses and bronzers meet this demand, but feeders have not kept pace. As a consequence serious difficulties have been encountered when it has been attempted to run these machines at the high speeds they are capable of. The proper presentation of the sheets to the presses and their transfer to the feed cylinder of the press has been particularly difficult. Experience has shown that these difficulties can only be avoided by bringing the sheets slowly to the front guides of the press.

It is desirable, therefore, that the feeder be so arranged as to present the sheets to the press at a rate of speed sufficiently slow to insure correct positioning of each sheet and the positive gripping thereof by the feed cylinder. The ideal condition would be one in which the sheets advance slowly from their source of supply for their entire distance of travel to the front guides of the press, but the advisability of individually caliper each sheet throughout its entire length and the desirability of pulling the sheet off of the pile by suckers engaging the front edge portions thereof especially in the case of large sheets makes it impossible to convey the sheets from the source of supply to the press in constantly overlapped relationship which would be necessary for a slow advance of the sheets the entire distance from the source of supply to the press.

The present invention thus broadly contemplates a sheet feeder which will present the sheets slowly to the press and at the same time separate the same from the source of supply in spaced succession.

It is an object of this invention to provide a sheet feeder which separates the sheets from the source of supply, carries them past a caliper mechanism, and then underlaps them and continues their advance slowly in underlapped relationship.

Another object of this invention resides in the provision of novel means for underlapping the sheets as they are conveyed from the source of supply to their point of destination.

Another object of this invention is to provide means forming part of the conveyor for advancing the sheets by which one sheet is tucked under a preceding sheet.

Another object of this invention is to provide a sheet feeder of the character described where-

in sheets are fed first at a high rate of speed and then at a slow rate of speed and wherein the sheets moving at high speed are tucked under the preceding sheets moving at slow speed.

Another object of this invention is to provide a sheet feeder so arranged as to carry the sheets from their source of supply at high speed for a predetermined distance along a defined path to a slow-down mechanism by which the speed of travel of the sheets is decreased to allow successive sheets to be carried thereunder to effect an underlapped relationship.

With the above and other objects in view which will appear as the description proceeds, this invention resides in the novel construction, combination and arrangement of parts substantially as hereinafter described and more particularly defined by the appended claims, it being understood that such changes in the precise embodiment of the hereindisclosed invention may be made as come within the scope of the claims.

The accompanying drawings illustrate several complete examples of the physical embodiment of the invention constructed according to the best modes so far devised for the practical application of the principles thereof, and in which:

Figure 1 is a view in side elevation with parts broken away and in section showing a sheet feeder embodying this invention;

Figure 2 is an enlarged longitudinal section view through the feeder illustrating particularly the manner in which the sheets are underlapped;

Figure 3 is a detail view taken on the plane of the line 3—3 in Figure 1;

Figure 4 is a detail section view taken on the plane of the line 4—4 in Figure 3;

Figure 5 is a side view of a modified embodiment of the invention;

Figure 6 is a partial top plan view of the modification shown in Figure 5 taken on the plane of the line 6—6 in Figure 5;

Figure 7 is an enlarged detail section view of part of the mechanism shown in Figure 5;

Figure 8 is a detail section view illustrating part of the mechanism shown in Figure 7 but in another position, and

Figure 9 is a side elevation with parts broken away and in section illustrating the application of this invention to a continuous feeder.

Referring now particularly to the accompanying drawings in which like numerals designate like parts throughout the several views, the numeral 5 represents the feed cylinder of a printing press or other printing machine to which sheets are to be fed. Conventional front

guides 6 are mounted in co-operative relation to the cylinder 5 and against which the leading edges of the sheets to be fed are brought.

The sheets are conveyed by the feeder indicated generally by the numeral 7 from a source of supply 8 which may be either a pile of sheets as shown in Figures 1 and 5 of a fanned-out bank as shown in Figure 9. At one end the feeder 7 is supported by a pedestal 9 and at its other end it rests on the usual feed board 10 of the press. In the embodiment illustrated in Figures 1 to 4, inclusive, the feeder comprises an endless chain conveyer 11 trained about sprockets 12 and 13, mounted on shafts journaled respectively in the pedestal 9 and supporting heads 14 which rest on the feed board 10. Rails or bars 15 and 16 join the heads 14 to the pedestal sides to maintain these parts properly spaced and rigidly joined.

