Sept. 6, 1966 G. M. MARKS 3,271,016

MACHINE FOR HEAT SETTING SYNTHETIC FABRICS

Filed Oct. 27, 1964 3 Sheets-Sheet 1

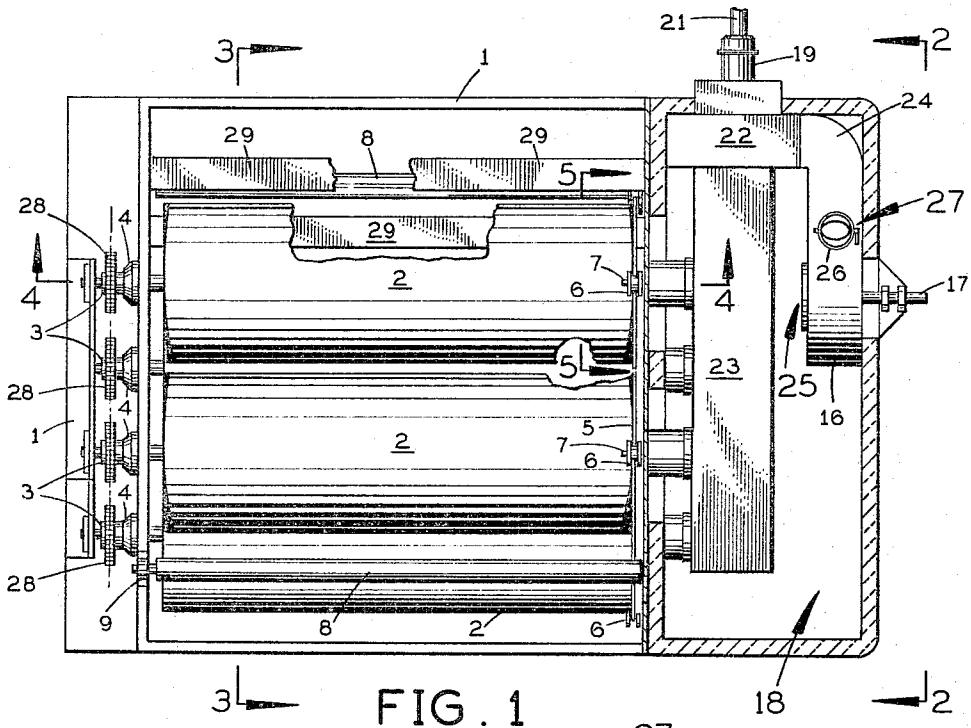


FIG. 1

