United States Patent

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[54] **DEVICE FOR GRIPPING PAPER SHEETS**
9 Claims, 4 Drawing Figs.

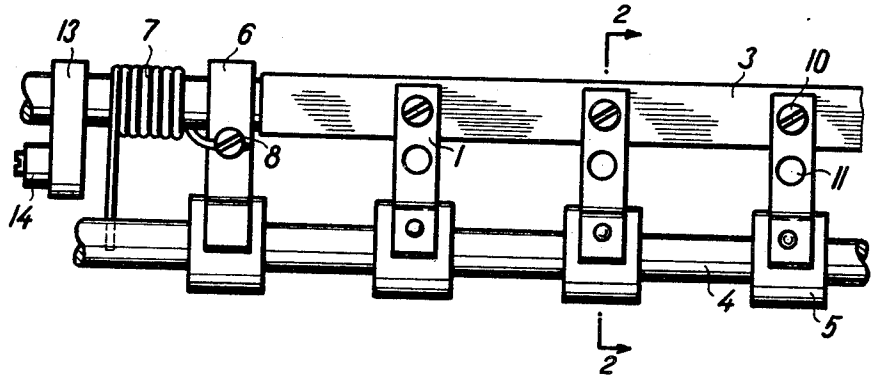
[52] **U.S. Cl.** **271/79;** 198/180; 271/51
[51] **Int. Cl.** **B65h 29/02**
[50] **Field of Search** 271/45, 51, 53, 79, 82, 85; 198/180

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ABSTRACT: A device to be used in printing presses and the like for gripping paper sheets during transportation thereof includes a pair of parallel shafts one of which is a carrier shaft and the other of which is a stop shaft. The stop shaft carries a plurality of rubber stops which are distributed therealong while the carrier shaft carries a plurality of springy grippers which are fixed thereto and extend therefrom into overlapping relation with respect to the several stops. The grippers are all made of springy flat leaf spring material. At their ends where they overlap the stops the grippers respectively carry rubber plates situated between the leaf springs and stops and directly engaging the latter when there is no sheet gripped between these rubber plates and rubber stops.



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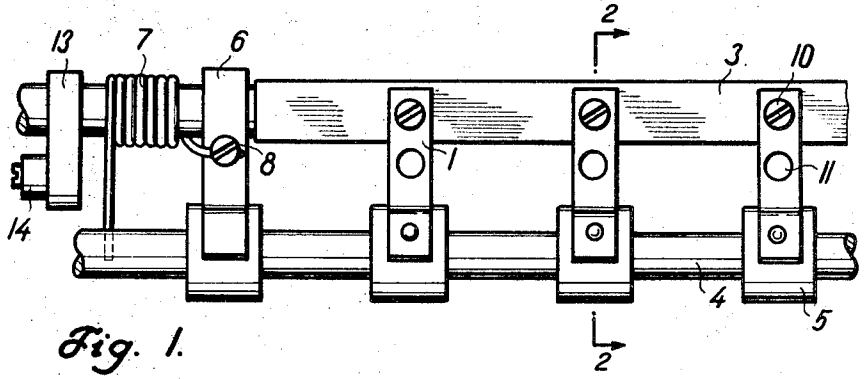


Fig. 1.

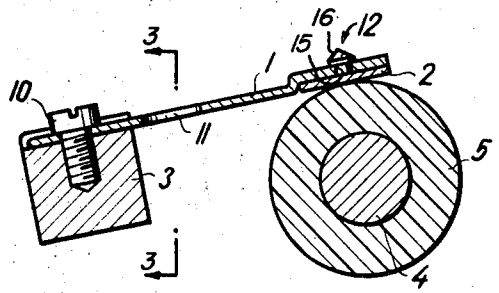


Fig. 2.

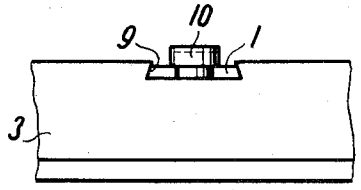


Fig. 3.

