

[54] METAL DELAMINATING MACHINE

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[22] Filed: Jan. 3, 1972

[21] Appl. No.: 214,666

[52] U.S. Cl. .... 156/584, 101/1, 29/200 D

[51] Int. Cl. .... B32b 35/00, B23p 19/02

[58] Field of Search .... 156/584, 344, 254;  
29/426, 427, 239, 200 D; 101/1

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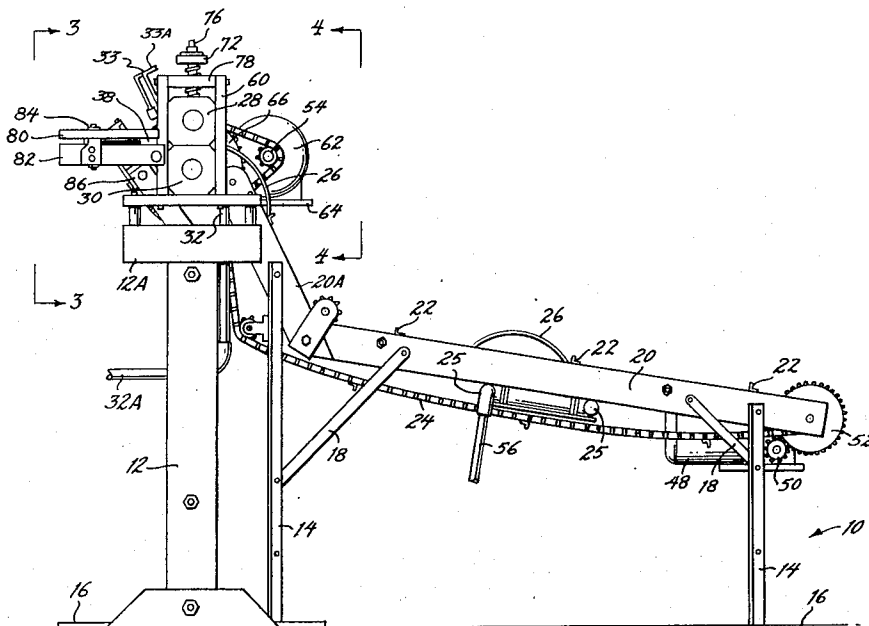
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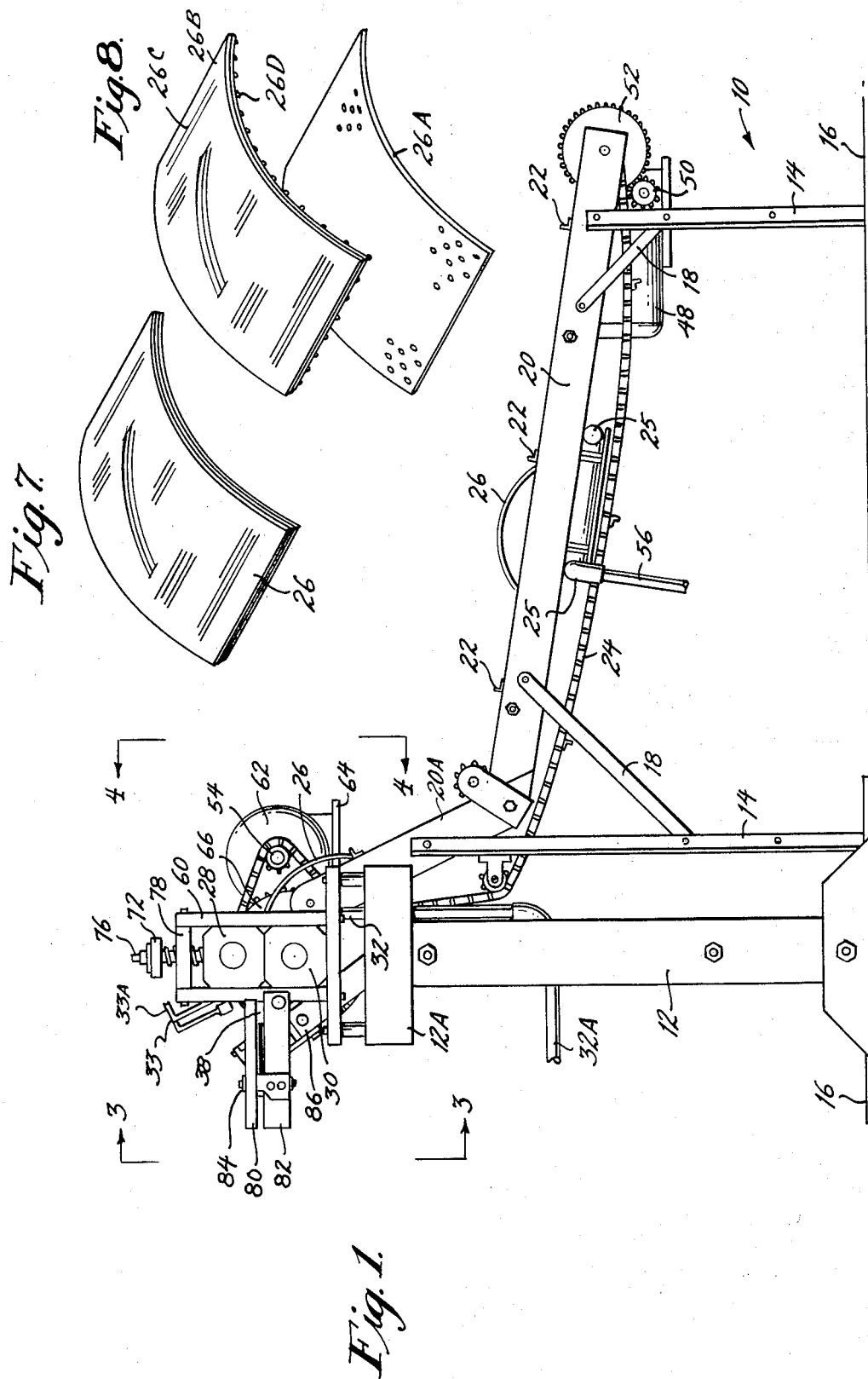
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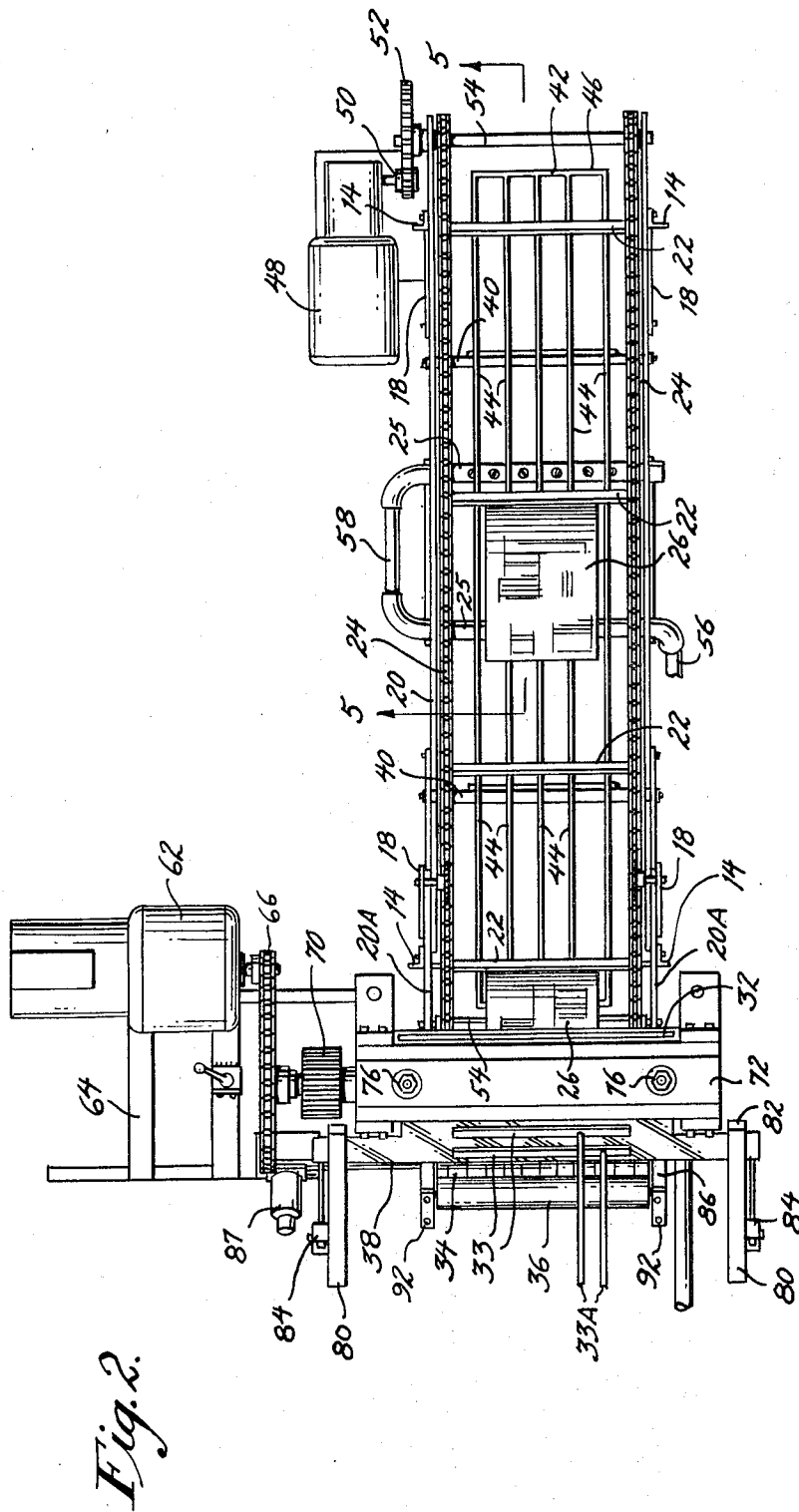
## ABSTRACT