The sprocket chains 11 are equipped with a plurality of gripper bars 17 having grippers 18 adapted to be opened by cams 19 and 20 carried by the pedestal 9 and the heads 14, respectively. When the grippers are opened by the cams 19 they are in position to receive the leading edge of a sheet presented thereto from the source of supply 8 and advanced over a table 21, carried by the pedestal 9. The sheets are separated from the source of supply in any suitable manner (not shown) and advanced onto the table 21 by swinging suction arms 22 (only one being shown).

The arms 22 deposit the leading edge portions of the sheets on a constantly revolving feed roller 23 having a surface speed corresponding to the speed of travel to the conveyer 11. When properly positioned on the roller 23 a drop roll 24 descends and holds the sheets so as to be advanced by the roller 23 over the table 21 between a caliper mechanism 25.

The caliper mechanism may be of any conventional design, and in the present instance is shown as a pivotally mounted segment 26 suspended above a continuously rotating roll 27. The spacing between the peripheries of the segment and roll 27 is such as to allow only a single sheet to pass. When a sheet having a thickness greater than that of a single sheet advances through the caliper mechanism the segment 26 is swung about the axis of its support; rocking its shaft and initiating the functioning of trip mechanism (not shown) by which the entire feeder is stopped.

As stated, the roll 23 has a surface speed the same as that of the conveyer 11 and this speed is comparatively high so as to enable the caliper mechanism of the individual sheets. Upon being picked up by the grippers of the conveyer 11, the sheets are advanced at high speed to the end of the conveyer 11 where the grippers are again opened by the cam 20. During their advance by the endless conveyer 11 the sheets are supported on a table generally composed of a plurality of side-by-side bars or sticks 28.

Near the end of their conveyance by the conveyer 11 the speed of the sheets is decreased by a slow-down mechanism indicated generally by the numeral 29. This slow-down mechanism consists of one or more airwheels 30 mounted on arms 31 supported on a tube 32 telescoped over the shaft which mounts the sprockets 13. This airwheel 30 is of conventional design having a plurality of circumferentially spaced ports 33 through its flange 34 adapted to align with a port 35 in a suction shoe 36 engaging the inner periphery of the flange 34. The suction shoe 36

is carried by a tubular arm 37 also mounted on the tube 32 in line with an opening therein so that the hollow arm 37 is communicated with the interior of the tube 32.

As shown in Figure 3, the inner diameter of the tube 32 is greater than the shaft over which it is telescoped to provide an air space which is connected to a suitable source of suction (not shown) by means of a flexible duct 38 and a tubular stem 39 carried by one of the arms 31. The stem 39 has a hose 40 attached thereto for connecting it with the source of suction.

The airwheels 30 are driven at a surface speed substantially slower than that of the conveyer 11, through a train of gears 41 mounted on one of the arms 31 and drivingly connecting the shaft 42 on which the airwheel is mounted with the shaft of the sprockets 13. One of the gears of the train 41 is mounted on the tubular stem 39 as is also a cam roller 43 arranged to rest on a bar 44.

The bar 44 together with levers 45 and 46 forms a parallelogram linkage adapted to be actuated to raise and lower the airwheels and their associated mechanism at the dictation of a cam 47. The cam motion is transmitted to the parallelogram mechanism by a link 48 attached at one end to the lever 46 and at its other end to a pivoted lever 49 having a cam follower 49' tracking on the cam. The cam 47 is so timed that the airwheels are lowered in time to permit the gripper bars to pass.

The surface speed of the airwheels being substantially less than the speed of the conveyer 11 effectually slows down the speed of the advancing sheets so that they continue their advance at a relatively slower speed and have a gradual approach to the front guides 6 of the press. To convey the sheets forwardly to the press after they have been acted upon by the slow-down mechanism, an endless tape conveyer 50 is provided. At its end adjacent the conveyer 11 the tape conveyer is trained over a roll 51 which is continuously driven at the same surface speed as the airwheels. Above the roll 51 is a drop roll 52 which co-acts with the roll 51 to grip the advancing sheets as they are presented thereto.

Inasmuch as the sheets travel at high speed for part of their distance and at slow speed for the remaining part of the distance from the source of supply to the press, they must be underlapped during their slow advance. To effect this underlapped relationship the high speed conveyer 11 is so associated with the means of conveying the sheets at slow speed that the leading edges of the sheets moving at high speed are carried beyond the trailing edges of the preceding sheets moving at slow speed. Also, each gripper bar is equipped with guides or deflectors 53 which may be part of the grippers themselves, by which the trailing edge of a slow moving sheet is lifted and the leading edge of the next successive fast moving sheet is tucked under the slow moving sheet to dispose the same in underlapped relationship as clearly shown in Figure 2. In this manner the means for tucking one sheet under the other forms part of the conveyer itself.

