Feb. 6, 1968 E. M. ASSONY 3,367,549

COLLATOR STRIPPER BELT

Filed Feb. 24, 1966

Fig. 1

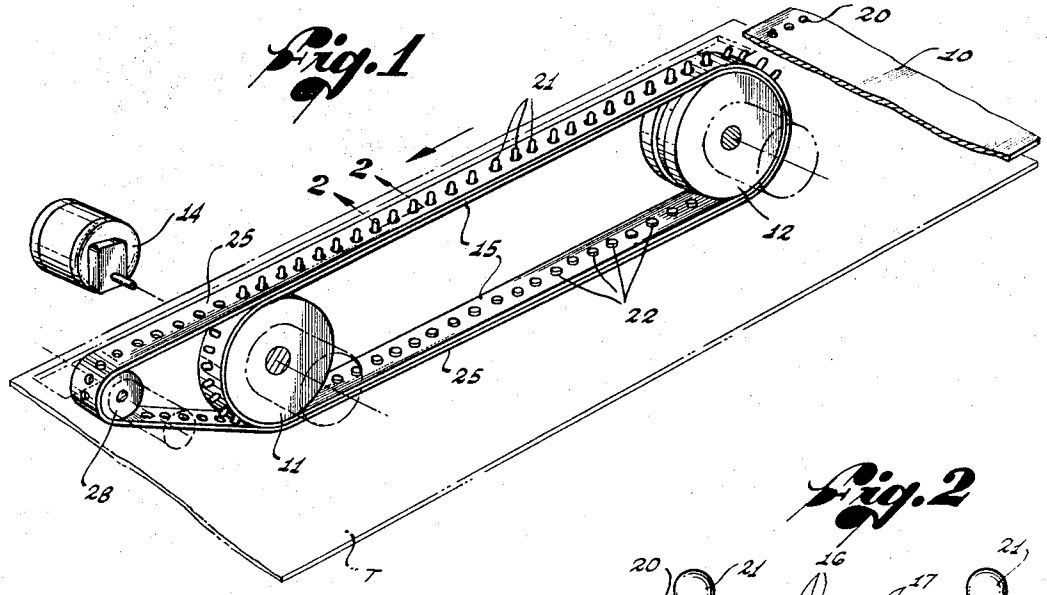


Fig. 2

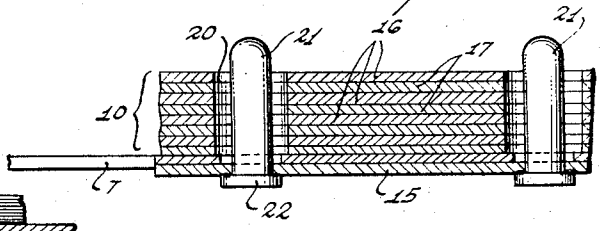


Fig. 4

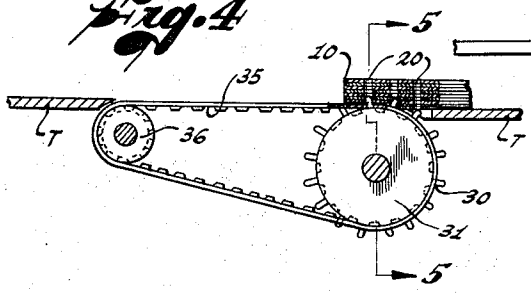
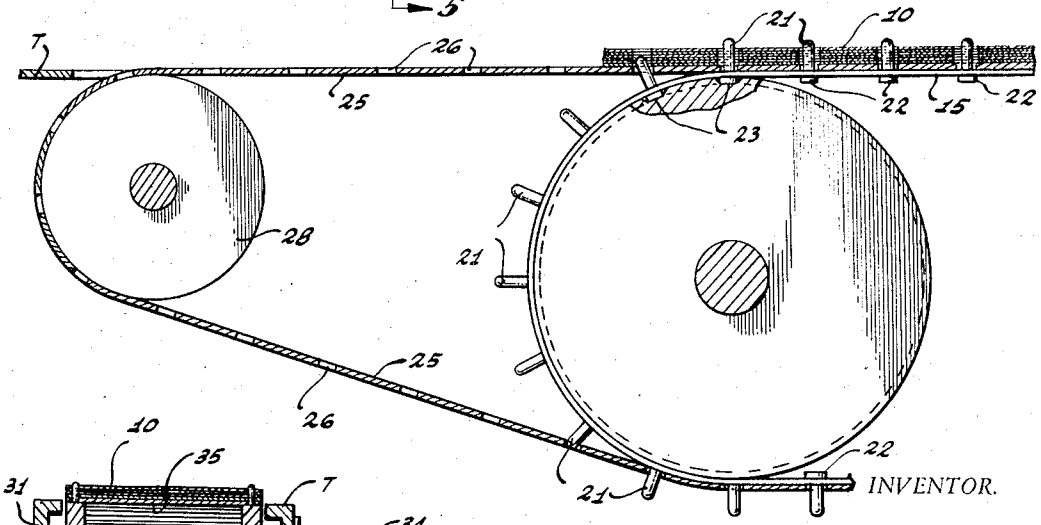