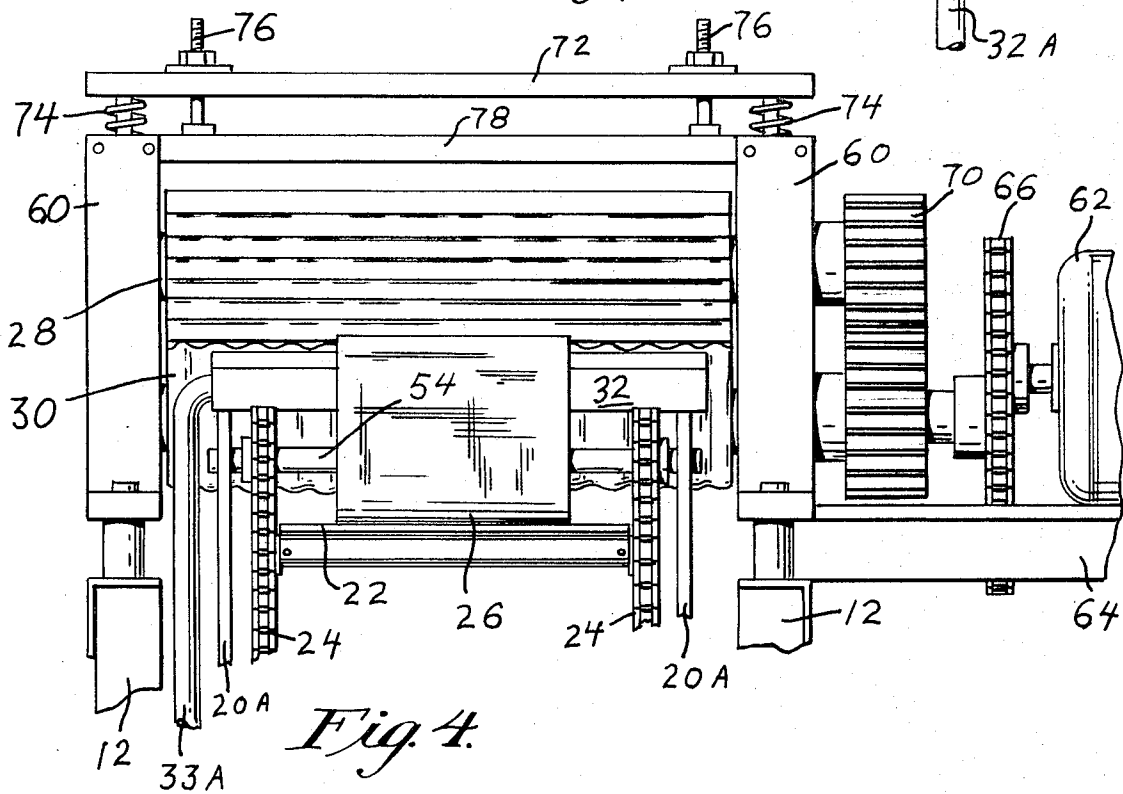
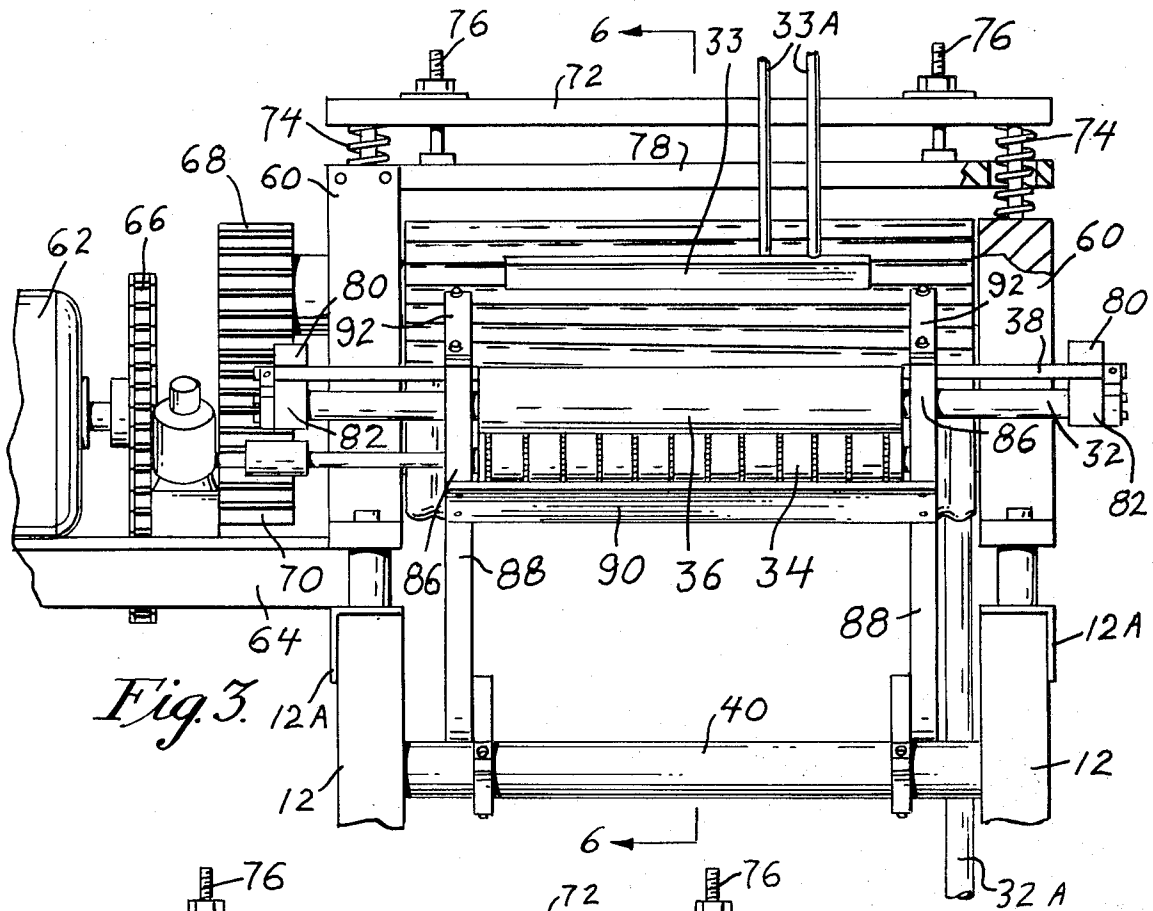
A metal delaminating machine for separating the plastic bound aluminum and copper layers of an exhausted printing plate, the metal delaminating machine including upstream heating means for directing heat against the aluminum layer, downstream heating means for directing heat against the copper layer and means to direct the plate against spreading means, such that the aluminum layer is separated from the remainder of the printing plate, while the plastic is burned away from the copper, with the aluminum and copper layers being received by individual puller roller means to produce clean aluminum and copper layers.

