United States Patent

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[33] **Germany**
[31] **P 17 61 506.4**

[54] **DEVICE FOR THE REMOVAL OF SHEETS, INSERTS OR THE LIKE RELEASED FROM A ROLLER FRAME**
3 Claims, 5 Drawing Figs.

[52] **U.S. Cl.** **271/12,** 271/29, 271/DIG. 1
[51] **Int. Cl.** **B65h 5/08**
[50] **Field of Search** 271/12, 11, 29

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ABSTRACT: A device for the removal of sheets from a stack on a roller frame comprising a plurality of rollers mounted on the frame and which rotate in a different sense from the sense of rotation of the roller frame, the said rollers being provided with suction grippers which remove the sheets from the stack and feed them to a conveying means, the speed of which is independent of the rotational speed of the roller frame.

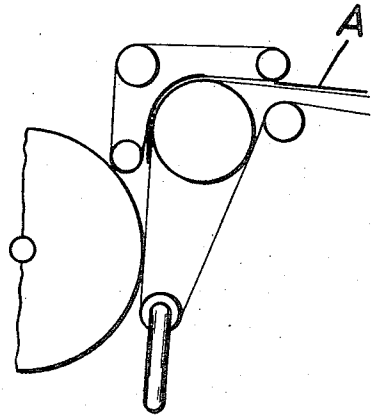

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Fig. 1

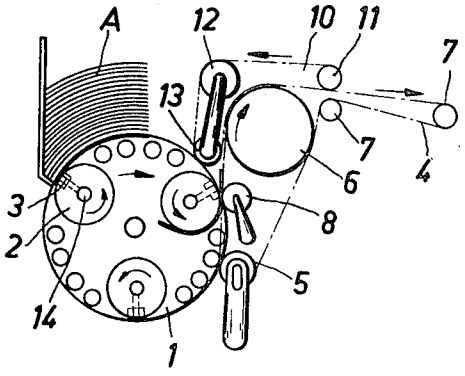


Fig. 2

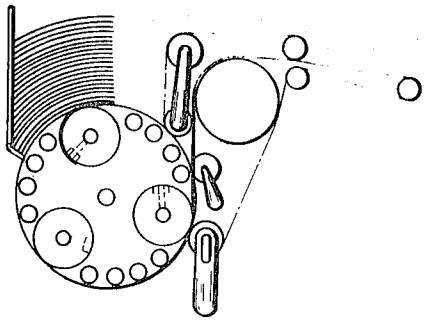


Fig. 4

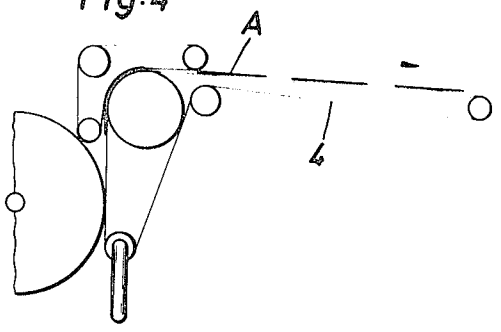


Fig. 3

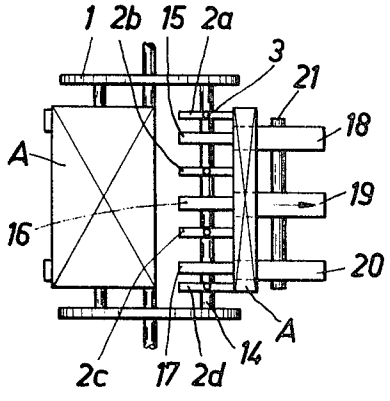
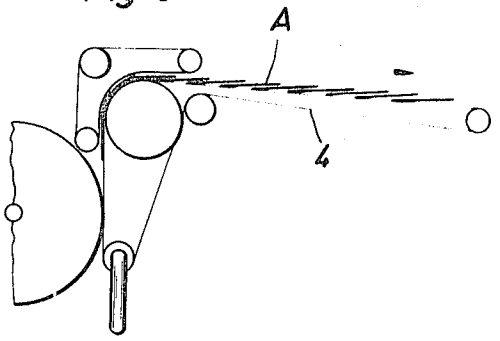


Fig. 5



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DEVICE FOR THE REMOVAL OF SHEETS, INSERTS OR THE LIKE RELEASED FROM A ROLLER FRAME

The invention relates to a device for the removal of sheets, inserts or the like released from a roller frame.

Roller frames or drums serve the purpose of removing individual sheets or inserts successively from a stack consisting of sheets, inserts or the like and feed them for further processing. Roller frames are known which possess a plurality of individual rollers provided with suction grippers and which revolve in the opposite sense to the sense of rotation of the roller frame. Upon passing the stack, the roller seizes with its suction grippers the front edge of an insert, winds this latter around itself upon forward movement of the roller frame and delivers it at a release point to a gripping appliance, which conducts the insert out of the roller frame.