The same result can be obtained by a mechanism which does not necessarily form part of the conveyer per se and in Figures 5 to 8, inclusive, one such other method of underlapping the sheets is illustrated. In this construction the sheets are carried forwardly from the source of

supply by a fast moving tape conveyer 55 to a slower moving tape conveyer 56. To enable fast moving sheets being advanced by a conveyer 55 to be tucked under the slower moving sheets being carried forwardly by the conveyer 56, a plurality of fingers 57 is provided to lift the tail or trailing edge portion of the slow moving sheets in time to permit the leading edges of the fast moving sheets to be carried thereunder. These fingers 57 are mounted on a common shaft 58 extending transversely across the feeder and continuously rotated to swing the arms constantly about the axis of the shaft.

A helical gear connection 59 between the shaft 58 and a driven shaft 60 provides a drive for the arms. The gear connection 59 incorporates a gear 61 slidably splined to the shaft 60 to allow the entire tail-lifting mechanism to be adjusted along the length of the feeder to compensate for the sheets of different lengths. A gear 62 driven by a crank and meshing with a rack 63 provides convenient means for adjusting the position of the tail-lifting mechanism.

As best shown in Figures 7 and 8, the arms 57 are so proportioned and shaped as to swing down in back of the trailing edge of a slow moving sheet and to substantially move forwardly therewith and at the same time lift the same in time to permit the leading edge of the next successive and fast moving sheet to be carried thereunder.

Inasmuch as the modification illustrated in Figures 5 to 8, inclusive, differs from that previously described only in the manner in which the sheets are tucked under each other, or in other words the manner in which the underlapped relationship of the sheets is effected, further description thereof is not required.

While the invention thus far has been described in association with the conventional pile type of feeder, it is also susceptible to use with a continuous feeder as shown in Figure 9. In this embodiment of the invention the manner in which the sheets are overlapped is the same as that disclosed in Figures 1 to 4, inclusive, the only distinction being that in place of the conveyer 11, a longer and right angularly arranged endless chain conveyer 65 is employed. This conveyer 65 has the gripper bars 17 mounted thereon to carry sheets from the feed board 66 of the continuous feeder upwardly along a vertical stretch and then horizontally toward the press. The arrangement of the continuous feeder in this instance is similar to that shown in Patent No. 2,016,479 issued to Frank R. Belluche on October 8, 1935. By this arrangement the sheets may be loaded onto the supply table 67 of the continuous feeder, printed side up. They are reversed in their passage to the feed table 66 and again reversed by the conveyer 65 so as to be presented to the press, printed side up.

From the foregoing description taken in connection with the accompanying drawings, it will be readily apparent that this invention provides an exceptionally simple and practical construction for sheet feeders which completely solves the problem of proper presentation of the sheets to a high speed press.

What we claim as our invention is:

1. In a sheet feeding device, means for holding a stack of sheets, means for removing sheets individually from the stack, means for advancing sheets removed from the stack at high speed for part of a predetermined distance along a defined path leading away from said stack holding means, other means for advancing sheets at slow speed

for a successive part of said distance along the same path, said two means being so associated that a sheet moving at high speed is carried beyond the trailing edge of a preceding sheet moving at slow speed so as to effect an overlap between said sheets, and means adapted to deflect the trailing edge of a sheet moving at slow speed to facilitate the overlapping of the sheets.

2. In a sheet feeding device, fast moving means for advancing sheets at high speed for part of a predetermined distance along a defined path, slow moving means for advancing sheets at slow speed for a successive part of said predetermined distance along the same path, said two means being so associated that a sheet moving at high speed is carried beyond the trailing edge of a sheet moving at slow speed, and means for acting on the trailing edge of a slow moving sheet coincidentally with the approach of a fast moving sheet toward the trailing edge of the slow moving sheet for deflecting said trailing edge and providing clearance for the advancing fast moving sheet so as to enable said fast moving sheet to be carried thereunder to effect an overlap of said sheets.