6 Claims, 8 Drawing Figures











## METAL DELAMINATING MACHINE

This invention relates to a metal delaminating machine, and in particular to a machine that may be used to separate the aluminum and copper layers away from the remainder of an exhausted printing plate.

With the rise in prices of many basic metals, there has been an increasing interest in obtaining supplies of such metal through the scrap dealer. Aluminum is one such metal, and for this reason it has been most desirable, wherever possible, to salvage aluminum so that it can be used again. Now, good quality copper is also in demand.

A fertile source of scrap aluminum has been found in certain types of printing plates which utilize an aluminum layer as a base, with these plates having a copper layer adhered to the aluminum layer by various types of plastics or adhesives. Such printing plates are exemplified by the printing plates shown in U.S. Pat. Nos. 2,722,261, 3,015,268, 3,023,700, 3,031,960 and 3,211,091. The construction of these plates is generally shown in FIGS. 7 and 8 of the present application, and these plates are generally somewhat curved or convex.

It has been found that the aluminum layer cannot be efficiently or economically removed from the printing plate by a simple heating process, and for this reason, the reclaiming of aluminum from the printing plates has not been done on a wide scale, with the difficulty of reclaiming tending to depress the scrap value of the printing plates.

It has been suggested that the copper, plastic and adhesive layers be simply burned away, but the noxious gases produced in such a burning process are difficult to dispose of in view of the increasingly strict anti-air pollution laws. Also, with the increasing value of copper, it has become desirable also to salvage the copper layer.

Furthermore, the aluminum realized from the burning process may not bring a sufficiently high price on the market in view of possible damage in the burning process.

It is accordingly an object of the present invention to provide a metal delaminating machine which will effectively strip away the aluminum layer and separate copper layer from the remainder of a printing plate, in such a way that the aluminum and copper are essentially unaffected by the delaminating operation.

Yet another object of the present invention is to provide a metal delaminating machine which is relatively simple in construction, and also which is easily and inexpensively maintained.

The foregoing, as well as other objectives of the invention, are achieved by providing a delaminating machine which includes several strategically placed heating means to direct heat against the aluminum and copper layers of the printing plate.

In the preferred form of the invention, the heating means are a narrow band of flame, located upstream, which is directed against the aluminum layer that has been preferably preheated. Spreading means are provided in the path of travel of the printing plate immediately after roller means, such that the spreading means penetrate into the printing plate in an action that frees the aluminum layer from the remainder of the printing plate. Downstream heating means direct heat against the copper layer to burn away the plastic. Puller means

are provided to pull the aluminum and copper layers completely away from each other.

Other objects and many of the attendant advantages of the present invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

FIG. 1 is a side elevational view of a preferred embodiment of a delaminating machine constituting the present invention;

FIG. 2 is a top elevational view of the delaminating machine of FIG. 1;

FIG. 3 is an end elevational view looking upstream from the front end of the machine as indicated by the arrows 3—3 of FIG. 1;

FIG. 4 is an elevational view looking downstream from behind the main upper and lower rollers as indicated by the lines 4—4 of FIG. 1;

FIG. 5 is a sectional view of an enlarged scale taken along the lines 5—5 of FIG. 2;

FIG. 6 is a sectional view taken along the lines 6—6 of FIG. 3; and

FIGS. 7 and 8 are schematic views of the printing plate, with FIG. 8 showing the printing plate in exploded view.

Referring now in greater detail to the various figures of the drawings wherein like reference characters refer to like parts, there is shown generally at 10 in FIG. 1 a metal delaminating machine which is a preferred embodiment of the present invention. The machine 10 basically comprises a pair of main frames 12 with floor supports 14 extending upwardly from floor 16.

Braces 18 are provided, with the supports 14 and braces 18 serving to hold beds 20 and inclined beds 20-A in the position of FIG. 1. As shown in FIGS. 2 and 5, the beds 20 and inclined beds 20-A serve to hold movable photographic plate supports 22 which are moved upwardly and forwardly by main chains 24 as will be discussed hereinafter.

As shown in FIGS. 1 and 6, each of the supports 22 serve to hold a photographic plate or laminate 26, the details of which are shown in FIGS. 7 and 8. In particular, the photographic plate 26 is generally curved in a convex manner as shown in FIG. 7, although the present invention is clearly not limited to the processing of curved plates, and actually the present invention is useful in stripping away other materials which need not necessarily be part of a photographic plate, such as a lead coated plate that is mounted on aluminum. As shown in FIG. 8, the photographic plate 26 comprises a backing layer 26-A or first layer which, for purposes of demonstrating a specific embodiment, is the aluminum layer that is to be stripped away from the remainder of the plate.

As indicated in the prior art cited hereinabove the remainder of the photographic plate basically involves an outer copper layer 26-C or second layer and an interior layer 26-D which may be plastic or adhesive, and may even involve fabric material which is embedded in the plastic or adhesive.

