Aug. 20, 1935. W. T. MILLER 2,011,645

MACHINE FOR PERFORATING SHEET MATERIAL

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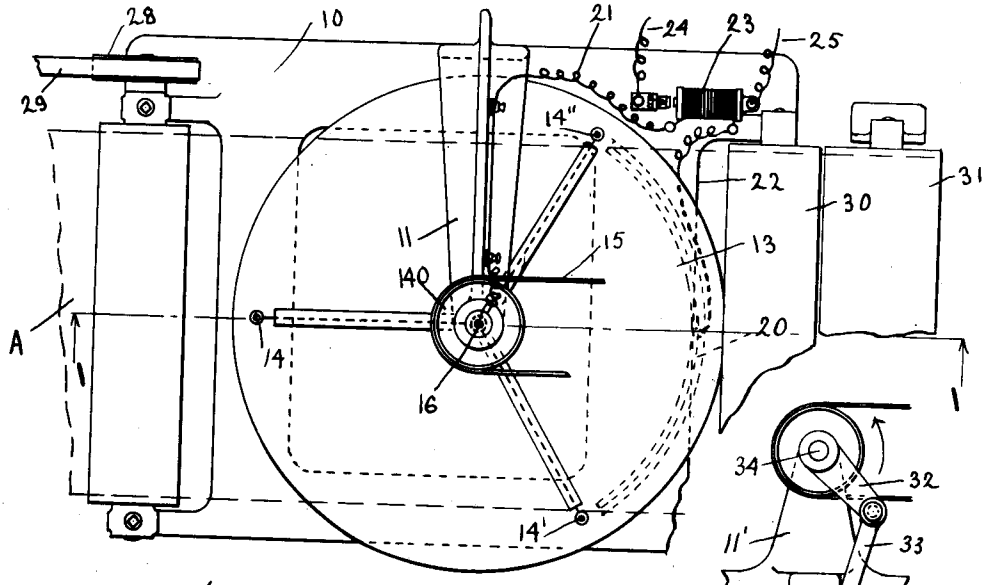

