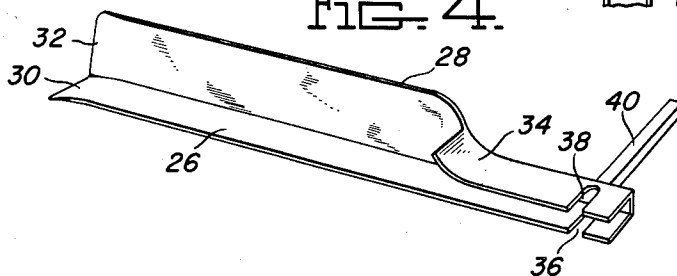


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APPARATUS FOR DETECTING PIN HOLES IN SHEETS

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This invention relates to apparatus for detecting pin holes in sheets and more particularly to guide means for use in such apparatus. Due to the light gages and relatively small sizes of certain sheet products, particularly those to be finished into tin plate, the sheets are very flexible. Also, there is a tendency for the sheet to become skewed as it enters the inspection device. In either case there is danger of light leaking past the edges of the sheet into the photosensitive device of the pin hole detector with resulting operation of the pin hole detector when there is actually no pin hole in the sheet.

It is therefore an object of our invention to provide guide means for sheet and pin hole detectors whereby the sheet is kept flat and square as it passes through the pin hole detector.

This and other objects will be more apparent after referring to the following specification and attached drawings, in which:

Figure 1 is a schematic plan view of the apparatus of our invention;

Figure 2 is a view taken on the line II—II of Figure 1;

Figure 3 is a view taken on the line III—III of Figure 1; and

Figure 4 is a perspective view of one of the guides.

Referring more particularly to the drawings, the reference numeral 2 indicates a belt conveyor for conveying sheets S to be inspected for pin holes. A second conveyor 4 is arranged in spaced relationship with the conveyor 2 at the exit end thereof. The conveyors 2 and 4 are driven in timed relationship from a motor 6 by means of a double sheave 8. The drive for conveyor 2 is from sheave 8 through a V-belt 10 and sheave 12. The drive for conveyor 4 is from sheave 8 through a V-belt 14 and sheave 16. A light source 18 is located between the conveyors 2 and 4 at one side of the path of travel of the sheets between the conveyors. As shown, the light source is above the path of travel. A photosensitive pin hole detecting device 20 which consists of a plurality of photocells with their circuits is located beneath the light source 18 and is activated by light from light source 18 when a sheet with a pin hole or pin holes therein passes therebetween. The light source and photosensitive device of the pin hole detector have a length substantially as great as the width of the widest sheet to be inspected so that the sheets can be inspected over their full width. The apparatus so far described is disclosed in the copending application of Coleman and Rendel, Serial No. 272,471, filed February 19, 1952, and does not, per se, form any part of the present invention.

Spaced guides 24R and 24L are located adjacent the exit end of conveyor 2. The guides 24R and 24L are preferably constructed of an alloy which can be polished to prevent binding and which is sufficiently hard to withstand wear. Each of the conveyors 24R and 24L has a substantially horizontal portion 26 extending from the sheet entry end thereof to a position beyond the light source 18 and an upwardly extending outer portion 28 which is preferably arranged at an angle of slightly

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greater than 90° to the horizontal portion 26 as shown in Figure 3. The entry ends of portions 26 and 28 are provided with flared portions 30 and 32, respectively, to facilitate entry of the sheet into the guide. The exit end of each guide is provided with a flared cover member 34 which is spaced above the horizontal portion 26 a distance slightly greater than the thickness of the sheets being inspected. The horizontal portion 26 and cover member 34 have slots 36 and 38 therein aligned with the light source 18. These slots extend outwardly to a point slightly inwardly of the upwardly extending portion 28. A shield 40 is attached to each guide at the light source 18 and extends outwardly therefrom a distance at least equal to one-half the difference in width between the widest and narrowest sheets to be inspected. Sufficient clearance is maintained between the cover plate 34 and horizontal portion 26 to permit bent corners or other edge defects to pass through the guide without binding but the cover guide in all cases will force the sheet downwardly so that it will pass beneath the pin hole detector. The guides 24R and 24L are attached to vertical bar members 42 in any suitable manner and are preferably arranged to permit minor vertical adjustment. Members 42 are attached to horizontal members 44 which have threaded openings therethrough for receiving rotatable screws 46 and 48. The screws 46 and 48 are threaded at each end with the threads on one end being righthand and the threads on the other end lefthand, so that rotation of the screws 46 and 48 causes the guides 24R and 24L to move away or toward each other, depending upon the direction of rotation of the screws. Screw 46 has a hand wheel 50 at its outer end and a sprocket 52 adjacent thereto which drives the screw 48 by means of chain 54 and sprocket 56 attached to screw 48.