One purpose of the present invention is to completely separate the aluminum layer 26-A from copper layer 26-C in a clean manner, such that it will be of the greatest value for scrap purposes.

As further indicated in FIGS. 1 to 6 the plates 26 are advanced forwardly and upwardly and into the bight between upper main roller 28 and lower main roller 30.

As indicated in FIG. 6 the flame from upstream burner 32 is directed in a narrow band against the undersurface of the photographic plate 26, and directly upon the aluminum layer 26-A.

As further shown in FIG. 6 lower puller roller 34 cooperates with upper puller roller 36 in order to achieve any further stripping effect that may be necessary to strip away the aluminum layer 26-A from the remainder of the photographic plate 26.

As shown in FIG. 6 the photographic plate is directed against the edge of a spreader 38 immediately after the leading edge of the photographic plate 26 passes beyond main rollers 28 and 30. Thus, the spreader 38 not only completes any stripping action that may have been initiated by the heating means of the present invention, but also the spreading blade 38 directs the aluminum layer 26-A toward the rollers 34 and 36.

It has also been determined that a preheating of the photographic plates 26 may be desirable in many instances, and for this reason auxiliary burners 25 are associated with the beds 20, as seen in FIGS. 1, 2 and 5.

With reference to FIG. 2, it can be seen that the inclined beds 20 and 20-A are spaced apart by means of struts 40 which are held in the beds by appropriate fasteners. There is also provided grid work 42 involving longitudinal bars 44 (FIG. 2) connected together by end bars 46. The photographic plates 26 rest on the grid work 42 as the photographic plates are being moved forwardly by the action of chains 24 and supports 22.

As further shown in FIGS. 1 and 2, the chains 24 are driven by a motor 48, which, through associated gearing, such as meshing gears 50 and 52, convey a driving action to a sprocket (not shown) which drives the chains 24 in a counterclockwise sense as viewed in FIG. 1 so that the photographic plates 26 are delivered forwardly and upwardly. The chains 24 are, of course, supported by idler gears of conventional construction, like the gears 54 of FIG. 1.

About midway between floor supports 14, there is provided the auxiliary burners 25 which are fed by gas supply line 56 which actually is present in the form of a pair of parallel lines connected together by segment 58. The gas line 56 is supported upon the bed 20 by conventional hangers or other means known to the art.

There are times when the preheating of the photographic plates 26 will be unnecessary, depending upon the plastic or adhesive used in the plates. In cases where the plastic or adhesive has thermoplastic properties, such as where the material of the plastic or adhesive is a so-called "wood vinyl," then a preheating means will simplify and expedite the stripping action at the main rollers 28 and 30.

In other instances, it will be found that the preheating means are not necessary, and therefore are simply not used.

So far the entire rear portion of the delaminating apparatus of the present invention has been described in detail. The forward portion will now be described, as can best be seen by an inspection of FIG. 6.

Here, the upper main roller 28 and lower main roller 30 are provided to receive the photographic plate 26. The rollers 28 and 30 are held in roller supports 60 through the use of bearings (not shown) of a construction well known to those skilled in the art. The rollers 28 and 30 are driven by a motor 62 held on a suitable mounting 64, with the power of motor 62 conveyed by

gearing 66 which drives a lower gear 68 that in turn drives an upper gear 70.

It can be seen from FIG. 3 that a platen 72 is provided above the main rollers, with the weight of the platen 72 being applied to coil springs 74. The platen 72 is held in place by means of a tightening bolt 76 which extends to a cross bar 78 that lies between the roller supports 60.

With reference to FIG. 6, it can be seen that the spreader 38 is clamped in place by being positioned between upper spreader holder 80 and lower spreader holder 82. The holders 80 and 82 may be adjustable vertically as well as in all other directions so that the rearwardly facing edge of the spreader 38 will be precisely directed into the edge of the photographic plate 26 as it emerges from the main rollers 28 and 30. The holders 80 and 82 are maintained in a desired relationship by means of clamp 84 as can be seen in FIG. 1.

The puller rollers 34 and 36 are held in supports 86 as can be seen in FIG. 6. The puller rollers are driven by a motor 87 which can be seen in FIG. 2.

The supports 86 extend from an arm 88 that is supported upon a strut 40 as can be seen in FIG. 6. A cross member 90 as well as an end panel 92 are provided for the supports 86. Finally, it can be seen that the end panel 92 presses upon a spring 94, and threaded supports are provided in order to increase or decrease the tension in this resilient mounting.

