Feb. 14, 1939. H. EHRIG ET AL 2,146,945

SHEET FEEDER

Filed April 26, 1937 3 Sheets-Sheet 1

Fig. 1

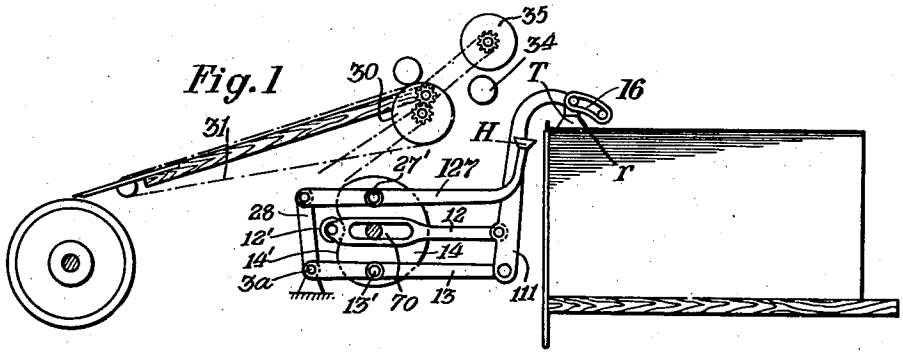


Fig. 2

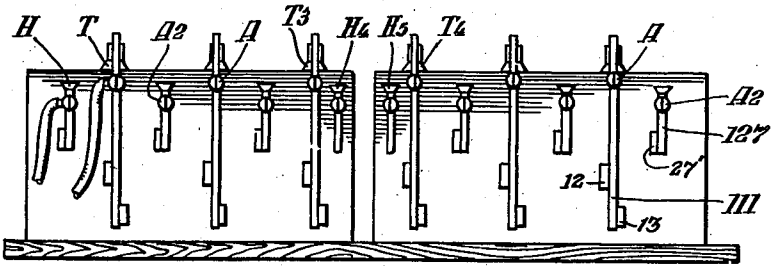


Fig. 3

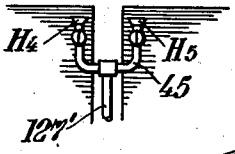
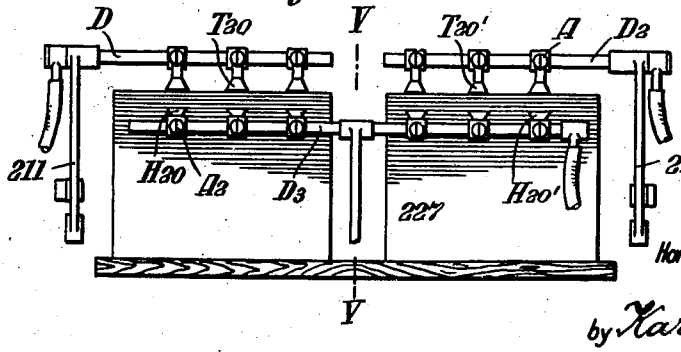