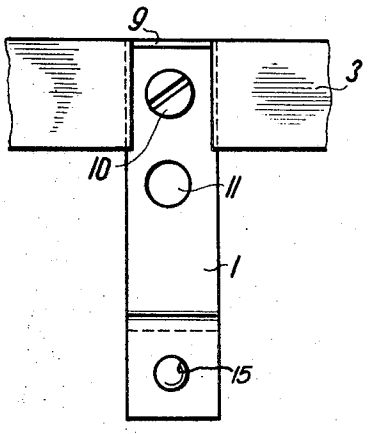


Fig. 4.

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DEVICE FOR GRIPPING PAPER SHEETS

BACKGROUND OF THE INVENTION

The present invention relates to devices for gripping and transporting paper sheets.

For example, the structure of the present invention may be used in printing presses or similar devices where it is necessary to grip and transport paper sheets. In printing presses, particularly offset printing presses, the paper sheet which has been printed is gripped and transported, with a structure carried by chain conveyors, to a stacking table where the sheets are stacked one upon the other.

This chain type of conveyor for the paper sheets will in a printing press carry a device of the invention for gripping a paper sheet to carry and transport the latter. The gripping device thus grips the printed sheet which issues from the press and then delivers the sheet to the depositing table where the sheet is released to be located in a given stack of the printed sheets.

Known devices of the referred to general type conventionally include a row of grippers which are swingably carried by a carrier rod or shaft and which are yieldably pressed against suitable stops by way of torsion springs. Each gripper has its own torsion spring, and the several grippers are urged thereby respectively against the several stops which are themselves carried by a separate stop shaft or rod which extends parallel to the carrier shaft carrying the grippers. The grippers are displaced to open positions during engagement or release of a paper sheet, by way of the action of a cam on a roller carried by a lever or crank which is fixed to and extends from the carrier shaft at one end thereof. The closing movement of the grippers is brought about by way of a torsion spring situated at one end of the series of torsion springs and capable of having a given prestress provided for acting on the end gripper which is adjustable. The individual torsion springs coact with the several grippers in order to bring about their proper coaction with the several stops.

It is customary to make the grippers of a relatively rigid material such as metal castings or suitably stamped sheet metal. The stops, however, are for the most part made of rubber or plastic and are directly engaged by the grippers.

The disadvantage of these known devices resides in the fact that the rubber stops soon become pressed out of shape at the locations where they are directly engaged by the metal grippers so that the result is that the stops are provided in a relatively short time with undesired depressions. These depressions result in a lack of a secure grip on a paper sheet with the result that the sheet can slide from between the grippers and stops and can become undesirably damaged.

A further disadvantage of this type of conventional construction resides in the fact that the individual grippers are relatively complex and also in the fact that the several grippers respectively require several torsion springs so that each gripper will have its own torsion spring. When it becomes necessary to exchange one torsion spring or gripper for another it is essential to disassemble the entire series of grippers from the carrier shaft. These operations are of course extremely tedious and result in high labor costs.

SUMMARY OF THE INVENTION

It is accordingly a primary object of the present invention to provide a device of the above type which will avoid the above drawbacks.

In particular, it is an object of this invention to provide a construction where the grippers can be made of an exceedingly simple construction at far less cost than has heretofore been possible.

In addition, it is an object of the invention to provide a construction which will enable any selected gripper to be removed and replaced without requiring an entire series of grippers to be removed and then again replace.

Furthermore, it is an object of the present invention to provide a construction which does not require a torsion spring for each gripper.

Also, it is an object of the invention to provide a construction which will not cause in the stops undesired depressions which undesirably hamper the operations in the manner described above.

In accordance with the invention, the device includes a pair of parallel shafts one of which is the carrier shaft and the other of which is the stop shaft. The stop shaft carries a plurality of rubber stops which are distributed along the stop shaft while the carrier shaft carries a plurality of springy grippers. The springy grippers are in the form of elongated flat leaf springs respectively fixed to the carrier shaft and respectively extending into overlapping relation with respect to the stops. The end regions of the several grippers which overlap the stops respectively carry elastomeric plates situated between the springy grippers and the stops and directly engaging the latter. At their ends distant from the stops the leaf springs which form the grippers are respectively received in elongated grooves of dovetail cross section, which are formed in the carrier shaft.