3. In a device of the character described, means for advancing sheet material along a defined path at high speed for a portion of a predetermined distance of travel and at slow speed for a successive portion of said predetermined distance of travel, and lifting means operable in coordination with the high speed advancing means adapted to engage and deflect the trailing edge of a preceding sheet traveling at slow speed in time with the high speed advance of the next successive sheet to allow tucking of said next successive sheet moving at high speed under said preceding sheet moving at slow speed.

4. In combination with mechanism for advancing sheet material along a defined path, a conveyer for carrying the sheet material along said path at a predetermined speed, slow down means intermediate the ends of the conveyer adapted to act upon the sheets as they are presented thereto by the conveyer to slow down the speed of the sheets with respect to the speed of the conveyer, and deflector means for lifting the trailing edge of a sheet being acted upon by the slow down means to permit the tucking of a sheet being advanced by the conveyer to the slow down means under said sheet being acted upon by the slow down means whereby the sheets continue their advance beyond the slow down means in overlapped relationship.

5. In combination with mechanism for advancing sheet material along a defined path, a conveyer for carrying the sheet material along said path at a predetermined speed, slow down means adapted to act upon the sheets as they are presented thereto by the conveyer to slow down the speed of the sheets with respect to the speed of the conveyer, stationary supporting means to support the sheets as they are advanced and means carried by the conveyer for lifting the trailing edge portion of a sheet being acted upon by the slow down means off of the supporting means to enable the next successive sheet to be carried by the conveyer under said first designated sheet whereby the sheets continue their advance beyond the slow down means in underlapped relationship.

6. A device for overlapping sheets comprising a conveyer to deliver sheets to a predetermined point, feeding mechanism to bring the sheets to said conveyer, retarding mechanism to decrease the speed of the sheets with respect to the con-

veyer speed after delivery to said predetermined point, and means on the conveyer to cause the trailing edge of the preceding sheet being acted upon by the retarding means to be deflected to allow the next successive sheet to be carried a distance thereunder so that said preceding sheet lies in underlapped relationship therewith.

7. In a sheet feeding device, a conveyer for advancing sheets at high speed for part of a predetermined distance along a defined path, stationary supports for the sheets along said path, means for continuing the advance of the sheets at slow speed along said defined path, said high and slow speed means being so associated that a sheet advanced at high speed by the conveyer is carried beyond the trailing edges of a preceding sheet advancing at slow speed, and means on said conveyer for lifting the trailing edges of sheets advancing at slow speed off of said stationary supports in time to enable the sheets advanced at high speed to be carried under the preceding sheets and effect an underlap therebetween with the first fed sheets uppermost.

8. In a sheet feeder a conveyer to carry sheets along a defined path including a plurality of grippers to grip the leading edges of sheets to be conveyed, and means on said grippers to lift the trailing edges of previously conveyed sheets lying in the path of the grippers whereby the sheets being conveyed may be carried under said previously conveyed sheets.

9. In a sheet feeder, an endless chain conveyer for advancing sheets along a defined path, said conveyer including gripper bars, grippers on said bars to grip the leading edges of sheets to be conveyed, and means on said grippers to lift the trailing edge portions of previously conveyed sheets lying in the path of the grippers so as to enable the sheets being conveyed thereby to be carried under said previously conveyed sheets.

10. In a sheet feeder, the combination of means for separating sheets from a stack of overlapped sheets, means for conveying said separated sheets individually along a defined path at high speed, means for calipering the sheets as they are conveyed at high speed, retarding means to decrease the speed of the sheets after they have been calipered, means to continue the advance of the sheets at slow speed, and means to tuck the fast moving sheets under the trailing edge portions of the slow moving sheets so that the advance of the slow moving sheets is in underlapped staggered relationship.

11. In a sheet feeder, the combination of a conveyer to carry sheets along a defined path at high speed, an air wheel mounted to act on the sheets traveling along said defined path, said air wheel having a surface speed slower than that of the conveyer so as to decrease the speed of the sheets presented thereto by the conveyer, and means to lift the trailing edges of the sheets being acted upon by the air wheel so that the conveyer carried sheets may be tucked thereunder.

12. In a sheet feeder, the combination of a fast moving conveyer to carry sheets along a defined path, a slow moving conveyer to continue the advance of the sheets along said path, and means independent of said conveyer to engage and lift the trailing edges of the sheets as they are initially acted upon by the slow moving conveyer so as to enable the sheets being carried by the fast moving conveyer to be carried thereunder whereby the sheets travel on the slow moving conveyer in underlapped staggered relationship.