Fig. 4

Fig. 5



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SHEET FEEDER

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Fig. 6

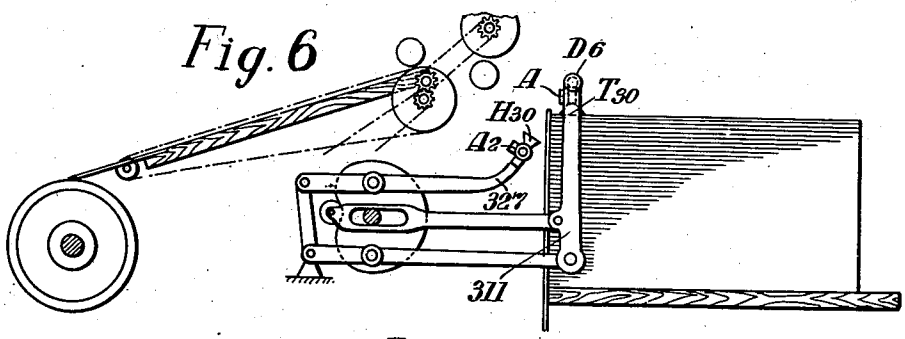


Fig. 7

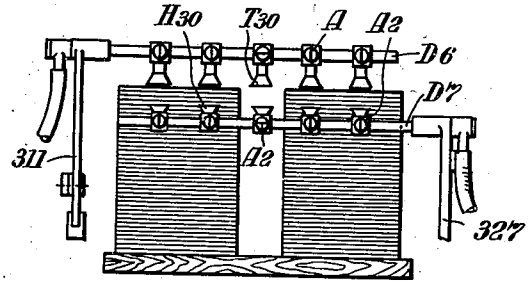


Fig. 8

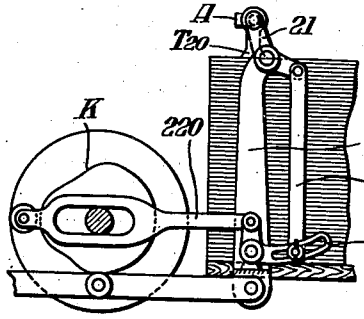


Fig. 9

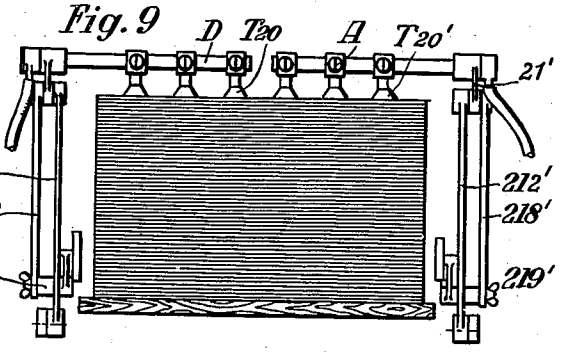


Fig. 10

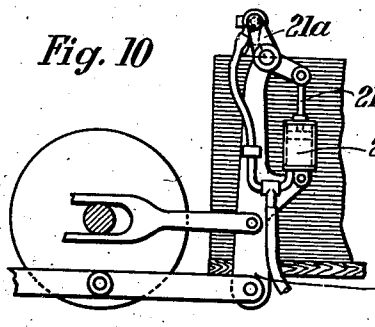
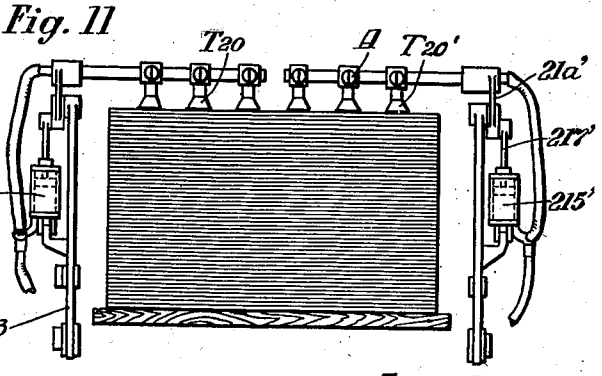