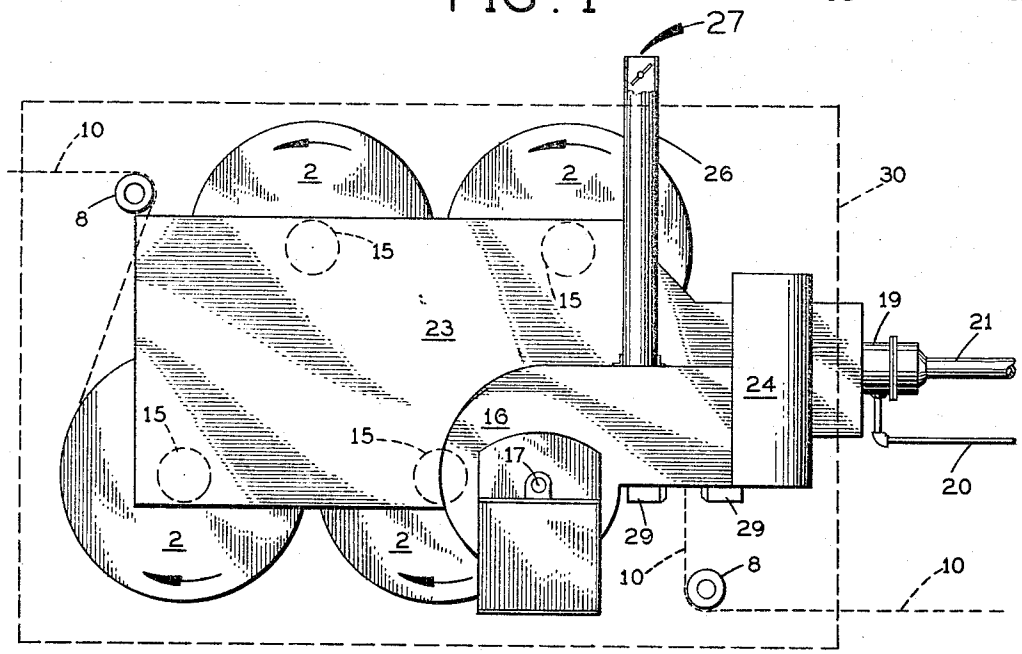


FIG. 2

INVENTOR.
GEORGE M. MARKS
BY
Lloyd J. Anders

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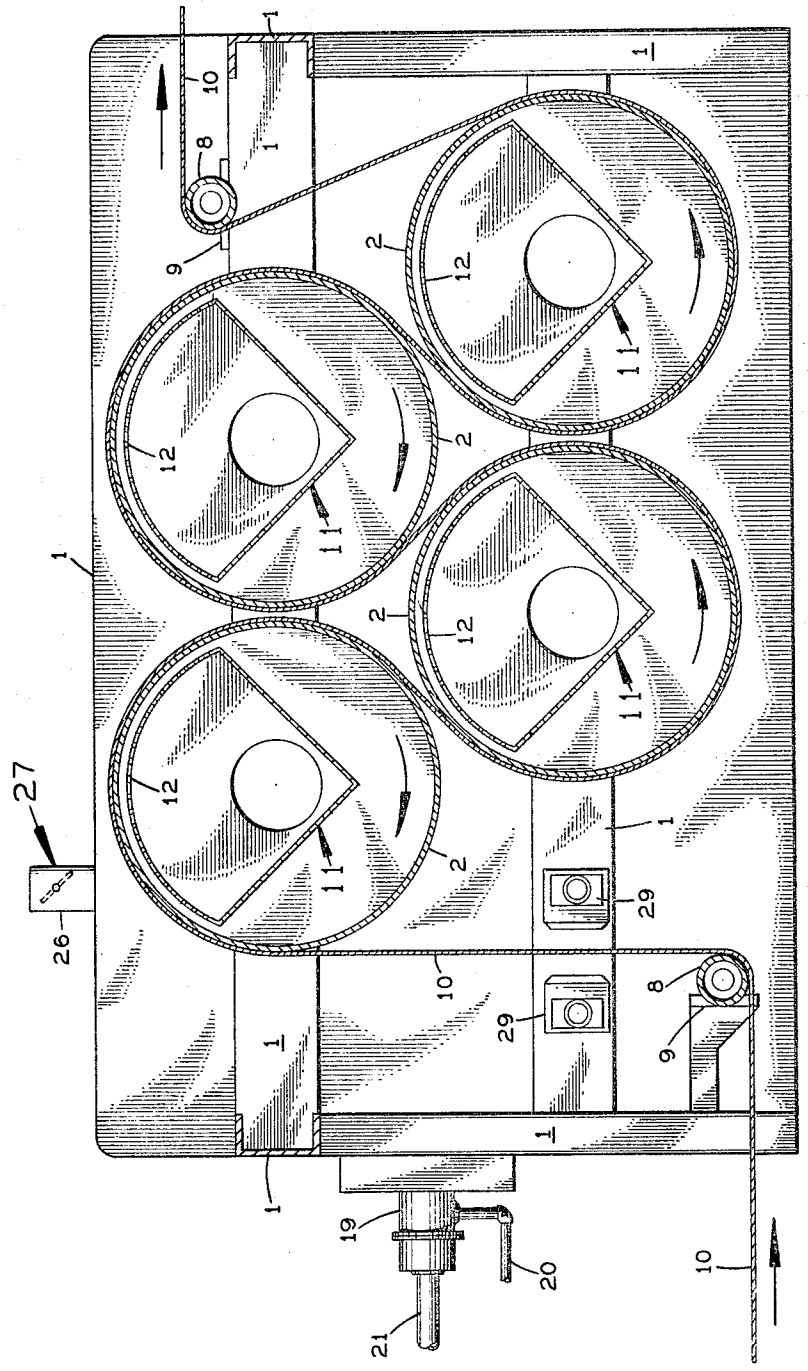