As a result of these features the assembly and disassembly of the structure is considerably simplified, as compared with conventional constructions. Any selected gripper can be independently removed and replaced without disturbing the other grippers. A further advantage of the structure of the invention resides in the fact that the rubber or elastomeric plates which engage the rubber or elastomeric stops will not result in the formation of undesirable depressions therein while at the same time the engagement of the elastomeric materials of the plates and stops results in holding of a paper sheet with an increased force because of the increased coefficient of friction achieved in this way between the gripper assemblies and the stops. Because of the use of leaf springs to form the grippers the series of torsion springs required for the several grippers are completely eliminated, so that not only is the entire assembly considerably simplified and reduced in cost, but in addition the possibility of faulty operations is also reduced.

BRIEF DESCRIPTION OF DRAWINGS

The invention is illustrated by way of example in the accompanying drawings which form part of this application and in which:

FIG. 1 is a fragmentary plan view of a device of the invention;

FIG. 2 is a transverse sectional elevation taken in the plane of line 2–2 of FIG. 1 in the direction of the arrows and showing the structure at an enlarged scale;

FIG. 3 is a fragmentary transverse sectional elevation of the structure of FIG. 2 taken in the plane of the line 3–3 of FIG. 2; and

FIG. 4 is a fragmentary top plan view showing part of the structure of FIG. 1 at a scale larger than FIG. 1 so as to show more clearly additional details of the structure.

DESCRIPTION OF A PREFERRED EMBODIMENT

The device of the invention includes an elongated carrier shaft 3 and an elongated stop shaft 4 which is parallel to the shaft 3, both of these shafts being supported at their ends on a pair of parallel conveyor chains well known in the art.

The shaft 3 is formed with a plurality of grooves 9 distributed along the shaft 3, each groove having a dovetail cross section, the form of each groove 9 being apparent from FIGS. 3 and 4. Several springy grippers 1 are respectively received at one of their end regions in the several grooves 9, and it will be noted that the minimum width of each groove 9 is smaller than the width of each metal leaf spring which forms the gripper 1. A screw 10 extends through an opening in the gripper 1 into a threaded bore of the carrier shaft 3, as shown most clearly in FIG. 2, to fix in this way the several grippers 1 to the carrier shaft 3.

The springy grippers 1 in the form of flat leaf springs are fixedly carried by the carrier shaft 3 in the grooves 9 thereof and extend from the shaft 3 respectively into overlapping relation with respect to a plurality of stops 5 made of an elastomeric material such as rubber and surrounding and distributed along the stop shaft 4 which extends parallel to the carrier shaft 3. The several grippers 1 carry at their ends which overlap the stops 5 elastomeric springy plates 2 (see FIG. 2) which also may be made of rubber in the same way as the stops 5. The plates 2 are respectively situated between the grippers 1 and the stops 5, directly engaging the latter.

In order to fasten the plates 2 to the leaf springs of the grippers 1 the leaf springs are formed at their ends which overlap the stops 5 with openings 15 passing therethrough, and the several plates 2 have projections 12 integral therewith and projecting therefrom through the openings 15. The projections 12 terminate in enlarged outer ends 16 which after snapping through the openings 15 spread over and engage the top surface of the grippers or springs 1 so that in this way the several plates 2 are securely fastened to the grippers.

Further, at substantially central intermediate regions, the several grippers 1 are formed between their opposed end regions with circular openings 11 which serve to reduce the cross section of the grippers 1.

As was pointed out above the shafts 3 and 4 which carry the above structure are mounted at their ends on a roller type of chain, and the ends of the shafts 3 and 4 are provided with suitable known attachments by means of which the shafts 3 and 4 are supported on the conveyor chains.

In addition, the carrier shaft 3 is provided at one of its ends with an adjustable gripper 6, this gripper being the only adjustable one carried by the shaft. As is well known, the gripper 6 can have its angular position with respect to the shaft 3 adjusted. For this purpose the shaft 3 extends through an opening at one end of the gripper 6 and a suitable setscrew or the like is provided for adjusting the angular position of the gripper 6 with respect to the shaft 3. A torsion spring 7 which forms the only torsion spring of the entire assembly of the invention surrounds the shaft 3 in the region of the single adjustable gripper 6, and one end of the torsion spring 7 is fixed to the adjustable gripper 6 by an adjusting screw 8, while the other end of the torsion spring 7 engages the stop shaft 4 at the underside thereof. With this construction it is possible to provide an adjusted predetermined prestressing in the several springy grippers 1 by way of a suitable adjustment of the single adjustable grippers 6.