Fig. 11



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SHEET FEEDER

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Fig. 7a

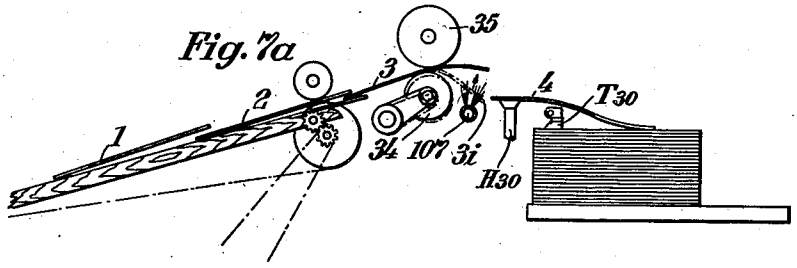


Fig. 7b

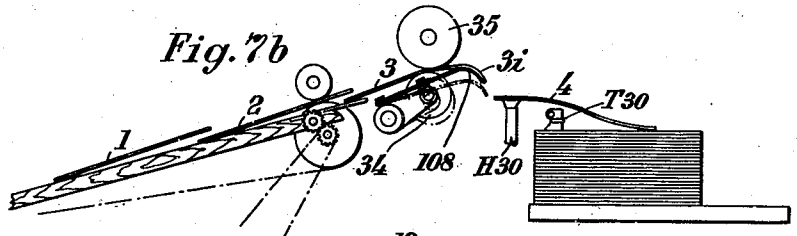


Fig. 7c

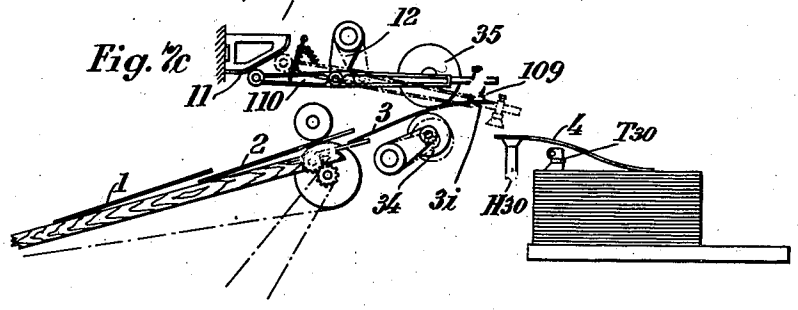
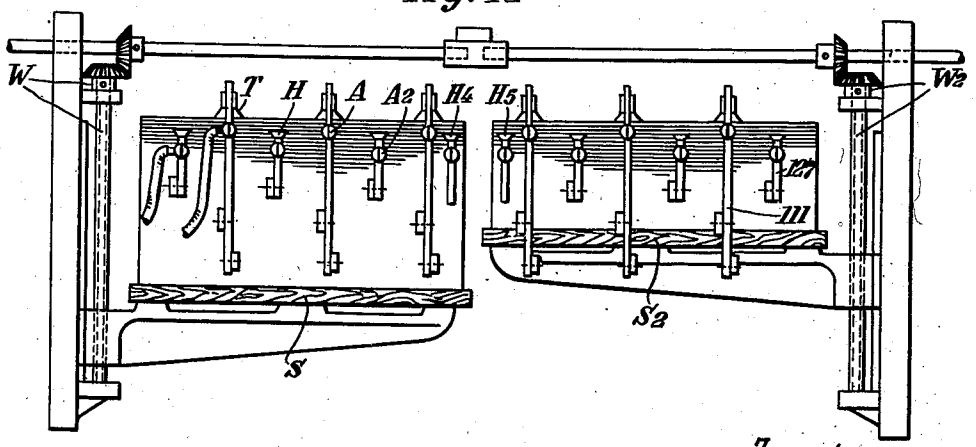


Fig. 12



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Patented Feb. 14, 1939 2,146,945

UNITED STATES PATENT OFFICE

2,146,945

SHEET FEEDER

Hans Ehrig and Ulrich Keilhauer, Leipzig, Germany

Application April 26, 1937, Serial No. 138,996
In Germany July 31, 1936

4 Claims. (Cl. 271—12)

Our invention relates to improvements in multiple purpose sheet feeders for printing presses, ruling, folding and like machines as disclosed in our United States Patent 2,060,800, which are provided with two sets of grippers, a primary and a secondary one, cooperatively arranged at the front end of the pile of sheets, the grippers of the primary set being adapted to engage the sheets from above and being provided with means for being tilted and moved in a closed cycle of movements designated *c*—*c2* (Fig. 3), so as to separate, lift and advance the sheets in the feeding direction, while the grippers of the secondary set are adapted to subsequently engage the sheets from underneath and being provided with means for laterally stretching the sheets and for being moved in a closed cycle of movements designated *e*—*e2* (Fig. 3), so as to further advance and deliver the sheets to a conveying mechanism.

In the embodiment of the invention disclosed in our United States Patent 2,060,800 intentionally only two grippers **10**, **10'**—representing the primary set—are provided, which are arranged at a small distance from the central plane of symmetry vertically intersecting the feeder structure, so as to seize the sheets S exclusively in their middle section (Fig. 4), while the secondary set of grippers comprises two groups **20**, **21**, **22** and **20'**, **21'**, **22'**, which are arranged at both sides of the feeder and outside the primary set, the object being to enable both sets of grippers to be moved by their actuating means (**11**, **27**) independently of each other, namely to freely pass each other, while moving in said closed cycles of movement *c*—*c2* and *e*—*e2* virtually intersecting each other at point *i* and three other points, as seen in Figs. 1 and 3.

Extensive practical experiments have shown, that with our patented feeders—because of having only two primary grippers **10**, **10'** in the middle section of the feeder structure—highly adhesive sheets, having a sticky or rather rough surface, or being of a coarse, felty texture cannot be separated from the pile in a positive and reliable manner, at least not at the desired high rate of speed exceeding 5000 sheets per hour.

Another drawback connected with the former consists therein, that it is impossible to separate and feed two sheets simultaneously, namely the upper sheets of two piles in juxtaposed position to each other, because each of said sheets is grasped by the respective gripper **10**, **10'** only at one corner, and because—by reason of their inertia and adhesion to their mates underneath—the sheets in transit are angularly displaced on being separated and advanced.