FIG. 3

INVENTOR.
GEORGE M. MARKS
BY
Lloyd J. Anderson

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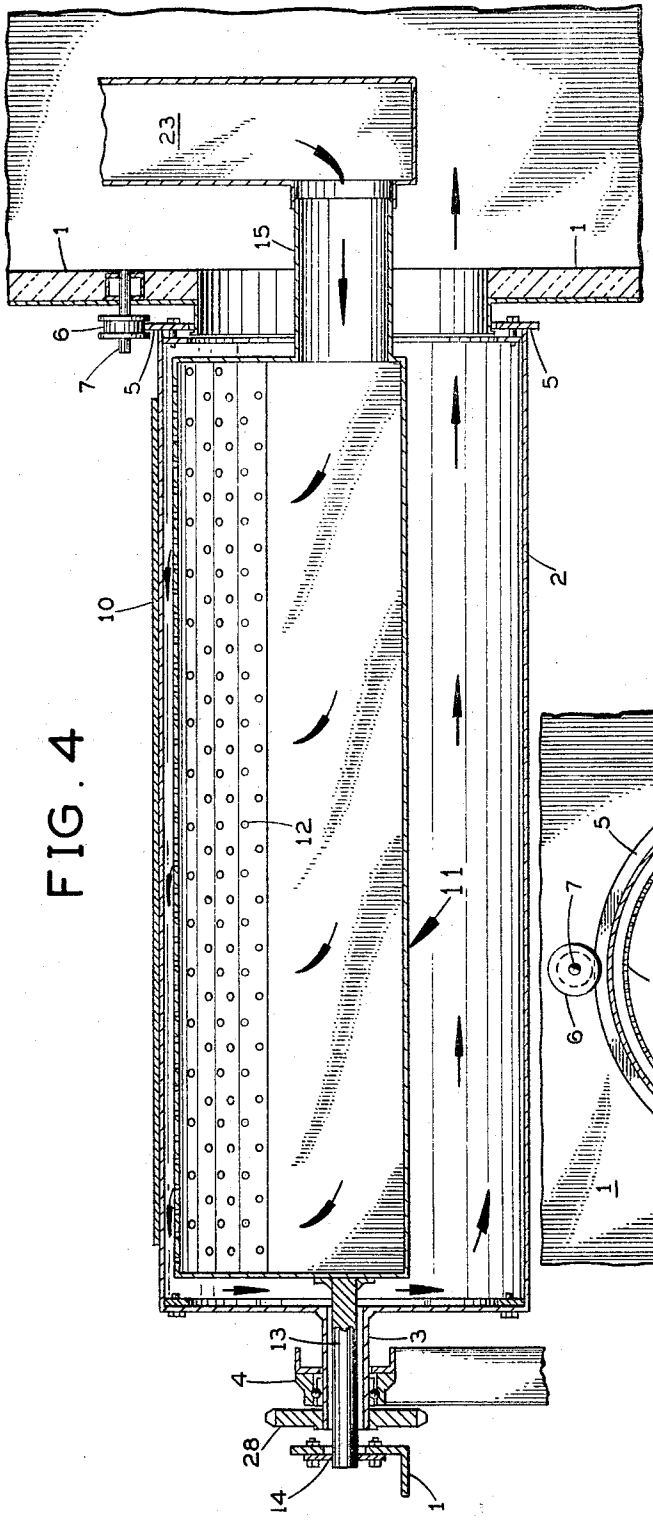
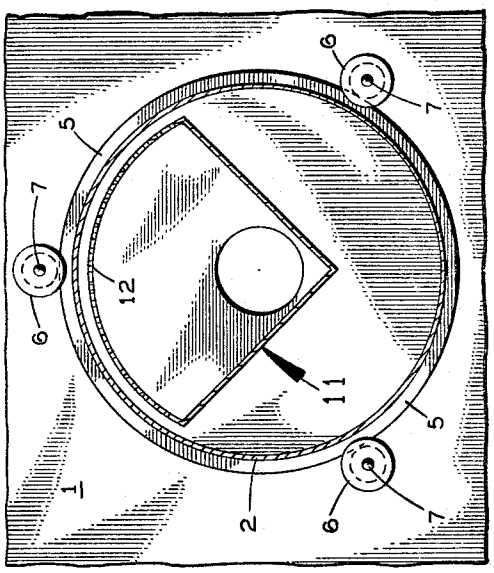


