

Aug. 22, 1939.

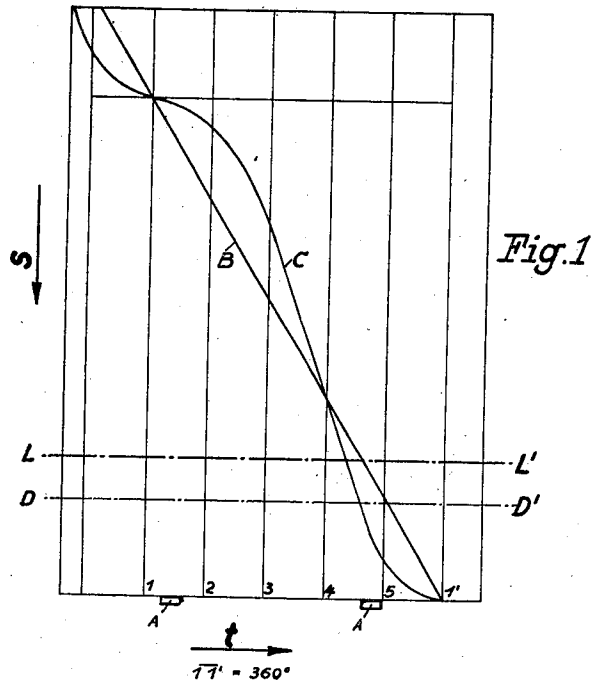
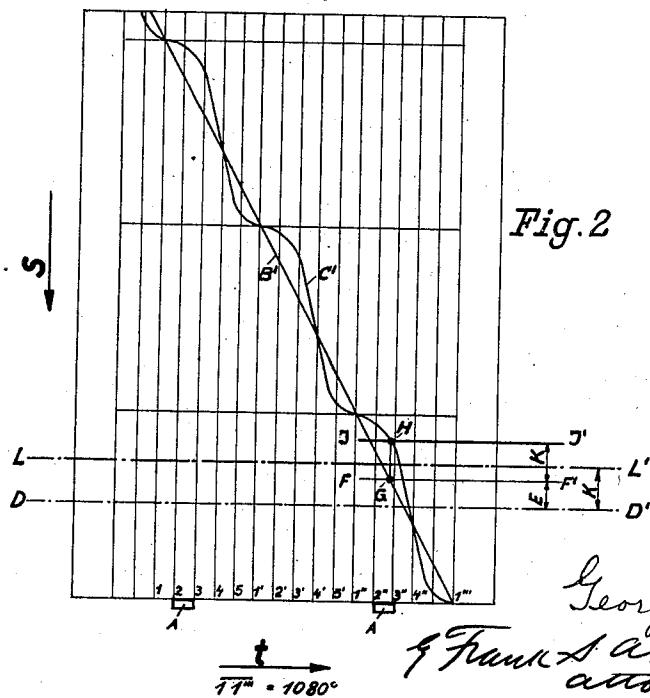
G. SPIESS

2,170,489

SHEET FEEDING DEVICE

Filed June 10, 1937

2 Sheets-Sheet 1



Inventor:
Georg Spiess,
Frank S. Appleman
attorney.

Aug. 22, 1939.

G. SPIESS

2,170,489

SHEET FEEDING DEVICE

Filed June 10, 1937

2 Sheets-Sheet 2

Fig.3

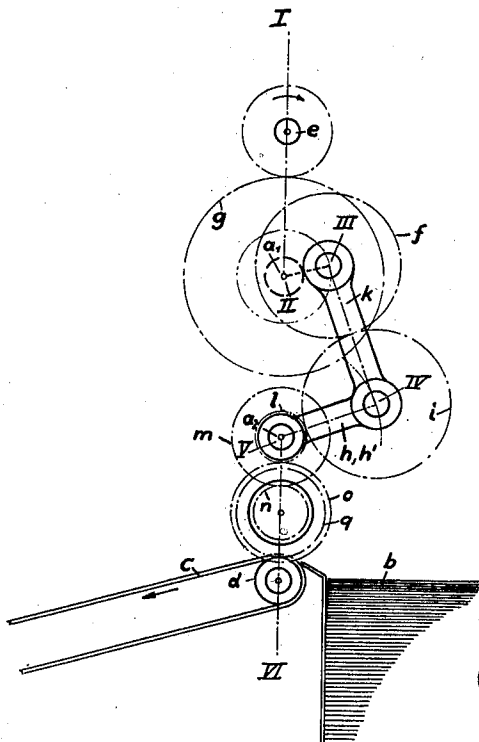
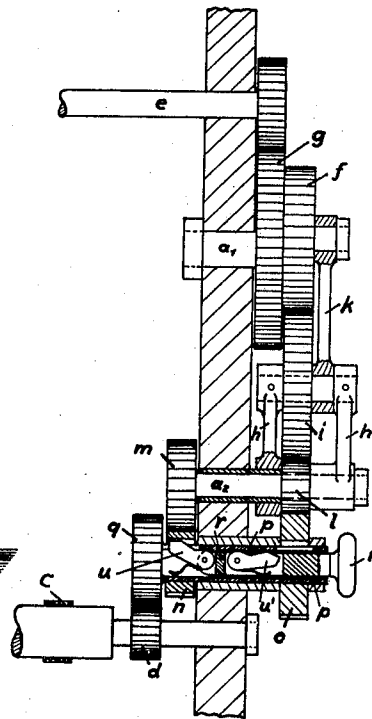