This invention of ours aims at overcoming the said drawbacks, namely to so re-design our patented feeder, that even sheets of a highly adhesive and obstinate nature, including card board and tissue paper, and of the largest sizes used in trade, can be safely separated in a trouble free manner and at a high rate of speed.

In connection therewith the invention aims at providing structurally improved feeders of the type concerned for sheets of medium and smaller sizes, which can be quickly reset for sheets of different width, this being an important factor in job printing, where often sheets of different—medium and small—sizes are to be printed in small issues but in speedy succession.

A special feature of the smaller feeders re-designed according to this invention consists in the provision of an auxiliary sheet lifting mechanism cooperatively associated with the secondary set of grippers, which insures the proper transfer even of sheets of the very smallest sizes used in practice to the sheet conveying mechanism of the feeder in correctly overlapped condition, namely in cases where the feeder is set for staggered feed.

Another likewise important feature of the improved feeder consists therein, that two sheets—even of different nature, for instance of different thickness—can be jointly separated from two piles of different height, arranged side by side, a peculiar printing job, which for instance occurs in printing simultaneously and consecutively numbering in one and the same machine pairs of forms for custom office use, one of the two forms, which both bear the same number, on stout paper, and the other one, intended to serve later on as carbon copy, on tissue paper.

The nature and scope of the invention are briefly outlined in the appended claims and will be more fully understood from the following specification taken together with the accompanying drawings, in which

Figs. 1 and 2 diagrammatically show in side and front elevation a sheet feeder re-designed according to this invention for feeding sheets of the largest sizes used in the trade;

Fig. 3 shows a modified arrangement of the innermost grippers of the secondary set;

Figs. 4–5 diagrammatically show in side and front elevation a structurally modified feeder re-designed for feeding sheets of medium size;

Figs. 6–7 diagrammatically show another structurally modified feeder re-designed for feeding sheets of small sizes;

Figs. 7a, 7b, 7c are side elevations showing auxiliary sheet lifting mechanism associated with the secondary grippers for feeding sheets of the very smallest sizes in correctly overlapped relation to each other;

Figs. 8–9 are a front and side elevation showing by way of an example a feeder re-designed according to this invention, the tilting mechanism of which is mechanically operated instead of being suction operated as in our master patent;

Figs. 10–11 are a front and side elevation showing by way of an example an improved feeder, the tilting mechanism of which is suction operated;

Fig. 12 is a front elevation showing an improved feeder for feeding sheets of the largest sizes, which is adapted to feed also two sheets of different thickness simultaneously.

In contradistinction to the specific arrangement of the grippers shown in our United States Patent 2,060,800, and referred to more in detail in the preamble of this specification, the grippers of both sets including the primary set are—according to this invention—distributed over the whole width of the feeder, namely preferably arranged in groups comprising two or more grippers, which are disposed at both sides off the median plane of symmetry of the feeder.

In the embodiment of the invention shown in Figs. 1–2 each of the grippers T and H of the primary and secondary set has an actuating mechanism of its own, to the levers 111 and 127 of which the grippers are attached; as seen in Fig. 2 the grippers and their actuating mechanism are arranged in staggered position, namely alternating between each other, except in the middle, where a pair of grippers H4, H5 of the secondary set is arranged between the innermost grippers T3, T4 of the primary set with the object to enable two sheets being separated simultaneously from two piles arranged side by side.

The mechanism for actuating the various levers 111 and 127 carrying the individual grippers concerned resembles in all essential details that described in our earlier United States Patent 2,060,800 and comprises:

(1) A rotary shaft 70;

(2) A plurality of disks 14 keyed to said shaft 70 and being spaced in registration with the respective grippers;

(3) Slotted pitmans 12 linked to the levers 111 and slidingly guided by shaft 70 for being reciprocated; the means for reciprocating said pitmans 12 include cams 14' provided on said disks 14 and rollers 12' engaging said cams and being attached to the pitmans 12;

(4) Swing arms linked to the levers 111 and fulcrumed at 3a; pins 13' laterally projecting from said arms 13 are provided which engage covered cams (not shown) formed in said disks 14 for swinging said arms 13 up and down;

(5) Swing arms 28 fulcrumed at 3a and linked to the levers 127; the latter are provided with pins 27' laterally projecting therefrom and engaging covered cams (not shown), which are formed in said disks 14.

Each of the grippers concerned is provided with a valve or cock, indicated in the drawings at A, A2, and with a rubber hose for being individually connected with or disconnected from a common source of suction air, which operates the grippers in the usual way through an air control mechanism, not shown but known per se in the trade.

