April 23, 1963 C. J. ANTONUCCI 3,086,457

HIGH SPEED PRINTER COOLING SYSTEM

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Fig. 1.

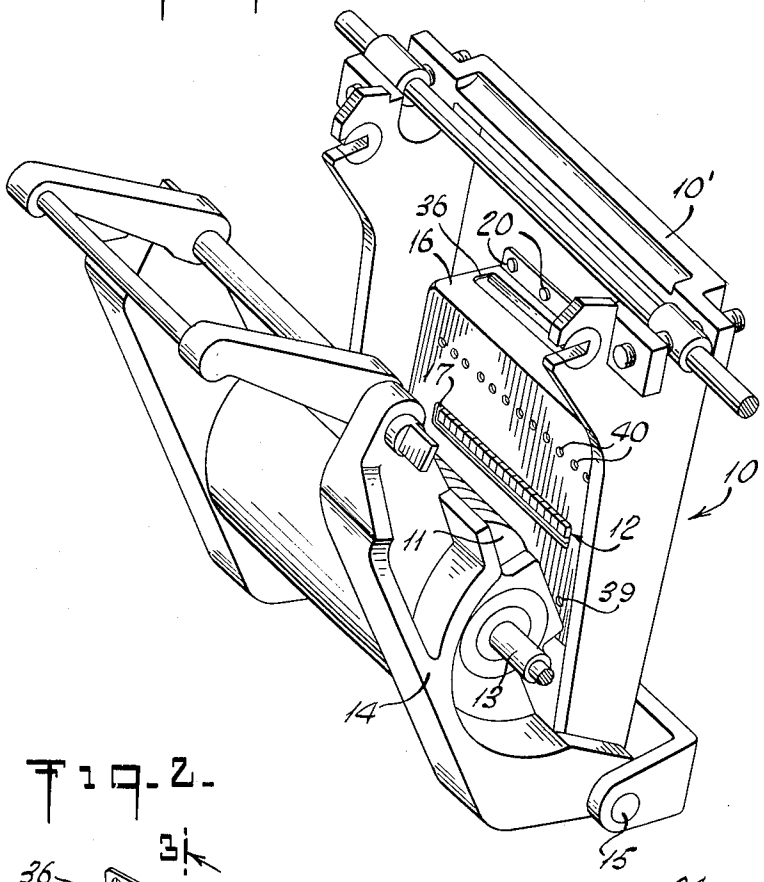


Fig. 2.

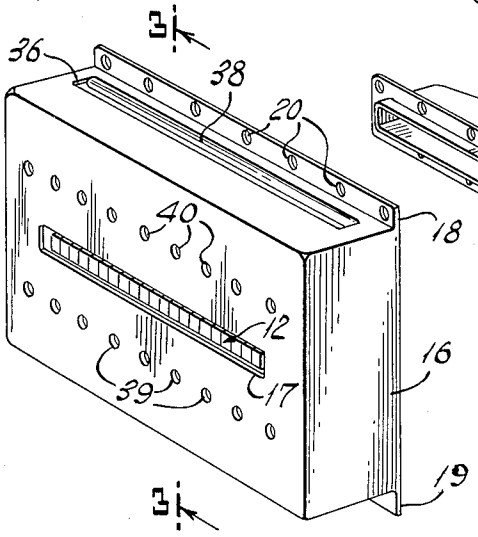
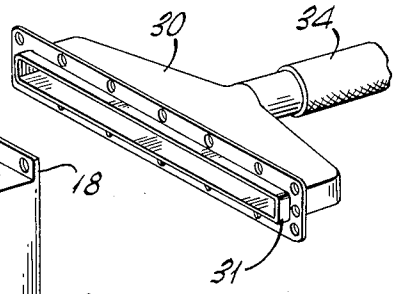


Fig. 4.



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Fig. 3.