Fig.4



Inventor:
Georg Spiess,
Frank S. Appelman,
attorney.

UNITED STATES PATENT OFFICE

2,170,489

SHEET FEEDING DEVICE

Georg Spiess, Leipzig, Germany

Application June 10, 1937, Serial No. 147,567
In Germany May 29, 1936

4 Claims. (Cl. 271-46)

This invention relates to a sheet feeding device capable of both single and staggered feeding.

In devices which separate the sheet from the pile to supply it to a working machine feeding can be effected by operating either at so high a conveying speed that the sheets follow one another at a certain distance or directly one after the other, or at so low a speed that the sheets overlap one another in scalelike fashion during feeding.

Some of the known feeding devices permit choosing between these two conveying speeds and thus between two feeding methods. This applies to non-rhythmically working devices as well as to those having an accurately fixed working rhythm.

The last-mentioned devices include apparatus which stop the sheet before it is taken over by the working machine by guiding it up to the front gauges. As it is important to slow down the conveying speed shortly before stopping to prevent the sheet from striking the gauges too hard, periodically operating retarding gears are employed. In apparatus capable also of staggered or overlapped feeding the speed of the individual sheets is not retarded while they are striking the front gauges.

If the purpose of reversibility were fulfilled by rendering possible staggered feeding per se, a proper relation between the retarded speed at arrival of the sheet during single feeding and its non-retarded speed during staggered feeding could be attained, because, provided both devices have the same number of revolutions, the arrival speed at the gauges would be the same for both methods of feeding if the speed of staggered feeding were equal to the lowest speed of retarded feeding. A limit is set of course to retardation by the lowest permissible speed of staggered feeding, which should not drop to zero.

The purpose of staggered feeding, however, is to supply more sheets than at single feeding in the same period of time, which means that the non-retarded sheet at staggered conveying, according to the increase in speed of the apparatus, arrives at the gauge almost as fast as it would arrive at single conveying if the retarding gear were omitted. It is therefore one of the objects of the invention to insure retardation also for staggered feeding and thereby to provide the possibility of fully utilizing the advantages which this method affords.

According to this invention, I provide a sheet feeding apparatus having a single driving mechanism,

arranged on one side, for periodically accelerating and retarding the conveying bands during each working cycle, wherein for adjusting the speeds of the conveying bands for single feeding and for overlapped feeding of the sheets, two driving wheels of different sizes are arranged on the periodically accelerated and retarded driving shaft of the gear, which wheels engage two other pinions loosely mounted on an intermediate shaft driving the conveying rollers, each of which pinions can be coupled with the intermediate shaft, as desired, through the medium of a wedge coupling.

A further feature of the invention is that the distance of the side gauge from the front gauge can be made larger than with scale-like feeding with uniform speed. In staggered feeding, the distance of the side gauges is determined by the extent of staggering; the second sheet must not arrive at the side gauge before the preceding one has left it, so that the side gauge must be located as closely as possible to the front gauge. For constructional reasons it is, however, not possible to alter the distance of the gauges at each reversal of feeding speeds, so that even when sheets are fed singly, one has to depend upon the small disadvantageous spacing of the gauges which has been found necessary for staggered feeding. The invention eliminates this difficulty by permitting sufficiently large spacing of the gauges even in staggered feeding by periodic retardation. How this is possible will be explained below.

By way of example, the invention is illustrated in the accompanying drawings, in which Figures 1 and 2 are the time and path curves of a front edge of a sheet at high and low conveying speeds; Fig. 3 is a view of the gear; and Fig. 4, a section on the broken line I—VI, of Fig. 1 with the knee III—IV—V stretched out.