As seen in Fig. 3 the innermost grippers H4, H5 of the secondary set may be both attached to advantage to one single lever 127' provided with a forked upper end 45 with the object of actuating both grippers in a more economical and simple manner—viz. by one single actuating mechanism instead of two.

Various other changes and modifications may be conveniently made in the structural details of feeders of the improved design shown and described, without substantially departing from the spirit and the salient ideas of this invention:

With the embodiment of the invention, shown in Figs. 4 and 5 and designed for printing presses of medium size, the grippers of the primary set are arranged in two groups T20 and T20', symmetrically distributed over two carrier rods D, D2, which are coaxially arranged to each other and are fixed in cantilever fashion at their outer ends to the levers 211 and 212 of actuating mechanism of the type described with reference to Figs. 1 and 2; the carrier rods D, D2 are spaced from each other at their inner ends so as to allow the lever 227 of another actuating mechanism to freely pass therethrough, which is arranged in the central plane of symmetry V—V of the feeder, and to the carrier rod D3 of which the grippers H20, H20' of the secondary set are attached in two groups and in symmetric disposition.

With the embodiment of the invention shown in Figs. 6 and 7 and designed for printing presses of the smallest sizes used in the trade for job printing, the grippers T30 of the primary set are secured to a carrier rod D6, which is attached in cantilever fashion at one end to the lever 311 of an actuating mechanism of the type described with reference to Figs. 1 and 2, while the grippers H30 of the secondary set are mounted in a disposition reciprocal to that of the primary set on a carrier rod D7 attached at its outer end to the lever 327 of another actuating mechanism of the type described with reference to Figs. 1 and 2.

All the feeders described with reference to Figs. 1–7 can be quickly reset for sheets of different width by opening or closing the respective suction air cocks A, A2 of those grippers, which according to their position are to be used or not to be used for the respective job, and (or) by slightly displacing the outermost grippers on their carrier rods in lateral direction.

It will be noted from Figs. 6 and 7, that for feeders of the smallest sizes only two actuating mechanism namely one on each side of the feeder are required as against three in Figs. 4 and 5 namely one in the middle and one on each side, and still more with the feeders of the larger sizes, shown in Figs. 1, 2, 12 wherein each of the respective grippers has an individual actuating mechanism of its own.

In Fig. 12 a feeder designed for printing presses of the larger sizes is shown, which is provided in a manner known from sheet feeders of other types with two separate platforms S, S2 arranged side by side, and having individual elevating mechanism W, W2 of their own, which are capable of adjustment as to their rate of elevating by adjusting means known and not shown.

All the feeders re-designed according to this invention may be conveniently provided with a sheet conveyor of the double geared type described in our earlier United States Patent 2,060,800 and adapted to work at the operator's option at two different rates of speed, namely so as to feed the sheets either singly and in spaced relation to one another or jointly in the form of

a row of sheets in staggered relation to and overlapping one another.

Of said conveying mechanism which forms no part of this invention in Figs. 1, 4 and 6 only the conveying rollers 34, 35, pulleys 38 and tapes 31 are shown.

All the feeders re-designed according to this invention may be conveniently fitted with double platforms S, S2 having individual elevating mechanism so as to afford the separation and feeding of two sheets of unequal thickness simultaneously for odd printing jobs of the type indicated hereinbefore by way of an example.

It has been found, that—under certain working conditions, where a feeder of the design shown in Figs. 4–7 is set for staggered feed, namely with the sheets approaching the press overlapping each other, so that the rear edge of the first sheet lies on top of the front edge of sheet number two, as seen in Figs. 7*a*—7*c*, and where small size and thin sheets of highly flexible nature are under treatment,—the rear portion of the sheet number three in transit to the conveying rollers 34, 35 is apt to drop and bend down, as indicated at 3*i* in dot and dash lines in Fig. 7*a*, and with the result, that the front edge of sheet number four would be misplaced—namely over the rear edge of sheet number three, instead of underneath: This would be fatal, since every first sheet arriving at the front lay marks must not be frictionally engaged by the secondary sheet, but must be free to be pulled laterally into contact with the side lay marks.

In order to ensure under all working conditions and with all kinds of sheets, including small and thin sheets, their proper positioning with regard to the overlapping edges referred to above, an auxiliary sheet lifting mechanism has been provided according to this invention for cooperation with the feed rollers 34, 35, namely for positively up-lifting the rear portion of the sheets as indicated by an arrow in Fig. 7*a*:

In the embodiment of the invention shown in Fig. 7*a* said sheet lifting mechanism comprises a perforated tube 107, connected with a source of compressed air, (not shown) through which blast air is periodically blown so as to hit the rear portion of the sheets in transit and lift the latter.

