

May 16, 1961

W. KOCH

2,984,178

GRIPPER FOR USE IN PRINTING MACHINES

Original Filed March 7, 1956

3 Sheets-Sheet 1

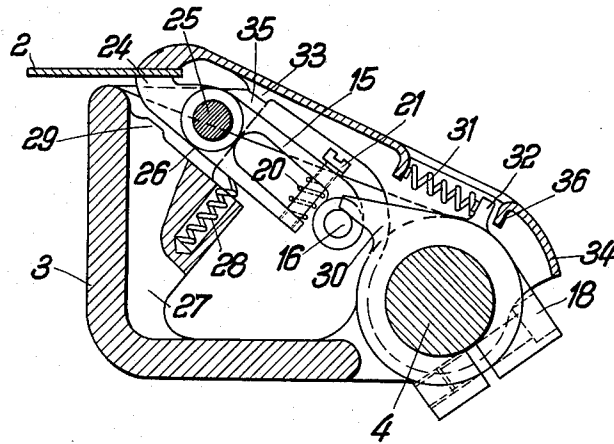


Fig. 1

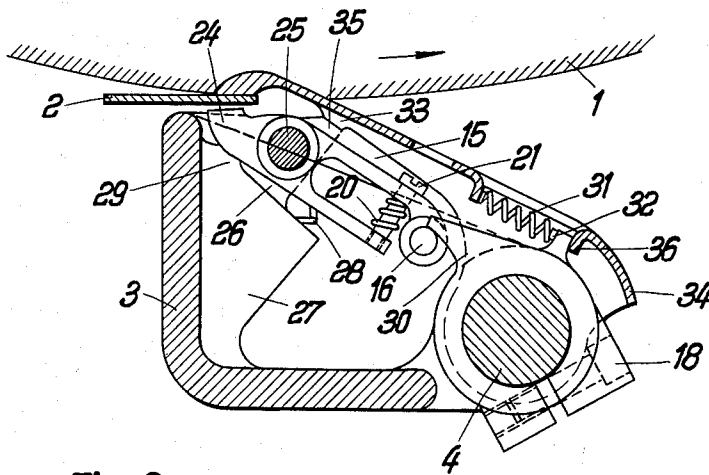


Fig. 2

Inventor:
WERNER KOCH
By Hane and Nydick
ATTORNEYS

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3 Sheets-Sheet 2

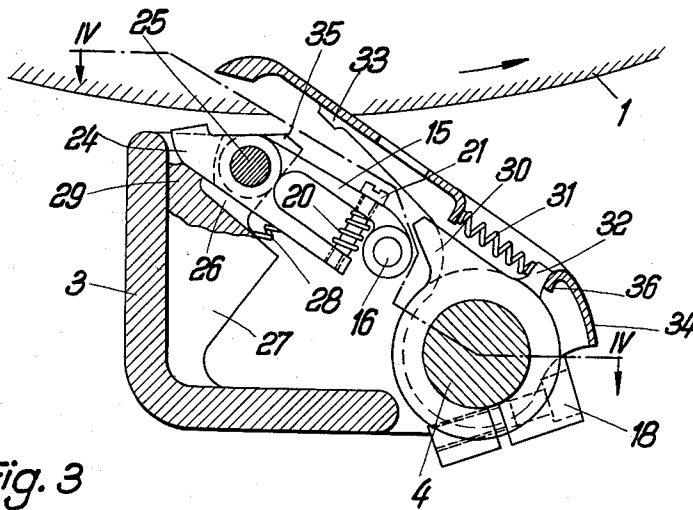


Fig. 3

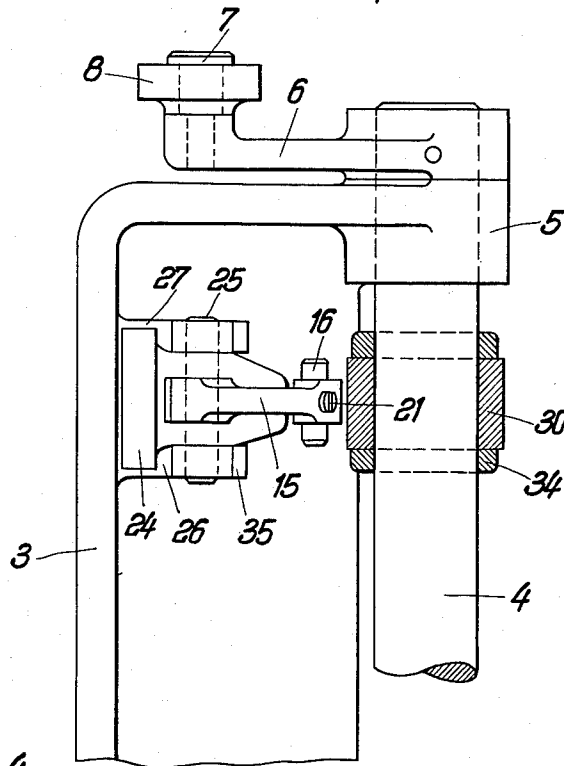


Fig. 4

Inventor:
WERNER KOCH
By Hane and Nydick
ATTORNEYS

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3 Sheets-Sheet 3

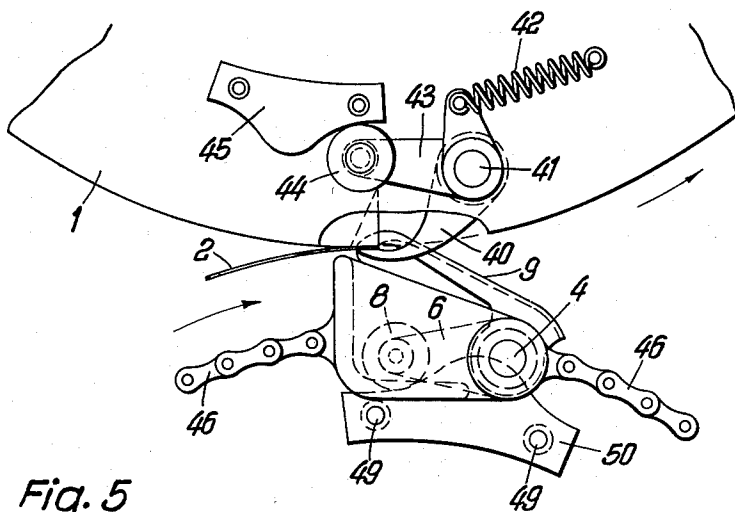


Fig. 5

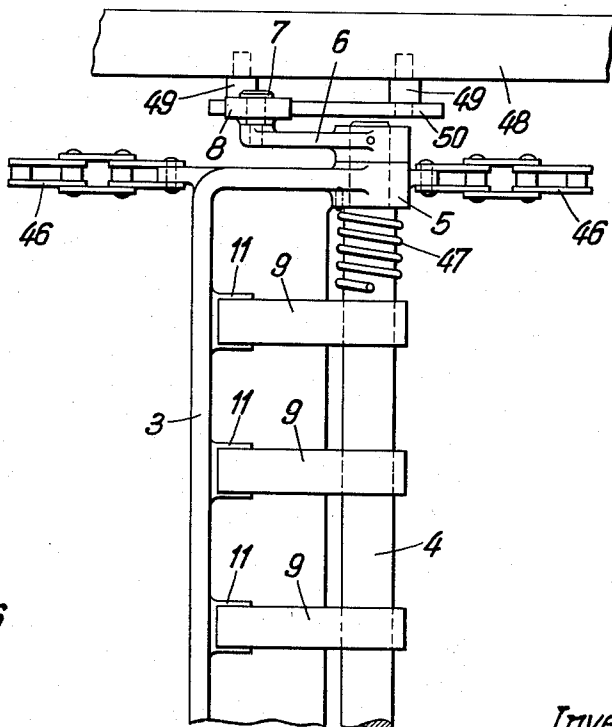


Fig. 6

Inventor:
WERNER KOCH
By *Kane and Nydick*
ATTORNEYS

1

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GRIPPER FOR USE IN PRINTING MACHINES

Werner Koch, Offenbach (Main), Germany, assignor to Roland Offsetmaschinenfabrik Faber & Schleicher A.G., Offenbach (Main), Germany

Original application Mar. 7, 1956, Ser. No. 570,102, now Patent No. 2,882,049, dated Apr. 14, 1959. Divided and this application Feb. 10, 1959, Ser. No. 792,442

4 Claims. (Cl. 101-409)

This invention relates to a gripper device for use in connection with the conveying means of sheet printing machines, especially for the sheet feeding and stacking devices thereof, and is a division of my application Serial No. 570,102, filed March 7, 1956, now U.S. Patent No. 2,882,049, for an invention also relating to the gripper devices of sheet printing machines, particularly such which are adapted for the conveyance, for example in multicolor printing machines, of the sheets in accurate registry from one printing mechanism to the next following.