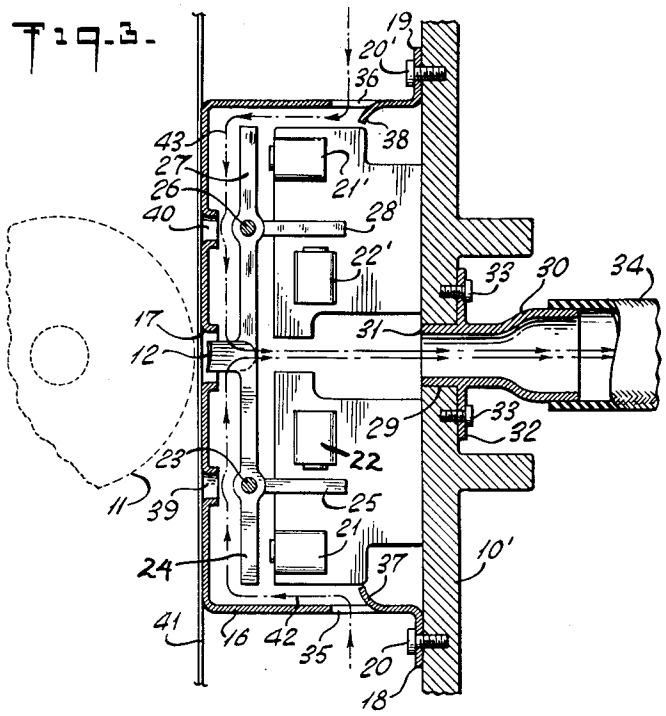
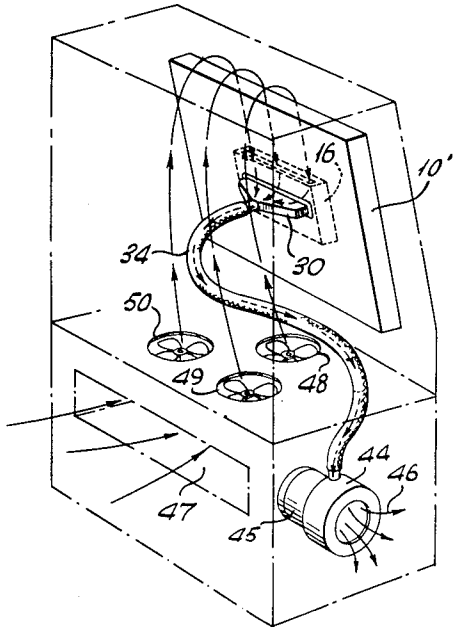


Fig. 5.



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HIGH SPEED PRINTER COOLING SYSTEM

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5 Claims. (Cl. 101—93)

The present invention, generally, relates to high speed printers and, more particularly, to a cooling system adapted for high speed printers.

The present day trends toward ever increasing speeds for high speed printer apparatus are encountering difficulties from unexpected sources. One such difficulty that has arisen deals with excessive temperatures that are developed due to the closely spaced, compact electrical coils used to drive the print hammers at rapid rates.

Previous attempts to alleviate the temperature problem have directed attention toward placement of cooling fans within the housing of the printer apparatus to direct air upwardly through the housing. While this expedient has been met with limited success in reducing temperature in the amplifier circuits and other electrical components within the printer housing, the hammer drive coils still develop excessive temperatures. These high temperatures produce erratic operation of the print hammers and cause hammer firing times to vary depending upon the magnitude of the temperature.

Accordingly, it is a principal object of the present invention to provide a cooling system for a high speed printer apparatus.

It is also an object of the invention to provide a cooling system for a high speed apparatus which system is simple in structure and economically feasible in manufacture.

A further object of the invention is to provide an improved structural arrangement for a high speed printer apparatus which admits of greater cooling effect for the component parts thereof.

Briefly, the invention includes an enclosure means having particularly positioned surfaces spaced closely with the electrical coils and having a plurality of openings, one opening for air intake and one opening for air exhaust. A connector provides means for connection to a vacuum pump so that air is drawn into the air intake opening of the enclosure and directed in a predetermined manner past the electrical coils for exhaust through the air exhaust opening.

One group of the plurality of openings in the enclosure is located along the front surface thereof and develops a suction against the paper on which the hammers print, thus the usually included paper hold-down elements may be removed.

These and other objects and advantages of the invention will become more apparent from the following detailed description of a preferred embodiment thereof taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a view in perspective of a printing drum and hammer assembly including the cooling system in accordance with the invention;

FIG. 2 is a view in perspective of the enclosure surrounding the hammer firing coils in accordance with the invention;

FIG. 3 is a view in cross section taken in the plane 3—3 in FIG. 2;

FIG. 4 is a view in perspective of an adapter for connection between the enclosure shown in FIG. 2 and a suitable vacuum source; and

FIG. 5 is a view in perspective partly in phantom lines showing the overall cabinet of a high speed printer and

showing in solid lines the component parts making up the cooling system in accordance with the invention.