At the same end of the shaft 3 where the torsion spring 7 is located, the shaft 3 also carries an elongated crank or lever 13 which projects radially from the shaft 3 and which carries at its outer free end a freely turnable roller 14 to be engaged in a known way by a cam which will turn the shaft 3 so that in this way the several grippers will be displaced to open positions where the plates 2 are spaced from the stops 5, thus enabling a paper sheet either to be gripped or to be released. As soon as the roller 14 is displaced beyond the cam, the grippers will be returned by the spring 7 to their gripping position where the plates 2 are urged toward the stops 5, either gripping a sheet between the plates 2 and stop 5 or directly engaging the stops 5.

During operation of the structure described hereinbefore the several springy grippers 1 will have been initially adjusted in such a way that all of the grippers coact with the stops 5 to provide the desired gripping action therewith. This adjustment is brought about by way of the torsion spring 7 and the single adjustable gripper 6 which is turned to an angular position with respect to the shaft 3 that will bring about the desired coaction of the several grippers 1 with respect to the stops 5. The proper coaction between the grippers 1 and the stops 5 is brought about by way of the elastic deformation of the plates 2. Thus, after the plates 2 have an engagement with respect to the stops 5, which produces a desired elastic deformation of the plates 2, the spring 7 and adjustable gripper 6 are turned further so as to result in a turning of the shaft 3 which will provide the desired prestressing of the several grippers 1. The carrier shaft 3 with the springy grippers 1 and the stop shaft 4 with the stops 5 are carried by the roller chains during depositing of a paper sheet on the stacking table and are transported along a predetermined path. At the location where the sheet is to be gripped, the roller 14 engages a cam so that the grippers 1 are momentarily displaced to their open position, engage a paper sheet and grip the latter, transporting the sheet to the stacking table. At the latter table a second cam engages the roller 14 to displace the grippers to their nongripping positions so as to release the paper sheet upon opening of the grippers, and in this way the printed paper sheet is delivered to the desired location. Of course, upon movement of the roller 14 beyond the second cam, the grippers again return to their closed positions.

We claim:

1. A device to be used in a printing press or the like for gripping a paper sheet during transporting thereof, comprising a pair of parallel shafts one of which is a carrier shaft and the other of which is a stop shaft, a plurality of stops carried by and distributed along said stop shaft, a plurality of springy grippers respectively fixed to and carried by said carrier shaft and extending therefrom into overlapping relation with respect to said stops, respectively, said grippers each being made of a flat leaf spring, and said grippers respectively terminating in free end portions which respectively overlap said stops, and a plurality of yieldable elastomeric plates respectively carried by said free end portions of said grippers and situated between said free end portions thereof and said stops in engagement with the latter when there is no sheet between said plates and stops.

2. The combination of claim 1 and wherein said carrier shaft is formed with a plurality of grooves of dovetail cross section respectively receiving end portions of said grippers opposed to those which overlap said stops.

3. The combination of claim 1 and wherein said stops also are made of a yieldable elastomeric material.

4. The combination of claim 3 and wherein said plates and said stops are made of rubber.

5. The combination of claim 1 and wherein said springy grippers are respectively formed with cutouts situated between said shafts at intermediate portions of said grippers for reducing the cross section of said grippers.

6. The combination of claim 1 and wherein said springy grippers are respectively formed at said elastomeric plates with openings, and means connected to said plates and respectively extending through said openings for fastening said plates to said grippers.

7. The combination of claim 6 and wherein said means which fixes said plates to said grippers includes projections integral with said plates, respectively extending through said openings thereof, and engaging said grippers for retaining said plates securely fastened thereto.

8. The combination of claim 1 and wherein said carrier shaft carries a single gripper which is angularly adjustable with respect to said carrier shaft and which engages a stop carried by said stop shaft, and a single torsion spring surrounding said carrier shaft and engaging said stop shaft and said single adjustable gripper for adjusting the force of the latter and also adjusting the angular position of said carrier shaft to adjust the engagement between the remainder of the grippers and the stops carried by said stop shaft.

9. The combination of claim 8 and wherein said single adjustable gripper and said torsion spring are located at the region of one end of said carrier shaft to one side of all of the rest of the grippers.