In printing machines, the pregripper and the stacking gripper, and in multicolor printing machines the sheet conveyor also, cooperate with the printing cylinders of the machines. The feeding gripper, or pregripper, receives the sheets from the feed table and passes them to the printing cylinder, while the stacking gripper receives the printing sheets from the cylinder in order to deposit it, directly or indirectly, on the stack of the finished sheets. The sheet conveyor serves to take the sheets from the printing cylinder of one printing mechanism to the printing cylinder of the succeeding mechanism. In the moment of reception, or disposal respectively, the sheet is in contact with its front edge on one side with the surface of the printing cylinder and on its other side with the gripping means of the respective conveyor, except in the case of the pregripper in which the sheet is received not from the printing cylinder but from the feed table.

In all the aforesaid cases due consideration must be paid to the different thicknesses of the sheets, and conveying devices are known which, for that reason, are provided with devices by means of which the upper and/or lower grippers can be adjusted in a direction at right angles to the sheet surface in order to be able, at the moment of the reception, or disposal respectively of the sheet, to adapt the width of the gap between the cylinder surface and the lower gripper to the thickness of the sheets to be printed.

Devices of the kind referred to, however, are complicated in construction and expensive to produce. Another disadvantage consists in that their employment considerably prolongs the idling times of the machine, for which reason they are used in the conventional printing machines on the grippers only. In connection with the stacking devices and the conveyors this possibility of adjustment is, as a rule, not resorted to and, instead, one leaves the space between the cylinder surface and the gripper sufficiently large to accommodate even the thickest printing material, such as cardboard for instance. This, however, encounters the other disadvantage that thin sheets are apt to stretch along their front edges during their transfer from one mechanism to the other and thus lose their registry for the succeeding printing operations. In the transfer grippers of multi-color printing machines an exact transfer between the individual printing mechanisms is practically impossible.

The invention removes these and other disadvantages.

2

It substantially consists in the provision of an upper gripper of which one part acts on one side of the sheet and is movable in relation to the gripper carrier, while in its closed position it rests against an abutment thereof, the lower gripper acting on the other side of the sheet opposite the upper gripper and also is adapted to move in relation to the carrier.

The invention further rests in the provision of a gripper in which either the upper or the lower gripper will attain its sheet receiving position prior to the other and so that its sheet contacting surface will always remain unchangeable, though adjustable, in its receiving position, which usually is a position flush with the surface of the printing cylinder, while the other gripper part is caused to move in timed relation toward the respective first part and so as to adapt itself to the various thicknesses of the sheets.

The invention renders it possible for the operative gripping surface particularly of the upper gripper to maintain its position in relation to the printing cylinder, and of both grippers in relation to the conveyor, or the gripper carrier respectively, independent of the thickness of the material to be printed. In this way any distortion or warping of the front edges of the sheets is successfully avoided and the accuracy of registry in the transportation of the sheet is ensured.

In accordance with a preferred embodiment of the invention a common actuating member for the two gripper parts is provided, which operates in such a manner as to cause the movement first of the upper gripper and, in timed relation thereto, of the lower gripper so as to close the latter upon the former irrespective of the thickness of the sheet which has meanwhile moved therebetween. Such common actuating member simplifies the entire mechanism which thus becomes inexpensive and yet more reliable.

Another feature of the present invention rests in the provision of automatic means for causing a resilient gripping action of at least one of the gripper parts, preferably the lower gripper, for the purpose of affording a firm hold on the sheet which is gripped between the jaws of the upper and the lower gripper. The arrangement may preferably be such as will enable said resilient means to be varied in their effectiveness if required.

In the aforesaid preferred form of construction of the invention the lower gripper is in the shape of a two-arm lever which is pivoted to the upper gripper and on the one arm of which the common actuating member is caused to act, while the other arm is provided with a gripper jaw at its end and with means for cooperation with a fixed abutment on the gripper carrier, a resilient member being interposed between the two grippers tending to move them into their open position. If a plurality of grippers is arranged on a common shaft, the resilient member may be interposed between the shaft and the actuating member.

The accompanying drawings illustrate two modifications of the invention by way of example. In these drawings

Fig. 1 illustrates a sectional view of a gripper arrangement in accordance with the invention in its closed position.

Fig. 2 shows the same in an intermediate position in a sectional view similar to Fig. 1.

Fig. 3 illustrates the same in its open position.

Fig. 4 is a plan view of any of the foregoing figures partly in section on line IV-IV of Fig. 3.

Fig. 5 illustrates the invention as applied to a chain conveyor in side elevation.

Fig. 6 is a plan view of a gripper assembly in accordance with Fig. 5.

Like members are designated by like references throughout the various figures of the drawings.