Fig. 3



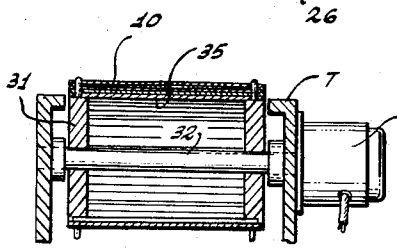


Fig. 5

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COLLATOR STRIPPER BELT

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The present invention relates generally to improvements in machines handling a paper web having a row of punched holes at which the web is engaged by a plurality of pins; and more particularly to a belt construction for conveying the web through or away from collating machines or the like operating on the web, said belt construction being effective to strip the web from pins which engage the web by projecting into or through the holes therein.

The typical web handled in machines of this type consists of a plurality of sheets of paper which have been collated and stacked, one above another. Typical of such a web is one comprising a plurality of business forms which are interleaved with single-use sheets of carbon paper. The individual sheets of papers are in long strips which have been perforated to simplify tearing off each set of the forms. Along at least one longitudinal margin, and often along both margins, there is a longitudinally extending row of spaced holes through the web which are used to advance the web and later to register the forms or web in another machine.

Known types of construction for handling a web of this character involve a belt having a row of spaced pins which engage the web by passing through the holes therein. The belt is at one edge of, or is exposed through a slot in, a table over which the web is advanced by movement of the belt and pins. At the end of the run engaging the web, the belt passes over a pulley or sprocket, which may be either driven or an idler, while the web continues on the table moving in the general direction of travel of said run of the belt. The travel of the belt around the pulley causes movement of the pins away from the web and retracts the pins from the holes in the web. It is at this point that the problem has arisen with the known devices since the pins, as they leave the web, oftentimes come in contact with the sides of the holes in the web with the result that the sheets in the stack are separated or else the holes are torn. This result apparently occurs because of the direction of relative movement of the pins, as they retract from the paper web, and the web itself. In known types of devices, the web is deprived of full support at the location of pin withdrawal. The result is that the web sags and tends to follow the pins as far as it can instead of being lifted clear of the pins.

Thus it becomes a general object of the present invention to provide a novel construction for stripping the paper web from a set of conveying pins in such a manner as to eliminate the damage created by the pins separating the sheets in the web or tearing the holes.

More particularly, it is an object of the present invention to provide a novel stripping arrangement for a web of the character described which supports the web as the pins are retracted from it, thereby maintaining a relative motion between the web and the pins such that the pins do not damage the web as they disengage from the web.

These and other objects of the invention are achieved according to the present invention by providing a construction for handling a paper web having a row of holes therein that comprises a first endless member having a row of pins engaging the web at the holes therein, a second flexible endless member interposed between the web and said first endless member and following a path that coincides in part with the path of said first endless member, and means directing the second endless member over a path which diverges from the path of the first member in such a direction that the pins are disengaged from the web holes while the second member is supporting the web and, in effect, lifting it clear of the pins.

In a preferred embodiment of the present invention, the two endless members comprise two conveyor belts, one longer than the other. The shorter belt carries pins which engage the web and over part of the path of the shorter belt the two belts overlie or engage one another. The longer belt extends on beyond the path of the shorter belt to support the web in such a manner that the web moves in essentially a straight line as the pins are withdrawn from the web.

How the above objects and advantages of the present invention, as well as others not particularly referred to herein, are achieved will be better understood by reference to the following description and to the annexed drawing, in which:

FIG. 1 is a schematic perspective, partly in vertical section, of a web-handling construction embodying the present invention.

FIG. 2 is a fragmentary enlarged vertical section on line 2—2 of FIG. 1.

FIG. 3 is an enlarged fragmentary elevation and longitudinal section illustrating the two endless members at the location where the web is stripped from the pins.

FIG. 4 is a vertical section through a modified form of the invention.

FIG. 5 is a vertical section through the drive sprocket on line 5—5 of FIG. 4.

Referring now to the drawing, and more particularly to FIG. 1, there is shown a stripper belt construction, viewed in longitudinal vertical section, embodying the present invention and adapted to transport a paper web **10** over the top surface of a table T or the like, both indicated in phantom in FIG. 1. The web-handling mechanism comprises a pair of spaced pulleys or sprockets **11** and **12** which are rotatably mounted by any suitable means, not shown in the drawing. These sprockets may be part of a machine which performs various functions on the web, such as assembling and collating the printed sheets which are discharged over table T; but in a broad sense, the stripping mechanism is independent of any other specific mechanism and consequently has been shown here detached from other mechanism. This shortens the present disclosure by eliminating description of such other mechanism and makes the present invention more readily apparent.