From an inspection of FIG. 6, it can be seen that one of the main rollers may be serrated, and in some cases, it is preferable that both rollers 28 and 30 be serrated. The puller rollers 34 and 36 may be similarly constructed.

The presence of downstream burner assembly 33 comprised of one or more burner jets is effective, as shown in FIG. 6. Thus, as the copper layer 26-B is carried away from the aluminum layer 26-A, the downstream burner 33 is effective to burn away the plastic 26-D (FIG. 8) that had served to secure the copper layer to the aluminum layer. Thus, the copper layer 26-B is essentially free of plastic and is generally pure. The aluminum layer 26-A is likewise free of plastic in view of the stripping action that occurs immediately downstream of the rollers 28 and 30 as promoted by the action of upstream burner 32.

It will be readily understood that the temperatures of the burners 32 and 33 will have to be adjusted, depending upon the particular physical properties of the plastic layer 26-D as well as the thickness of the metal layers, the speed of the machine and possibly other variables. However, it will readily occur to those skilled in the art to make adjustments of the burners 32 and 33 relative to each other in order to achieve optimum operating temperatures.

In operation, the motors 48, 62 and 87 are turned on, and the burners 25, 32 and 33 are lit. The photographic plates 26 are placed one by one upon the supports 22, as can be seen in FIG. 2. The plates 26 pass one by one over the preheater 25 so that the heat of the exposed flame is directed against the lower surface, which is preferably the aluminum surface.

The action of the motor 48 drives the chain 24 so that the photographic plates continue to be advanced along the beds 20 and 20-A until the forward edge of each photographic plate is fed into the rollers 28 and 30 in the position of FIG. 6.

In some cases, the aluminum layer may tend to start to separate from the remainder of the plate under the heat from burners 25. However, the action of the main rollers 28 and 30 tends to eliminate any difficultly separable areas, and also the rollers 28 and 30 direct the photographic plate so that its edge meets the spreader 32 to initiate the desired spreading action. The rollers 28 and 30 supply the necessary force in order to continue to urge the photographic plate about the spreader 38.

Just before the photographic plate passes into the rollers 28 and 30, the direct flame from upstream burner 32 is directed in a narrow band against the lower aluminum surface of the photographic plate 26. It can be seen from FIG. 6 that flame treatment of burner 32 occurs immediately before the entrance of the forward edge of the photographic plate into the rollers 28 and 30.

The aluminum layer now falls easily away in a clean stripping action from the remainder of the photographic plate, and by virtue of the action of the spreader 32 the aluminum plate is directed into puller rollers 34 and 36. These rollers convey the aluminum plate to a separate storage area. The copper-plastic portion of the photographic plate is exposed to the action of burner 33 to remove the plastic, and the copper layer is collected in a different storage area.

It is therefore seen that the present invention provides a metal delaminating machine which enables the recovery of a clean aluminum and copper plate, with such a recovery not being possible through normal heating techniques. Clearly, plates comprised of other metals or other non-metals or combinations thereof may be processed using the present invention.

Without further elaboration, the foregoing will so fully illustrate my invention that others may, by apply-

ing current or future knowledge, readily adapt the same for use under various conditions of service.

What is claimed as the invention is:

1. A metal delaminating machine for separating a first layer from a second layer of a laminate held together by a heat combustible material, said machine including at least two separate heating means and spreading means, said heating means including upstream heat means directing heat against said first layer, roller means for conveying said printing plate past said upstream heating means and into said spreading means which are so aligned as to be placed directly in the path of said laminate whereby said spreading means are placed in contact with the edge of said printing plate to facilitate the clean separation of said first layer from the remainder of said laminate, and downstream heating means beyond said rollers, said downstream heating means directing heat against said material to remove it from said second layer.

2. The metal delaminating machine of claim 1 wherein at least one of said heating means is a narrow band of flame directed toward said aluminum layer.

3. The metal delaminating machine of claim 1 wherein said roller means comprises a pair of cooperating rollers which are driven by a motor.

4. The metal delaminating machine of claim 2 including a preheat burner.

5. The metal delaminating machine of claim 1 including puller rollers driven by a separate motor, with said first layer being directed into said puller rollers following the action of said spreading means.

6. The metal delaminating machine of claim 2 including beds having movable supports for carrying said laminate, preheat means adjacent said bed, said laminate being advanced toward said roller means.

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