FIG. 4

FIG. 5



INVENTOR.
GEORGE M. MARKS
BY
Lloyd J. Anders

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MACHINE FOR HEAT SETTING SYNTHETIC FABRICS

George M. Marks, Greenville, S.C., assignor to Industrial Heat Engineering Corp., Greenville, S.C., a corporation of South Carolina

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6 Claims. (Cl. 263—3)

This invention relates in general to textile machines and more particularly to a machine for the continuous heat setting of synthetic fabrics by the uniform distribution of predetermined heat thereon.

Prior heat setting apparatus including mechanism for the passage of synthetic fabric over steam heated drums or subjecting the moving fabric to heat from reflected infra-red heat sources. Both prior mechanisms are fraught with difficulty, particularly from the non-uniform application of heat to the moving fabric which in effect oftentimes defeated the purpose of heat setting, which is intended to relieve irregular stresses therein and produce a finished fabric with a high degree of uniform planar "memory."

Prior heating machines, such as described in applicant's U.S. patent, Number 2,984,472, are unsatisfactory for heat setting because of the non-uniform heating of the drums resulting from the direct flame against the drums from the burners therein.

The present invention overcomes the above objections and disadvantages by the provision of a multi-drum machine through which the fabric is passed at relatively high uniform speed and in which each drum is uniformly heated by recirculated hot gas of predetermined temperature uniformly distributed and impinged against the inner periphery of each drum by stationary baffle means, which construction is a principal object of the invention.

A further object of the invention is the provision of a heat setting machine of high thermal efficiency which includes a plurality of rotatable drums in parallel spaced relation with duct means related thereto for conducting and re-circulating heated gas within each drum for uniformly heating the outer periphery thereof and including means for guiding linear fabric over the outer surface of the drums for uniformly raising the temperature of the fabric to a predetermined degree relieving the non-uniform stresses therein while moving at a predetermined velocity.

Another object of the invention is the provision of a cylindrical heat setting drum journaled for rotation about its principal axis and including therein a fixed baffle means having a cylindrical shaped foraminated portion in close proximity to the inner surface of the drum for uniformly distributing heated gas against the inner cylindrical surface of said drum including power means for recirculating the gas therein.

These and other objects and advantages in one embodiment of the invention are shown and described in the following specification and drawings, in which:

FIG. 1 is a top plan view of the machine in reduced scale with a portion of the housing thereof broken away.

FIG. 2 is a side elevation of the machine shown in FIG. 1.

FIG. 3 is an enlarged cross sectional side elevation taken through section line 3—3, FIG. 1.

FIG. 4 is an enlarged cross sectional view taken through section line 4—4, FIG. 1.