The operation of the device is as follows:

Assuming that the widest width of sheet is being inspected, hand wheel 50 is rotated to move the guides 24R and 24L apart the maximum distance. The sheets are then fed to the conveyor 2 in any suitable manner and will be maintained square to their direction of travel due to their engagement with the vertical portions 28 which are spaced apart a distance only slightly greater than the width of the sheet. If desired a similar guide arrangement may be provided at the entry end of the guides 24R and 24L to line up the sheets approximately prior to their entry into the guides shown. As the sheet passes beneath the light source 18 it is held down and in alignment with the portions 28 so that light cannot leak around the edges. The slots 36 and 38 are spaced inwardly of the vertical portion 28 so that the edge of the sheets extend beyond the slot. When a pin hole occurs in the sheet it is detected in the usual manner. When it is desired to inspect a sheet of lesser width the hand wheel 50 is turned to move guides 24R and 24L toward each other until the distance between the vertical portions 28 is slightly greater than the width of the sheets to be inspected. The shields 40 will prevent light from light source 18 from passing to the photosensitive device 20 and so prevent improper operation of the pin hole detector. The operation is otherwise the same as with the widest sheets.

While one embodiment of our invention has been shown and described it will be apparent that other adaptations and modifications may be made without departing from the scope of the following claims.

We claim:

1. Apparatus for detecting pin holes in sheets having substantially parallel side edges comprising means for conveying said sheets in a substantially horizontal path, a light source at one side of the path of travel of said sheets, photosensitive means on the opposite side of the path of travel of said sheets aligned with the light source, said light source and photosensitive device having a length

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substantially as great as the width of the sheet being inspected, spaced guides located at each edge of the sheet being inspected, each of said guides having a substantially horizontal portion extending from the sheet entry end thereof to a position beyond the said light source and an upwardly extending outer portion, said outer portions being spaced apart a distance only slightly greater than the width of the strip, and a cover member on each guide at its exit end spaced above the horizontal portion a distance greater than the thickness of the sheets being inspected, said horizontal portion and cover member having slots therein at said light source extending outwardly to a point slightly inwardly of the upwardly extending portion.

2. Apparatus for detecting pin holes in sheets comprising means for conveying said sheets in a substantially horizontal path, a light source at one side of the path of travel of said sheets, photosensitive means on the opposite side of the path of travel of said sheets aligned with the light source, said light source and photosensitive device having a length substantially as great as the width of the widest sheet to be inspected, spaced guides located at each edge of the sheet being inspected, each of said guides having a substantially horizontal portion extending from the sheet entry end thereof to a position beyond the said light source and an upwardly extending outer portion, means for moving said guides from a position where the upwardly extending portions are spaced apart a distance substantially equal to the width of the widest sheet to be inspected to a position where the upwardly extending portions are spaced apart a distance substantially equal to the width of the narrowest sheet to be inspected, a shield attached to each guide at said light source and extending outwardly therefrom a distance at least equal to one-half the difference in width between the widest and narrowest sheets to be inspected, and a cover member on each guide at its exit end spaced above the horizontal portion a distance slightly greater than the thickness of the sheets being inspected, said horizontal portion and cover member having slots therein at said light source extending outwardly to a point slightly inwardly of the upwardly extending portion.

3. Apparatus for detecting pin holes in sheets having substantially parallel side edges comprising a pair of conveyors arranged in tandem for conveying sheets to be inspected, a light source between said conveyors at one side of the path of travel of the sheets between the conveyors, photosensitive means on the opposite side of the path of travel of said sheets aligned with the light source, said light source and photosensitive device having a length

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substantially as great as the width of the sheet being inspected, spaced guides located adjacent the exit end of the first of said pair of conveyors, each of said guides having a substantially horizontal portion extending from the sheet entry end thereof to a position beyond the said light source and an upwardly extending outer portion, said outer portions being spaced apart a distance only slightly greater than the width of the strip, and a cover member on each guide at its exit end spaced above the horizontal portion a distance slightly greater than the thickness of the sheets being inspected, said horizontal portion and cover member having slots therein at said light source extending outwardly to a point slightly inwardly of the upwardly extending portion.

4. Apparatus for detecting pin holes in sheets of different widths comprising a pair of conveyors arranged in tandem for conveying sheets to be inspected, a light source between said conveyors at one side of the path of travel of the sheets between the conveyors, photosensitive means on the opposite side of the path of travel of said sheets aligned with the light source, said light source and photosensitive device having a length substantially as great as the width of the widest sheet to be inspected, spaced guides located adjacent the exit end of the first of said pair of conveyors, each of said guides having a substantially horizontal portion extending from the sheet entry end thereof to a position beyond the said light source and an upwardly extending outer portion, means for moving said guides from a position where the upwardly extending portions are spaced apart a distance substantially equal to the width of the widest sheet to be inspected to a position where the upwardly extending portions are spaced apart a distance substantially equal to the width of the narrowest sheet to be inspected, a shield attached to each guide at said light source and extending outwardly therefrom a distance at least equal to one-half the difference in width between the widest and narrowest sheets to be inspected, and a cover member on each guide at its exit end spaced above the horizontal portion a distance slightly greater than the thickness of the sheets being inspected, said horizontal portion and cover member having slots therein at said light source extending outwardly to a point slightly inwardly of the upwardly extending portion.

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