One of pulleys or sprockets **11** or **12** is an idler while the other one is driven by any suitable means, as, for example, electric motor **14**. This motor is here shown as being operatively connected to sprocket **11**, but it will be realized that either of the sprockets may be the driven one. Passing around the two sprockets **11** and **12** is a first flexible endless member **15** which typically is a metal belt; but the present invention is not limited to any particular material for belt **15**. Belt **15** may have any suitable length, depending upon the spacing between pulleys **11** and **12**; and it may be of any desired width. For example, it may be substantially the same width as the web **10** in order to support as well as transport the web.

Web **10** is shown in enlarged detail in FIG. 2 wherein it will be seen that the web comprises a plurality of individual sheets of paper **16** which typically are interleaved by carbon sheets **17**. However, a web of this character is merely illustrative of one which is advantageously handled by the present invention since any kind of web may be handled. Web **10** is provided adjacent one margin with a longitudinal row of holes **20** punched through the web either before or after the several sheets **16** and **17** have been stacked and collated. Belt **15** is provided with a plu-

rality of pins **21** which are arranged in a longitudinally extending row and spaced apart by the same distance as holes **20** so that the pins may project upwardly through holes **20** in the web, as shown in FIG. 2. Broadly speaking, belt **15** is but one form of endless member moving the series of pins **21** repeatedly over a closed path or circuit. In this way, pins **21** serve not only to aid in transporting the web in a forward direction but registration is maintained between the several sheets of the web.

Pins **21** may have heads **22** on the reverse side of the belt that serve as cleats that fit into sockets **23** in sprocket **11** to provide a driving engagement between the driving member and the driven belt. Of course, the cleats for this purpose may be elements unrelated to pins **21**.

A second flexible endless member **25** is also provided. It is interposed between web **10** and the upper run of belt **15**, as shown particularly in FIGS. 2 and 3, in which position the paper web rests upon and is engaged by belt **25**. Belt **25** is provided with a plurality of holes **26** which are aligned to register with pins **21** so that the pins pass through the belt, as shown, as well as through the web resting upon belt **25**.

In a typical construction, the two endless members are exposed through a slit in table T; but the stripper belts may also be arranged at one edge of the table. In either case, the top surface of belt **25** is substantially at the level of the top surface of the table with the web being supported chiefly on the table.

An idler **28** is provided at one end of and beyond the run of belt **15** between sprockets **11** and **12**. In this arrangement, the upper run of belt **25** extending from sprocket **12** to idler **28** is substantially straight and is also tangential to sprocket **11**, especially that segment between sprocket **11** and idler **28** around which belt **25** passes. Idler **28** thus provides one form of means for directing the second endless belt **25** over a path which diverges from the path followed by the first belt beginning at the position where the first belt follows around sprocket **11**. As a result of this divergance in the paths of the two belts, pins **21** are retracted from holes **20** in the web and holes **26** in the second belt in the initial portion of this divergence while the web is engaged and fully supported by belt **25** in the immediate vicinity of holes **20**, as shown particularly in FIG. 3.

From FIGS. 1 and 3, it will be seen that the two belts **15** and **25** travel over paths that coincide in part only. Belt **25** is longer and its path extends out beyond the path of belt **15** to pass around idler **28**. On its lower run, belt **25** preferably re-engages belt **15** at the lower side of sprocket **12**, pins **21** again entering holes **26** in belt **25** to maintain registration between the two belts. However, if desired, the two belts may not be brought together until farther along in their paths. In any event, it will be seen that by virtue of the pins passing through the openings in the belt, the two belts are driven in synchronism with each other at all times.

The operation of the present device will be self-evident from the drawings. The paper web is supported on table T at the level of the upper or outermost belt **25** at its top run. As the belt moves to the left in FIG. 1, the paper web is advanced over the web. Since belt **25** extends in the direction of travel beyond the range of movement of belt **15**, the paper web on the belt is engaged by it beyond sprocket **11** and in the zone where the paths of belt **15** and pins **21** diverge. At this zone of divergence, pins **21** are retracted downwardly from the openings **20** and **26** in the web and belt, respectively; but by virtue of the support for the web, the relative motion of the pins and the paper web is such that the pins are withdrawn without engaging and damaging the sides of web holes **20**.