Figs. 1 and 2 explain how it is possible to render the distance of the side gauges from the front gauges sufficiently large even in staggered feeding by periodical retardation. The two time and path curves are so represented that the area of the diagrams may be compared to the feeding table. In horizontal direction equal intervals of time are arranged, and in vertical direction the associated path of the front edge of the sheet is plotted from top to bottom. The speed of the sheet corresponds to the tangent of the inclination of the curve at the point concerned. A designates the front gauges. If the sheets were not subjected to periodic retardation, the time-path curve would be rectilinear, as in-

dictated by the lines B and B', but owing to the action of the retarding gear the curves C and C' are produced.

At the conveying speed of Fig. 1, during the interval of time $t-t'$, equal to one working cycle of the device, a very large path is negotiated which must be larger to an extent depending on the other conditions than the largest length of format in order to avoid overlapping and collision of the sheets during feeding. At the conveying speed of Fig. 2, during the same time interval $t-t'$, only a short path is covered which must be smaller than the smallest length of format if staggering of the sheets during feeding is to be insured. This path is repeated until the sheet arrives at the front gauge.

Assumed that the operating line of the side gauge is located at D-D', the side device must release the sheet at the very latest when the front edge of the next sheet, removed to the extent of E, arrives at F-F', Fig. 2, as otherwise the conveying of the next sheet would be interfered with. The time-path curve shows that the front edge arrives on the line F-F' at a moment lying between 2'' and 3'' (point G) if the sheet moves on the line B' without retardation. However, if the sheet moves with retardation along the line C', the edge thereof, at the same moment, will be only at the point H on the line J-J' and is therefore to the extent of the distance K farther away from the front gauges than without retardation, so that the side gauge can be upwardly displaced to the extent of K without endangering the feeding of the next sheet. The operating line L-L' of the side gauge can therefore be located at the most favorable point.

Referring to Figs. 3 and 4, the sheets are supplied from the pile b by a separating device, not shown, to the conveyors c which receive drive from the wheel d rapidly or slowly driven from the shaft e by means of a three-wheel retarding gear and a pull pin coupling, both of known type.

The three-wheel gear has the fixed points a_1 and a_2 . On the toothed crank disc g rotatable about the point a_1 the wheel f is eccentrically fixed. In the member a_2 the link h, h' is articulated which carries the wheel i and is moved by the crank g through the medium of the coupling k . The wheel i transmits the rotary drive by means of the wheel l and the shaft a_2 to the wheel m which is in engagement with the member n whilst the wheel l meshes with the wheel o . The wheels n and o loosely rotate on the hollow shaft p which is firmly connected with the wheel q . In the hollow shaft p the pin r with the spring pressed dogs u, u' is displaceably

arranged. If the pin r is brought into the position shown, the dog u will pass through a corresponding slot of the hollow shaft p and snap into the slot of the wheel n when the two slots are in register during rotation of the wheel. Rotation is then transmitted by the dog u to the members p, q and d , so that the conveyors c move rapidly and supply single sheets. If the pin r is displaced to the right, the dog u will be disengaged and the dog u' driven by means of the slot or key-way of the wheel o , with the result that the shaft p and the conveyors c will move slowly and the sheets are fed in staggered manner.

I claim:

1. A sheet feeding device having a main drive shaft for driving a driven feeding shaft at two speeds, one for single feeding and the other for staggered feeding, means for alternatively varying the speeds of said feeding shaft according to single or staggered feeding, and one speed varying gearing to slow down both said speeds of said single and staggered feeding.

2. A sheet feeding apparatus as claimed in claim 1, wherein the speed varying gearing drives the driven shaft by an eccentrically mounted pinion through a planet wheel.

3. In a sheet feeding device having single and staggered feeding, a driving shaft, a pair of gears fixed on said driving shaft, one of said gears being greater in diameter than the other, a hollow driven shaft, a pair of gears mounted on said driven shaft and meshing with the first mentioned gears, each of the last mentioned gears having a key slot, said driven shaft having slots opposite the gears thereon and the gears on the driven shaft having corresponding internal slots, a pair of dogs in said driven shaft, and means for selectively moving said dogs to project through the slots in the shaft and into the respective gear slots.

4. In a sheet feeding device having single and staggered feeding, a driving shaft, a pair of gears fixed on said driving shaft, one of said gears being greater in diameter than the other, a hollow driven shaft, a pair of gears mounted on said driven shaft and meshing with the first mentioned gears, each of the last mentioned gears having a key slot, said driven shaft having slots opposite the gears thereon and the gears on the driven shaft having corresponding internal slots, a pair of dogs in said driven shaft, means for selectively moving said dogs to project through the slots in the shaft and into the respective gear slots, and means for periodically accelerating and retarding the speed of said driving shaft.

GEORG SPIESS.