In the embodiment of the invention shown in Fig. 7*b* the auxiliary sheet lifting mechanism concerned comprises a plurality of guide rods downwardly bent at their rear ends 108, and attached preferably to the rocking frame, which carries the rollers 34.

In the embodiment of the invention shown in Fig. 7*c* said auxiliary sheet lifting mechanism comprises suction operated grippers 109 attached to an actuating mechanism, which essentially consists of a double armed lever 110, cooperatively associated by means of a spring with a stationary guide cam 11 and pivoted to a rocking lever 12.

In our United States Patent 2,060,800 tilting mechanism are disclosed for tilting the primary grippers about their rear edges *r*, and which are indirectly operated in a particularly smooth manner by suction air cylinders and pistons instead of by positively acting power transmitters.

Sheet feeders re-designed according to this invention may also be provided with suction operated tilting mechanism of the same design, more especially in cases, where the feeder is expected to work often and for long working periods at high rates of speed.

An advantageous disposition of this kind, wherein two air cylinders 215, 215' having pistons, piston rods 217, 217' and levers 21*a*, 21*a*' are arranged at both sides of the feeder structure for tilting the primary grippers T20, T20' is shown in Figs. 10 and 11 by way of an example.

In cases, where high speed is not the predominant consideration positively acting tilting mechanism of the usual design, as shown by way of an example in Figs. 8 and 9, may be conveniently provided, comprising cam and lever motions K, 220, which are cooperatively interconnected by means of rocking arms 212, 212', pin and slot gears 219, 219' and connecting rods 218, 218' with double armed levers 21, 21' for tilting the primary grippers T20, T20'.

What we claim is:

1. Sheet feeder of the type having two sets of grippers, a primary and a secondary one, cooperatively arranged at the front end of the pile of sheets, the grippers of the primary set being adapted to engage the sheets from above, so as to separate, lift and advance the sheets in the feeding direction, while the grippers of the secondary set are adapted to subsequently engage the sheets from underneath, so as to further advance and deliver the sheets to conveying means,—wherein the grippers of both sets are symmetrically distributed over the whole width if the feeder,—the grippers of the primary set being attached to carrier rods coaxially arranged and spaced from each other at their inner ends, said carrier rods being fixed in cantilever fashion at their outer ends to the levers of actuating mechanisms arranged at both sides of the feeder structure, while the grippers of the secondary set are attached to a carrier rod crosswisely fixed to the lever of another actuating mechanism arranged in the medium plane of symmetry of the feeder structure.

2. Sheet feeder of the type having two sets of grippers, a primary and a secondary one, cooperatively arranged at the front end of the pile of sheets, the grippers of the primary set being adapted to engage the sheets from above, so as to separate, lift and advance the sheets in the feeding direction, while the grippers of the secondary set are adapted to subsequently engage the sheets from underneath, so as to further advance and deliver the sheets to conveying means,—wherein the grippers of both sets are symmetrically distributed over the whole width of the feeder,—the grippers of the primary being attached to a carrier rod crosswisely extending over the feeder structure and being fixed in cantilever fashion to the lever of an actuating mechanism provided at one side of the feeder, while the grippers of the secondary set are attached to a carrier rod fixed in cantilever fashion and in a position opposite to that of the primary grippers to the lever of an actuating mechanism provided at the opposite side of the feeder structure.

3. Sheet feeder for printing presses and like machines having means for separating the sheets from the pile and means for conveying the separated sheets to the printing press or like machine,—said separating means comprising a plurality of primary grippers distributed over the whole width of the feeder for engaging the sheets along their front edge from above, separating and advancing them in the feeding direction, and a plurality of secondary grippers distributed over the whole width of the feeder for subsequently engaging the sheets from underneath and delivering them to the conveying means,—the

grippers of both sets being arranged in staggered position, alterating between each other.

4. Sheet feeder for printing presses and like machines having means for separating the sheets from the pile and means for conveying the separated sheets to the printing press or like machine—said separating means comprising a plurality of primary grippers distributed over the whole width of the feeder for engaging the sheets along their front edge from above separating and advancing them in the feeding direction, and a plurality of secondary grippers distributed over the whole width of the feeder for subsequently engaging the sheets from underneath and delivering them to the conveying means.

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