Referring now to FIG. 1 of the drawings, a high speed printer includes a printing drum and hammer assembly indicated generally by the numeral **10** and further includes a drum **11** and a plurality of hammers indicated by the numeral **12**. The drum **11** is rotatable about a shaft **13** journaled in a frame **14** which, in turn, is pivotable about an axis **15**.

For a further detailed description of the drum and printer hammer frame assembly, reference is made to three patent applicationsalso in the name of Carmine J. Antonucci: Serial No. 158,505, filed December 11, 1961, entitled "Drum Housing Latch Assembly"; Serial No. 158,506, filed December 11, 1961, entitled "Paper Phasing Mechanism"; and Serial No. 158,491, filed December 11, 1961, entitled "Paper Gap Control," all of which are assigned to the assignee of the present invention.

To provide cooling for the hammer modules in accordance with the present invention, a housing **16** is formed to substantially enclose the hammer modules, a slot **17** in the surface across which a paper web slides providing means for the hammer heads to emerge and strike in the direction of the drum **11**. The housing **16** is provided with oppositely extending flanges **18** and **19**, FIG. 2, through which a plurality of bolts or screws **20** extend to fasten the housing to the frame **10'** of the printer, the frame itself providing the back surface of the housing **16**.

As better seen in FIG. 3 of the drawings, a plurality of substantially identical hammer modules are positioned adjacent each other, each module including a first electromagnetic solenoid winding or coil **21** and a second electromagnetic solenoid winding or coil **22** positioned with the actuating axis thereof at substantially right angles with each other. A first hammer **12** is pivotable about an axis **23** which is common to all of the printer hammers on that side of the housing **16**, but alternate hammers have the downwardly extending portion **24** in position to be actuated by each respective coil in line with the coil **21**, whereas intermeditae hammers have the rearwardly extending portion **25** at an angle to be operated by each respective coil in line with the electromagnetic coil **22**.

While alternate hammers **12** are pivotable about the axis **23**, the intermediate hammers **12** from those pivoted about the axis **23** are pivotable about an axis **26** on the opposite side of the housing **16**, and the alternate hammers **12** within the group which are pivotable about the axis **26** have the upwardly extending portion **27** in a position for operation by each respective coil in line with the solenoid coil **21'**, the intermediate hammers **12** in this group having the rearward portion **28** at an angle for operation by each respective coil in line with the electromagnetic coil **22'**.

It is these coils **21**, **22**, **21'** and **22'** that develop the temperatures which have become responsible for the development of serious disadvantages in obtaining reliable high speed continuous operation.

Also seen in FIG. 3 is a plurality of bolts **20** and **20'** extending through flanges **18** and **19**, respectively, as described previously to support the housing **16** firmly against the rear surface **10'** of the frame **10**. An opening, indicated by the numeral **29** permits a nozzle adapter **30** having an extending portion **31** to be positioned therein so that a flange **32** permits a plurality of screws **33** to attach the adapter **30** through the rear surface **10'** of the frame **10**. A flexible hose **34** connects the adapter and the inside of the housing **16** with a suitable vacuum source, to be described in greater detail presently.

The housing **16** is provided with three principal openings, the opening **17** referred to previously in the front of the housing through which the hammers **12** strike, an elongated slot **35** along one side of the housing **16** which

extends substantially parallel with the hammer modules including solenoid coils 21 and 22, and an elongated slot 36 along the opposite side of the housing 16 and extending in a manner similar to the slot 35. The portion of the housing 16 which is bent inwardly and identified by the numeral 37 functions as an air flow deflector, and a similar portion 38 adjacent the slot 36 performs a like function.

A plurality of apertures in two rows, the apertures indicated generally by the numeral 39 being in one row and the apertures indicated generally by the numeral 40 being in a second row, provide means to hold printing paper 41 against the outer surface of the housing 16. Thus, additional paper holding devices become unnecessary with an apparatus in accordance with the invention.

Now it may be seen that as a vacuum is pulled through the flexible hole 34, the flow of air will be directed through the elongated slots 35 and 36, principally, since the slot 37 is substantially closed by the paper 41. And the air will be directed around the respective rows of solenoid windings as indicated by the series of arrows 42 and 43 on opposite sides of the housing 16.