From the foregoing description, it will be apparent that various changes and modifications in the detailed structure of the preferred embodiment illustrated by be made without departing from the spirit and scope of the present invention. For example, the two belts may travel together

over more or less of their total paths than illustrated. Likewise, while the two belts may be co-equal in width or substantially so, belt **15** may be only a narrow belt as shown carrying a single row of pins **21** while web supporting belt **25** is substantially equal to or wider than the full width of web **10** transported by the outer belt to provide web support. It is also within the scope of the invention to provide means other than holes **26** and pins **21** for maintaining synchronous movement between the two belts; and in this event, belt **25** may terminate closely adjacent pins **21** but not have holes through which the pins pass. In this case, the belt extends sufficiently closely to the row of pins to support the web adequately as it is stripped from the pins in the manner already described.

Both belts **15** and **25** are endless members and may take other forms than continuous belts. For example, they may be articulated members, like a chain. Also, a more compact arrangement may be made by, in effect, combining both sprockets **11** and **12** into one, in which case belt **25** passes around drive sprocket **11** and idler **28** only.

An example of this last modification is illustrated in FIGS. 4 and 5. The web **10** is advanced along table T by engagement with a series of equally spaced pins **30** mounted around the periphery of sprocket **31**. Sprocket **31** may be a drum extending across the full width of web **10**; but is here shown as comprising two sections mounted upon drive shaft **32** which is drivingly connected to electric motor **34** which rotates the sprocket, thus making sprocket **31** the drive sprocket. With this construction, it will be noted that idler sprocket **12** is eliminated, as is also the pin-carrying belt **15**, since all of the pins are now mounted on the periphery of the drive sprocket. Accordingly, sprocket **31** now becomes the endless member carrying pins.

Stripper belt **35** passes around drive sprocket **31** and also idler **36**. It may be desired to furnish cleats on the inner side of belt **35** to assure a non-slip engagement with drive sprocket **31**. Stripper belt **35** is provided with spaced perforations, in the manner already described, through which pins **30** on the drive sprocket pass in order to engage openings **20** in paper web **10**.

Belt **35** is here shown as extending across the web for the full width thereof in order to fully support the web in the interval between the two sections of table T which are respectively ahead of and behind the upper horizontal run of stripper belt **35**. Although the duration of the engagement of pins **30** with the web is more limited than in the embodiment of the invention first described, it will be understood that this engagement is still adequate to advance the web and that the action of the stripper belt in supporting the web while pins **30** are withdrawn from openings **20** in the web is essentially similar to that already described. As will be seen by reference to FIG. 5, web **10** is illustrated as provided with openings along two parallel margins, as is the case with some printed forms, in contrast with the belt arrangement of FIG. 1 which is adapted to a paper web having holes along one margin only.

Although pins **21** and holes **20** in the paper are shown as circular, the invention is not limited to this particular shape. Other shapes of pins and holes may be used; and the same shape need not necessarily be used for both holes and pins.

For these reasons, it is to be understood that the foregoing description is considered as being illustrative of, rather than limitative upon, the invention as defined by the appended claims.

I claim:

1. A construction for handling a web having a row of holes therein, comprising:

a first endless member having a row of pins engaging the web at said holes and moved by the endless member over a closed path;

a second flexible endless member interposed between

the web and said first endless member and following a path coinciding in part with the path of said first endless member;

means moving said members to advance the web;

and means directing the second endless member over a path diverging from the path of the pins on the first endless member to disengage the pins from said holes while the second member is in supporting engagement with the web in the vicinity of the pins.

2. A construction as in claim **1** which includes means imparting a curvature to a portion of the path of said first endless member,

and in which the directing means for the second endless member establishes the path thereof substantially tangential to said curved portion of the path of the first endless member.

3. A construction as in claim **1** in which the second endless member engages the web independently of and beyond the first endless member.

4. A construction as in claim **1** that also includes means driving both endless members in synchronism.

5. A construction as in claim **1** in which the second endless member is longer than the first endless member.

6. A construction as in claim **1** in which the first endless member is a rotary member with the pins mounted on its periphery; and the second endless member is a belt trained over the first member, said belt having a plurality of spaced holes therein receiving the pins.

7. A construction as in claim **1** in which the second endless member extends across the full width of the web.

8. A construction as in claim **1** that includes a table

extending parallel to a portion of the second endless member and supporting the web independently of the web.

9. A collator belt construction for handling a paper web having a row of holes therein, comprising:

a first belt engaging a pair of spaced sprockets;

a plurality of spaced pins on said belt engaging the web at said holes therein;

a second belt interposed between the web and the first belt and moving therewith;

and means extending the second belt beyond one of the sprockets substantially tangential of said one sprocket to support the web to and beyond the point of disengagement of the pins with the web as the first belt passes around the sprocket.

10. A collator belt construction as in claim **9** in which the second belt has a plurality of spaced holes through which pins extend for a portion of the travel of the two belts.

11. A collator belt construction as in claim **9** in which the last-mentioned means includes an idler spaced at one side of the pair of sprockets and around which only the second belt passes.

12. A collator belt construction as in claim **9** which also includes means driving the two belts in synchronism.

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