13. In a sheet feeder, the combination of a fast moving conveyer to carry sheets rapidly along a defined path, a slow moving conveyer to receive sheets from the fast moving conveyer and to continue their advance at slow speed, and a swinging finger arranged to swing down in back of the trailing edge of a sheet as it is initially acted upon by the slow moving conveyer and to lift said trailing edge portion so as to allow a successive sheet advanced by the fast moving conveyer to be carried thereunder.

14. In combination, a continuous feeder having a feed board over which a bank of sheets may be continuously fed, an endless chain conveyer having a portion thereof disposed adjacent the discharge end of said feed board, grippers on said chain conveyer adapted to grip the leading edge of a sheet presented thereto from said feed board and to carry said sheet along a defined path at high speed with successive sheets spaced apart, a slow moving conveyer adapted to receive sheets from said fast moving chain conveyer and to continue the advance of said sheets at slow speed, and means for lifting the trailing edge portions of the sheets as they begin their advance at slow speed to enable successive sheets traveling at high speed to be carried thereunder whereby the advance of the sheets at slow speed is in underlapped staggered relationship.

15. In a sheet feeder, a conveyer to carry sheets along a defined path including a plurality of grippers to grip the leading edges of sheets to be conveyed, and means carried by said conveyer to lift the trailing edges of previously conveyed sheets lying in the path of the grippers whereby the sheets being conveyed may be carried under said previously conveyed sheets.

16. In a sheet feeder, an endless chain conveyer for advancing sheets along a defined path, said conveyer including gripper bars, grippers on said bars to grip the leading edges of sheets to be conveyed, and means carried by said conveyer to lift the trailing edge portions of the previously conveyed sheets lying in the path of the grippers so that the sheets being conveyed thereby may be carried under said previously conveyed sheets.

17. A method of feeding sheets from a stacked source to a printing machine or the like, which comprises removing the sheets successively from said source, feeding the sheets at high speed and in non-overlapped succession for part of the distance from the source to the machine, calipering the sheets while they travel at high speed, gripping the sheets after they have been calipered to retard the speed of their advance, underlapping the fast moving sheets with those moving at retarded speed, and feeding the sheets during their final distance of travel to the machine in underlapped relationship and at slow speed.

18. A method of feeding sheets from a stacked source to a printing machine or the like, which comprises removing the sheets individually and successively from the top of said stacked source, feeding the sheets directly upon being removed from the source and for an initial part of the distance from the source to the machine at high speed and in non-overlapped succession, calipering the sheets while they travel at high speed, retarding the speed of the advancing sheets after they have been calipered lifting the trailing edges of the last sheet moving at retarded speed, positively carrying the next fast moving sheet under said last sheet moving at retarded speed to effect underlapping of the sheets, and feeding

the sheets for the remainder of the distance from the source to the machine in underlapped relationship and at slow speed.

19. A method of feeding sheets from a stacked
5 source to a printing machine or the like, which
comprises pulling the sheets successively from
said source by mechanism acting upon the forward
edge portion of the sheets, feeding the sheets
at high speed and in non-lapped succession
10 for part of the distance from said source to
the machine, positively gripping the sheets after
they have been advanced a predetermined distance
at high speed to retard the speed of their
advance, lifting the trailing edge portion of each
15 sheet as it moves at such retarded speed to provide
clearance for the next successive sheet approaching
the same at high speed, positively carrying said
next successive sheet moving at high speed
thereunder to effect underlapping of the
20 sheets, and feeding the sheets during their final
distance of travel to the machine in underlapped
relationship and at slow speed.

20. In a sheet feeder, the combination of means
for separating sheets from a stack, means for
25 conveying said separated sheets individually

along a defined path at high speed, retarding
means adapted to positively act upon the sheets
as they are presented thereto to retard the speed
of their advance, means to continue the advance
of the sheets at slow speed, and means to tuck
5 the fast moving sheets under the trailing edge
portions of the slow moving sheets so that the
advance of the slow moving sheets is in under-
lapped staggered relationship.

21. In a sheet feeder, the combination of
10 means for carrying sheets forward along a defined
path and at high speed, slow-down means arranged
to act upon sheets traveling along said defined
path as they are presented thereto by said
carrying means, said slow-down means
15 gripping the sheets and moving forward at a
speed slower than that of the carrying means
to positively move the sheets forward at a
decreased speed, and means operable upon the
trailing edges of the sheet being acted upon by
20 the slow-down means to provide clearance enabling
the next successive sheets to be carried thereunder.

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