Known removal devices are also equipped with suction or mechanical grippers, which take over and forward the sheet or insert upon its release by the roller of the roller frame. Since they have to take over the consecutive sheets or inserts, these removal devices naturally have to work at a speed equal to the rotational speed of the roller frame, so that the sheet released from the roller frame has to be carried off at a conveying speed equal to the peripheral speed of the roller frame.

In many instances this conveying speed corresponding perforce to the peripheral speed of the roller frame, the further a disadvantage, since frequently a conveying speed deviating upwardly or downwardly from the peripheral speed of the roller frame is advantageous for the further processing of the sheets or inserts. If, for example, the roller frame is to be used to interleave inserts, in the shape of printed sheets or the like, into periodicals, a periodical naturally has to be available at the interleaving point when a sheet, that is to be interleaved, is fed. From this it is clear that the conveying speed of the periodicals, into which the inserts are to be interleaved, also has to correspond to the rotational speed of the roller frame. Since the sheets that are to be interleaved arrive, on the last part of their path, in free fall in the periodicals, it is difficult to place exactly in the periodical the inserts that are to be interleaved; this difficulty is more especially present whenever several, for example two, fairly small inserts are to be interleaved side by side into a periodical or newspaper. On the other hand, a conveying speed which is lower in relation to the peripheral speed of the roller frame may also be desired when, for example, the inserts withdrawn from the roller frame are to be stacked.

An object of the invention is to obviate this disadvantage and to provide a device which makes it possible to remove the sheets or inserts from the roller frame at any desired different conveying speed.

In accordance with the invention, this task is solved in that, arranged at the release point of the roller frame, is a conveying means which receives the released sheet or the insert and the speed of which is independent of the rotational speed of the roller frame.

A further feature consists in that the speed of the conveying means can be varied during operation.

The invention is further distinguished in that the conveying means consists of two superjacent conveyor belts.

It is furthermore materially intrinsic that a lower conveyor belt possesses an independent driving mechanism and lies tangentially against the roller frame in the region of the release point.

The lower conveyor belt may comprise several, for example, three, individual belts lying side by side in a spaced-apart relation, and in that the rollers of the roller frame possesses several, for example, four, pulleys which are arranged securely on its shaft and which lie outside the individual belts and which have suction grippers, and several, for example, three, pulleys which engage with the individual belts and which are freely rotatable on the shaft of the roller.

As a result of the conveying means which are arranged and designed in accordance with the invention and which forward the insert released from the roller frame, it is possible to give these conveying means a greater speed than the peripheral speed of the roller frame, so that the inserts emerging from the roller frame are fed to the periodicals at a fairly high or higher speed. This increased conveying speed of the inserts makes possible, however, a more rapid and therewith more exact interleaving into the periodical, so that, with the device of the invention, it is readily possible to place several inserts side by side into a periodical, without the two inserts mutually overlapping or protruding in relation to the periodical.

If periodicals, which are to be combined in stacks, are ejected from the roller frame, it is possible, with the device of the invention, to keep the conveying speed of the conveyor belts less than the rotational speed of the roller frame, so that the inserts ejected successively from the roller frame, mutually overlap. Since the conveying speed of the conveyor belts can be varied during operation, it is possible to accelerate this at any desired point jerkily for a short time and subsequently to run the belts at a reduced speed once more. In this way, it is possible to form stacks on the conveying means, in that one, namely along with the counting of the inserts ejected from the roller frame, lets the conveying means run at a reduced speed until the stack count set on a counter is reached. Subsequently, the speed is raised abruptly for a short time and subsequently reduced again to the stacking speed. By this means, a gap arises between the individual overlapping inserts, whereby the respectively overlapping inserts correspond to the desired number of a stack.

With a use of this kind, of the device of the invention, one can thus form, on the conveying means, separate stacks of partially overlapping inserts, which merely have to be pushed together without a subsequent counting being necessary.

The accompanying drawings show one exemplary embodiment of the device of the invention, in which:

FIGS. 1 and 2 signify a representation of the device in different operating conditions;

FIG. 3 represents a top plan view in accordance with FIG. 1;

FIG. 4 denotes a diagrammatic representation of the conveying means driven at an increased speed; and

FIG. 5 denotes a diagrammatic representation of the conveying means driven at a reduced speed.

FIGS. 1 to 3 show the destacking device of the invention, in which a stack, consisting of sheets or inserts, rests on the upper side of the periphery of a roller frame or drum 1, which rotates in the clockwise sense.

The roller frame is equipped with three angularly spaced suction rollers (roller assemblies) 2, which rotate counterclockwise with their shafts 14 about their axes. Each suction roller 2 is equipped with a suction gripper 3, which, as is shown in FIGS. 1 and 2, draws off the bottommost sheet A of the stack in accordance with FIG. 1 and winds it around itself in accordance with FIG. 2. When the suction roller 2 arrives in the right-hand position in accordance with FIG. 1, the sheet A is released at the periphery of the roller frame 1.