Fig. 2

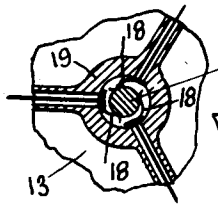

Fig. 3

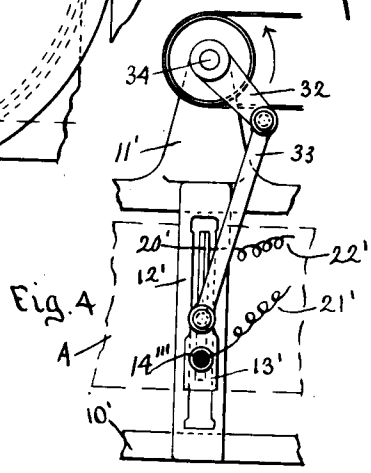

Fig. 4

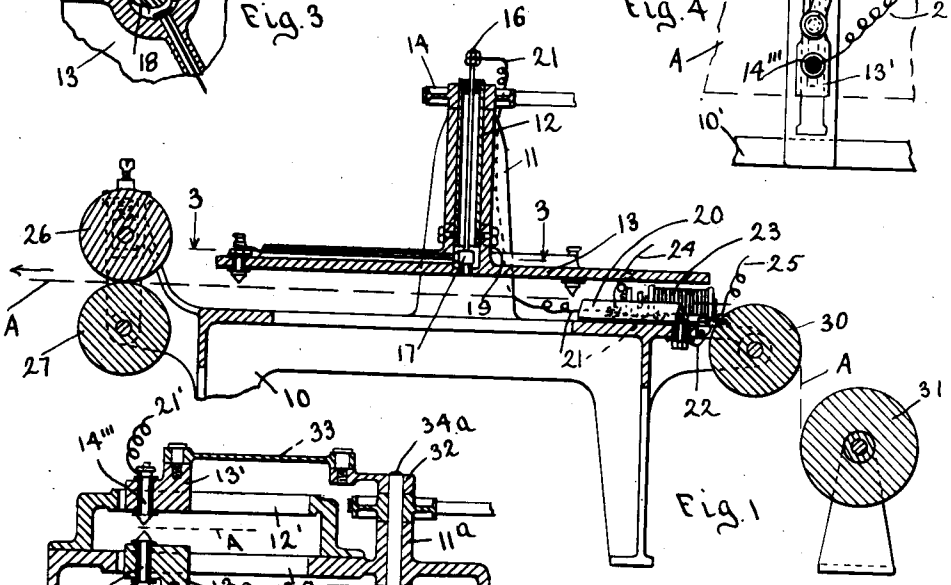

Fig. 1

Fig. 5

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MACHINE FOR PERFORATING SHEET MATERIAL

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8 Claims. (Cl. 175—265)

My invention relates to machines for perforating sheet material by means of electric sparks.

In the processing of certain imperforate sheet material, it is found advisable to perforate the material with minute holes to facilitate evaporation, and to prevent sweating, and the object of my invention is to provide means by which this may be done by producing successive lines of perforations across the sheet material, by means of electric sparks across a spark gap through which the sheet material is moved.

My invention consists in the novel construction of a machine and the method of operation to accomplish my object. In the accompanying specifications and claims and the drawing forming a part thereof, I have described and illustrated a preferred embodiment of my invention together with two modified forms that may be used, but do not confine myself to these embodiments as other modifications may be made within the scope of the appended claims.

In the drawing,

Fig. 1 is a sectional elevation of a machine for the purpose specified in which my invention is embodied.

Fig. 2 is a plan of the same.

Fig. 3 is an enlarged fragment showing one means for conveying the electric current to terminals.

Fig. 4 is a modification in which one terminal is reciprocated in operative relation to a fixed terminal of extended form.

Fig. 5 is a modification in which a pair of terminals are reciprocated across the path of movement of the sheet material.

Referring to the drawing,

The reference characters refer to like parts on all figures and in the modifications, Figs. 4 and 5, the indices, ' and *a* refer to elements similar in function to the main characters.

10 is a machine frame on which is rigidly mounted the goose-neck 11. In this goose-neck is journalled the hollow shaft 12, to one end of which is secured the disc 13, and to the other the driving pulley 14a, driven from a source of power not shown, by the belt 15, or by an equivalent, to rotate the disc at a relatively high speed. Insulated in the disc 13 are spark points 14, 14' and 14'' equidistant from the axis of rotation and preferably spaced equi-angular. The disc may be of insulating material, or of conducting material with the spark points insulated therefrom. The spark points are electrically connected by suitable insulated means to the main conductor 16, and one means is shown in Fig. 1 and in the enlarged plan, Fig. 3. Referring particularly to Fig. 3, the conductor 16 extends through and is insulated from the shaft 12, and terminates in a hub 17. Brushes 18 insulated from the disc 13, are mounted within the hub 19 thereof, and from these brushes extend the electric connections to respective spark points. I have indicated three spark points but the number may be varied as may be found expedient. As the disc is rotated, the spark points intermittently pass over the conductor 20, a spark gap being formed between it and each spark point as it comes into opposition, and a succession of sparks pass between as long as the respective points or as they will hereinafter be termed, the terminals, are opposed to the terminal 20.