As best seen in FIG. 5 of the drawings, the housing 16 is mounted at the front of the printer cabinet, on the front side of the panel 10', and the adapter 30 is shown in position behind the panel 10'.

The flexible hose 34 is shown extending from the adapter 30 to a vacuum pump 44 being driven by a suitable motor 45.

The source of the air which is exhausted by the vacuum pump 44, as indicated by the arrows 46, is through the usually provided rear opening 47 of the printer cabinet, shown in phantom lines, and directed upwardly by the plurality of fans 48, 49 and 50. This same air which is directed about the inner chamber of the printer cabinet is withdrawn by the vacuum pump 44 after first directing the air closely past the hammer modules, in accordance with the invention.

The following claims are intended to define the valid scope of this invention over the prior art and to cover all changes and modifications falling within the true spirit and valid scope of the invention.

What is claimed is:

1. In a high speed printer apparatus:
carrier means adapted to move a plurality of type characters past a printing station;
a plurality of print hammers supported in the printer apparatus at the printing station;
a plurality of electrical coils, one for each print hammer, for operating the hammers in accordance with a predetermined electrical code;
enclosure means having surfaces closely spaced with the electrical coils and having a plurality of openings, one opening for air intake and one opening for air exhaust and one opening to permit the print hammers to strike toward the carrier means;
connector means at the air exhaust opening for connection to an exhaust pump so that air is drawn into the air intake opening and past the electrical coils and out the exhaust opening; and
means to support the enclosure means about the print hammers and coils so that air through the intake opening tends to follow a path contiguous with the print hammers and coils to the exhaust opening for removing heat effectively.

2. In a high speed printer apparatus as set forth in claim 1 wherein one group of the plurality of openings is disposed across a surface of the enclosure means for drawing print paper thereagainst.

3. In a high speed printer apparatus as set forth in claim 1 wherein the plurality of print hammers and respective electrical coils are in the form of individual modules supported on a support surface; and the enclosure means is fitted over the modules whereby the surfaces of the enclosure means fit closely with the modules for directing air thereacross.

4. In a high speed printer apparatus as set forth in claim 3 wherein the surface on which the hammer modules are supported directs air in a predetermined manner within the cabinet of the printer apparatus, and the printer apparatus cabinet being otherwise sealed, the only air exhaust being through the enclosure means.

5. In a high speed printer apparatus:
a cabinet substantially enclosing the apparatus and having an opening in one surface for cooling air intake, and including at least one fan to direct the air intake upwardly through the cabinet;
carrier means adapted to move a plurality of type characters past a printing station;
a plurality of printing hammers supported in the printer apparatus at the printing station by a panel;
a plurality of electrical coils, one for each print hammer, for operating the hammers in accordance with a predetermined electrical code, the coils being mounted on the panel in a preselected pattern;
enclosure means having four sides and a front surface, the rear being open to permit the enclosure to fit over the print hammers and electrical coils and in tight fitting relationship against the panel;
the enclosure means further having at least two elongated openings on opposite sides thereof to provide for air intake from within the cabinet of the printer apparatus and a third enlongated opening at the printing station to permit the hammers to strike the type characters;
the panel having an elongated opening therein located behind the enclosure means;
connector means fitting closely within the elongated opening in the panel and being of a configuration to adapt the opening to fit a flexible hose;
an exhaust fan including a motor means to drive the fan to direct air externally of the printer apparatus cabinet;
a flexible hose connected between the adapter connector means and the exhaust fan, whereby air within the cabinet is drawn directly and closely across the electrical coils before being exhausted from the printer cabinet.

References Cited in the file of this patent

UNITED STATES PATENTS

2,171,643	Brenkert	Sept. 5, 1939
2,516,184	Christie	July 25, 1950
2,654,583	Treanor	Oct. 6, 1953
2,752,154	Nelson	June 26, 1956
2,753,181	Anander	July 3, 1956
2,787,210	Shepard	Apr. 2, 1957
2,942,856	Woodward et al.	June 28, 1960
2,960,633	Hall	Nov. 15, 1960
2,965,819	Rosenbaum	Dec. 20, 1960
3,001,469	Davis et al.	Sept. 26, 1961