In accordance with these drawings the sheet 2 to be conveyed may be held by the gripper, or grippers, for instance in the manner indicated in Fig. 5, in which it is shown how, at the moment of transfer from the cylinder 1 to the conveyer, the sheet is held by both, the cylinder gripper 40 and the conveyer or transfer gripper 9. The conveyer gripper may be of any known or convenient type and may be moved past the printing cylinder for instance by means of chains, a revoluble drum, an oscillating lever, or by any other means such as may be applicable to the invention hereinafter described.

The conveyer, by means of which the sheets are taken from the printing cylinder, usually comprises a plurality of grippers, of which in Figs. 1 to 4 only one is shown, and which are arranged on a carrier 3 of angular cross section which extends over the whole width of the machine as indicated in Figs. 4 and 10. In this carrier the gripper shaft 4 for the actuation of the grippers is journaled in bearings 5 and adapted to be rocked at predetermined intervals by an arm 6 carrying a pin 7 on which is mounted a roller 8. The rocking movement of the gripper shaft is controlled by a cam 50 mounted as by bolts 49 on the frame 48 of the machine. The upper gripper 34 is pivoted on the gripper shaft 4 and is journaled in a forked bracket 26 of the carrier 3 on a pin 25. The said bracket forms part of an abutment 26 preferably forming one piece with the casing or carrier 3.

A spring 28 partly housed in a bore of the said abutment and acting on the tail end of the lower gripper member 24 tends to turn the latter in counter-clockwise direction about its pivot 25 causing it to rest in the open position of the gripper against a projection 29 of the abutment 27 (Figs. 2 and 3). An intermediate lever 15 is provided having its lower end turned down and formed into a bearing for the reception of a pin 16 in such a manner, that it stands out to both sides from it (Fig. 4). A set screw 21 which is screwed into the tail end of the lower gripper is passed through the said lever 15 having its head made to project to the outside thereof. A spring 20 is interposed between the said tail end of the lower gripper and the intermediate lever 15.

A cam 30 which is fastened to the shaft 4 on the carrier by means of a clamp 18, has a projecting arm 32 which tends to exert a closing action on the upper gripper 34 over a spring 31 which is positioned between the said projection 32 and a projecting finger on the upper gripper. This position is shown in Fig. 1 in which the said spring 31 is compressed and the arm 32 has moved a slight distance away from its stop 36 on the gripper 34. The gripper, in this position, is closed under the resilient action of spring 20, as will now be explained.

When the gripper shaft 4 is rocked in counter-clockwise direction from the open position in Fig. 3 into the closed position of Fig. 1, the arm 32 of cam 30 compresses the spring 31, thereby pivoting the upper gripper resiliently in also counter-clockwise direction until its abutment 33 comes to rest on the seat 35 of the fixed abutment 27. In this way the position of the gripping surface of the upper gripper 34 is caused always to take its predetermined position flush with the outer surface of the material 2 to be printed, as is shown in Figs. 1 and 2.

On the return of the gripper from its open position in Fig. 3 into the closed position of Fig. 1, the lower gripper 24 is pivoted clockwise, while the gripper shaft 4 continues its rocking movement in counterclockwise direction. During this movement, as seen from the position of Fig. 3, the cam 30 contacts with the pin 16 at the end of the intermediate lever 15 (Fig. 2) and turns the lower gripper 24 via the lever 15 about its pin 25 in clockwise direction. Hereby spring 28 becomes compressed, while the stronger spring 20 causes lever 15 for a short interval to remain in contact with the head of screw 21. But as soon as the lower gripper 24 contacts

with the underside of sheet 2, the continued movement of shaft 4 causes the intermediate lever 15 to swing in relation to the lower gripper and to thereby compress the spring 20 still further (Fig. 1). During the continued action of cam 30 on pin 16 of lever 15, the compression of spring 20 then depends on the thickness of the sheet 2 only.

To open the gripper, shaft 4 is rocked in clockwise direction until the arm 32 comes to bear on the stop 36 thereby relaxing the spring 31. Cam 30 and the arm 32 continuing on their clockwise rotation, then cause the upper gripper 34 to open under the pressure exerted by the arm 32 on the projection 36 whereby, finally, the position of Fig. 3 is reached. Simultaneously herewith the spring 20 has also expanded and thereby pushed lever 15 into contact with the head of the screw 21. Hereby the lower gripper 24 pivots on its pin 25 until its lower head portion comes to rest on the projection 29 of the fixed abutment 27. This position is shown in Figs. 2 and 3 from which figures the ample space can be seen which exists between the two gripper jaws and which enables them to seize between them material of any conventional thickness without the risk of the leading edges of the sheets becoming crumpled or otherwise disfigured.