The two conductors 16 and 20, the latter being formed as an extended terminal, are connected by respective wires 21, 22, to an induction coil 23 in circuit by means of mains 24, 25, with a source of electric power not shown. Potential is built up by the induction coil, and as the disc is rotated, a succession of electric sparks occurs as and while each spark terminal passes over the opposed terminal, which is formed concentric with the path of movement of the movable terminals. The sheet material A is drawn over the terminal 20 and between it and the path of rotation of the movable terminals, at a relatively low speed. As indicated in the drawing the rolls 26, 27 are driven by the pulley 28 and belt 29 from a source of power not shown, and the sheet material is moved at a predetermined rate, the sheet being also supported on the roll 30 as it is drawn from a reel 31. As the machine is operated, a series of sparks from each movable terminal perforates the moving sheet and forms successive arcs of minute perforations laterally of the sheet, the relative speed of rotation of the movable terminals and the movement of the sheet material determining the spacing of the lines of perforations. The elements of my invention may be arranged in varied relation retaining essential features to include intermittent sparking between terminals separated when in operative position by an unvaried width of spark gap. In the embodiment described, the lines of perforations will be in the form of arcs laterally across the sheet, but straight lines of perforations may be made as shown in modification shown in Fig. 4. In this case, I mount one terminal 14''' in a crosshead 13' suitably mounted in a sliding bearing 12', and adapted to be reciprocated by means of the crank 32 and pitman 33, over a fixed terminal 20', the shaft 34 being mounted in the goose-

neck 11'. The sheet A may be moved in the manner above explained, in which case the lines of perforations would be at an angle with the selvage of the sheet, but if the sheet is moved intermittently, the lines may be arranged normal to the selvage, in either case separated according to the movement of the sheet.

In Fig. 5, I mount the terminal 20*a* in the crosshead 13*a*, and the two terminals 14''' and 20*a* are reciprocated in unison, by means similar to those described as applying to Fig. 4, the elements being similar and identified by the index *a*.

Having thus described my invention, I claim:

1. In a machine for perforating sheet material by means of electric sparks, a terminal element, movable laterally in a fixed path and in parallel relation to a sheet of material, and in such relation to a blade like terminal extended laterally, that a spark gap of unvaried width is formed therebetween when the terminals are opposed.

2. In a machine for perforating sheet material by means of electric sparks, the combination of a terminal element movable laterally and in a fixed path in such relation to a blade like terminal, that a spark gap of substantially unvaried width is formed between the former and the edge of the latter when the terminals are in opposition.

3. In a machine for perforating sheet material by means of electric sparks, the combination of a terminal element movable laterally in a fixed path in such relation to a fixed terminal that a spark gap of substantially unvaried width is formed therebetween when the terminals are in opposition, one terminal being a blade like extension in the direction of movement of the movable terminal.

4. A machine for perforating sheet material by means of electric sparks, including a pair of terminal elements, one fixed, the other relatively movable laterally in a fixed path, and one terminal being a blade like extension and in such relation to the other, that a spark gap of substantially unvaried width is formed between the former and the edge of the latter, while the movable terminal is opposed to the other.

5. In a machine for perforating sheet material by means of electric sparks, the combination of a blade like fixed terminal extended in a lateral plane, and a terminal movable in a fixed path in a plane parallel thereto and in such relation that a spark gap of substantially unvaried width is presented while the movable terminal is moved laterally in opposition to the fixed terminal.

6. In a machine for perforating sheet material by means of electric sparks, the combination of a terminal rotatable about a fixed axis, and a fixed terminal in the same radial relation to the said axis, and separated from the plane of rotation of the movable terminal to form a spark gap of unvaried width when the terminals are opposed.

7. In a machine for perforating sheet material by means of electric sparks, the combination of a terminal rotatable about a fixed axis and a terminal extending concentrically with said axis and in a plane parallel with and separated from the plane of rotation of the movable terminal by a spark gap of substantially unvaried width while the terminals are opposed.

8. A machine for perforating sheet material by means of electric sparks, including a plurality of terminals movable in a path concentric with a fixed axis; a fixed terminal concentric with said axis and at the same radial distance therefrom, the plane of rotation of the rotating terminals being parallel to the fixed terminal and separated therefrom to provide a substantially unvaried width of spark gap while each movable terminal is opposed to the fixed terminal; means for supplying electric current of sufficient potential to provide a succession of sparks between the rotated terminals and the fixed terminals while they are opposed.

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