A conveying arrangement is provided for the removal of the released sheet A, which consists of a lower endless conveyor belt 4 and an upper endless conveyor belt 10. The lower conveyor belt 4 lies tangentially against the roller frame 1 in the region of the release point; it is actuated by a driving mechanism, which can be set to any desired conveying speed. The lower conveyor belt 4 possesses the deflection rollers 5 and 7 and a pressure roller 8. The upper conveyor belt 10 rests in the region of the driving mechanism 6 on the lower conveyor belt 4; it does not possess its own drive, but is entrained by the lower conveyor belt 4. Provided in the region of the release point of the roller frame 1 is s resilient pressure roller for the lower conveyor belt, which pressure roller ensures a reliable entrainment of the released sheet A by the lower conveyor belt. The upper conveyor belt possesses the deflection rollers 11, 12, 13.

As is shown in FIG. 3, the driving mechanism 6 of the lower conveyor belt 4 consists of three driving rollers 18, 19, 20 which are in spaced-apart relation and which are arranged securely on the driving shaft 21. The suction roller 2 possesses four pulleys (2*a* to 2*d*) which lie outside and between the conveyor belts 18, 19, 20 and which are arranged securely on its shaft 14 and each of which carries a suction gripper 3. Arranged to rotate freely on the shaft 14 of the suction roller 2 are three pulleys 15, 16, 17 which engage with the conveyor belts bands 18, 19, 20. When the sheet A has reached the release point at the periphery of the roller frame 1, it is released by the suction gripper 3 of the pulleys (rotatably entraines disks) 2*a* and 2*d*. The pulleys freely rotatable disks 15, 16, 17 arranged loosely on the shaft 14 of the suction roller 2 revolve at the speed of the lower conveyor belt 4, so that the sheet A, after release by the suction gripper 3, can be withdrawn from the roller frame 1 without danger of damage at the speed of the lower conveyor belt 4.

If, in accordance with FIG. 4, the lower conveyor belt 4 is driven at a greater speed than the peripheral speed of the roller frame, gaps arise between the individual sheets A conveyed on the lower belt 4. When, from the conveyor belt 4, the sheets or inserts present thereon are to be interleaved into periodicals, then, as a result of the conveying speed of the sheets A which is greater than the conveying speed of the periodicals (not shown), an accurate interleaving of the sheets A is guaranteed.

When this device in accordance with the invention is to be used for stacking the sheets A, the conveyor belt 4 runs at a lower conveying speed than the peripheral speed of the roller frame. In this connection, the individual sheets A on the conveyor belt 4 overlap. Since the speed of the conveyor belt 4 can be varied during operation, individual stacks can be formed on the conveyor belt 4, whereby, between two consecutive stacks, the speed of the conveyor belt 4 is increased for a short period. By this means, there forms between the last sheet(s) A of the first stack and the first sheet(s) of the following stack, a gap in accordance with FIG. 4, so that the individual stacks of partially overlapping sheets A are separated from one another. By this means, a subsequent counting procedure is avoided, since the abrupt increase of the speed of the conveyor belt 4 can ensue as a function of a counting mechanism (not shown), which counts the individual consecutive sheets, and which brings about an abrupt increase of the conveying speed when a specific set number is reached. In this way, individual stacks can be formed on the conveyor belt 4 rotating at a lower speed, which stacks merely need to be pushed together at the end of the conveyor belt 4, and which contain a number of inserts A stipulated by the counter.

I claim:

1. A destacking apparatus for sheets, comprising a roller drum adapted to support a stack of said sheets along its periphery, said drum being rotatable in one sense and being provided with a plurality of angularly spaced roller assemblies along its periphery, each of said assemblies comprising a shaft rotatable in the opposite sense and provided with a plurality of disks axially spaced along the shaft and rotatably entrained therewith while being formed with suction grippers adapted to entrain the lowermost sheet of the stack along with the roller assembly upon movement thereof past the stack by said drum, and a plurality of disks freely rotatable on each shaft and axially spaced from one another and from the rotatably entrained disk of the shaft; and a conveyor assembly disposed adjacent said roller drum for receiving the sheets carried by said roller assembly at a location angularly offset from said stack, said conveyor assembly comprising a plurality of parallel endless conveyor bands spaced apart along the axis of rotation of said drum and communicating same at least at said location while being displaceable at said location in a direction opposite the direction of movement of the drum periphery, said rotatably entrained disks lying laterally outwardly from said banks and said freely rotatable disks being aligned with said bands, and means for rollingly supporting said bands and driving same at a speed independent of the speed of said drum.

2. The destacking apparatus defined in claim 1 wherein said bands are driven at a variable speed during the operation thereof.

3. The destacking apparatus defined in claim 2, further comprising a second conveyor assembly adjacent the first-mentioned conveyor assembly and entrained therewith for guiding said sheets between said conveyor assemblies.