Figs. 5 and 6 illustrate the invention as applied to a chain conveyer by means of which the sheets are transferred, for example, from one printing cylinder to another. Fig. 5 shows the position in which a sheet 2 is passed by the chain gripper to the printing cylinder whereby the sheet is held at its front edge jointly by the two gripper members. The grippers 40 on the cylinder 1 have just closed while the grippers 9 will be opened on the continued operation of the machine. A plurality of grippers 40 is arranged in known manner on a shaft 41 which is journaled in the cylinder 1 and adapted to be rocked by means of the spring 42, so that the gripper 40 will close and hold the sheet along its front edge.

Keyed to the shaft 41 is a lever 43 with a cam roller 44 which, in the rotation of the cylinder 1, comes into contact with a cam 45. This cam is fixed to the inside of the machine frame and is provided to effect the opening and closing of the grippers at predetermined intervals in the rotation of the cylinder. The conveyer which is shown in cooperation with the cylinder is a chain-conveyer comprising two endless chains 46. Each of these chains travels along one of the inside walls 48 of the machine frame over sprockets (not shown). Fixed to the said chains are a plurality of carriers 3 of the afore-described kind, each being journaled on a gripper shaft 4 so as to be capable of rocking movement. A spring 47 is provided to effect such rocking movement in counter-clockwise direction whereby the grippers are resiliently closed.

Also fastened to the machine frame 48 is a cam 50 by means of bolts 49, which cam, by the movement of the chain grippers, acts on the roller 8 and thereby controls, over lever 6, the opening and closing of the grippers 9 in their predetermined succession.

What I claim is:

1. In a sheet gripping arrangement for use in sheet printing machines, a gripper carrier, an upper gripper and a lower gripper on said carrier, a rockable gripper shaft on said carrier, cam means on said shaft for pivoting said upper and lower grippers in relation to the carrier, said lower gripper comprising a two-arm lever pivoted to the said carrier and having one of its arms provided with a gripping surface and the other constituting a tail end to the said lower gripper, said cam means on the rockable gripper shaft serving for opening and closing the grippers, a pivoted lever intermediate said gripper shaft and the lower gripper for transferring movement from said closing and opening means to said lower gripper, and means including a spring to connect the tail end of said lower gripper and said intermediate lever so as to effect a resilient grip of the lower gripper on the sheets to be

5

conveyed irrespective of the thickness of the material thereof.

2. In a sheet gripping arrangement for use in sheet printing machines, a gripper carrier, an upper gripper and a lower gripper on said carrier, a rockable gripper shaft on said carrier, cam means on said shaft for opening and closing said upper and lower grippers in relation to said carrier, said lower gripper comprising a two-arm lever pivoted to said carrier and having one of its arms provided with a sheet gripping surface and the other forming a tail end to the said lower gripper, a fixed abutment on said carrier, a portion of said lower gripper arranged for contact with the said fixed abutment when the gripper is in its open position, a pivoted lever intermediate the gripper shaft and said lower gripper for transferring movement from said opening and closing means to said lower gripper, and means including a spring to connect said tail end of the lower gripper and said intermediate lever so as to effect a resilient grip of the lower gripper on the sheets to be conveyed irrespective of the thickness of the material thereof.

3. A sheet gripping arrangement for use in sheet printing machines having upper and lower gripping means, comprising a gripper carrier, a rockable gripper shaft mounted on said carrier, means to rock said shaft, an upper gripper loosely turnable on said gripper shaft, a fixed abutment on said carrier to determine the sheet gripping end position of said upper gripper, a pivot pin on the carrier disposed parallel to said shaft, a lower gripper turnable about said pivot pin in cooperation with said upper gripper, said lower gripper having two arms

6

one carrying the gripper surface and the other forming a tail end to the said lower gripper, a compression spring in said carrier acting on said tail end resiliently urging the lower gripper in the opening sense of the gripper, a second abutment on said carrier for arresting the opening movement of said lower gripper at a predetermined end position, and actuating means operable by the said gripper shaft for moving first the said upper and then the said lower gripper into the sheet gripping position.

4. A sheet gripping arrangement for use in printing machines having a carrier, an upper and a lower gripper in said carrier of the kind set forth in claim 3, in which the upper gripper is provided with a compression spring and the actuating means with an arm on which the said second compression spring is supported, said second spring, when compressed, urging the said upper gripper into its sheet gripping position, while the said actuating means simultaneously urge the lower gripper in the direction of the upper gripper after the latter has assumed its sheet gripping position, both grippers being so timed in their relative movements that the gripping surface of the upper gripper always stops at the same sheet gripping position which is determined by the contact of the upper gripper with the said fixed abutment, while the lower gripper grips the sheets irrespective of their thickness.

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