FIG. 5 is an enlarged cross sectional view taken through section line 5—5, FIG. 1.

Referring to FIG. 1, a main frame assembly **1** is provided to support four cylindrical hollow drums **2** of like size for rotation about equi-spaced parallel axes. One end of each drum is supported by a hollow coaxial shaft **3** retained for axial rotation in frame **1** by a ball bearing assembly **4**, better shown in FIG. 4.

Referring to FIGS. 4 and 5, the opposite end of each drum **2** is axially supported for rotation in frame **1** by a circular flange **5** coaxially secured to the end of the drum by suitable fasteners with the flange retained within and guided by three flanged rollers **6** which are journalled for rotation on spindles **7** fixed in the frame **1** by well known means.

Referring to FIGS. 1 and 3, a pair of elongated spaced feed rollers **8** are journalled on pillow-block bearings **9** at the opposite ends thereof which are secured in frame **1** for free rotation about axes parallel to the axes of drums **2** for feeding linear fabric **10** into and from the machine respectively. Under the assumption that the fabric **10** is threaded through the machine, as shown in FIG. 3, and the input side of the fabric is provided with predetermined restraint and the output side of the fabric is subjected to withdrawl by well known means at the same speed as the predetermined peripheral velocity of the drums, then opposite sides of the fabric will be in peripheral contact with a pair of drums and be driven thereby in intimate contact therewith when the drums are rotated by means hereinafter described.

Referring to FIGS. 4 and 5, each drum **2** has a heat distributing baffle duct **11** therein which has a segmental cross section, as shown in FIG. 5, with a cylindrical foraminated baffle plate **12** positioned in close proximity to the inner surface of the wall of each drum. A shaft **13** is secured to a closed end of the duct **11** in coaxial relation to the axis of the drum **2** and projects through shaft **3** with predetermined clearance therebetween and the outer end of the shaft terminates in a disc **14** secured thereto which is adjustably retained to frame **1** by suitable fasteners, as shown in FIG. 4.

A duct inlet tube **15** is secured in the opposite end of duct **11** coaxial with the axis of the drum and projects through the open end of the drum thus providing an inlet for heated gas into the duct **11** for uniform impingement against the inner surface of the drum which provides a return path around the outside of the duct and passage through the open end of the drum for re-circulation to be hereinafter described.

Referring to FIGS. 1 and 2, a conventional centrifugal blower **16** having a shaft **17** adapted to be power driven is positioned in an insulated compartment **18** in frame **1**, as shown. Pressurized combustible gas is supplied to a burner **19** through a conduit **20** and pressurized air is supplied by a conduit **21** to provide an admixture of products of combustion and heated air when operated.

A fixed axial flow director **22**, of well known vane design, is positioned adjacent burner **19** to direct the flow of the products of combustion in a predetermined axial direction from the burner **19** and into a manifold assembly **23**, which is constructed and adapted to distribute the heated products of combustion into each of the tubes **15** and thence into each duct **11**.

A duct **24** connects the output of the blower **16** to the inlet of the flow director **22** and the inlet **25** of the blower is open into the compartment enclosure **18**. An exhaust stack **26** enters the outer side of the blower **16** and is provided with a damper assembly **27** for controlling the flow of exhaust gas therefrom.

Referring to FIGS. 1 and 4, a sprocket **28** is secured to the outer end portion of each drum shaft **3**, as shown, for engagement by a power driven chain means, not shown, for rotating each drum at a like predetermined velocity.

Also shown in FIGS. 1 and 3 is a pair of elongated infrared preheaters **29**, adjustably secured in frame **1** in predetermined spaced relation to the upward path of

movement of the fabric **10**. These heaters are preferably non-flaming gas or of the electric type.

Referring to FIG. 2, the entire machine is provided with an insulating housing **30**, in order that a uniform temperature of the drums may be more readily maintained relatively free from variations in ambient temperature influence.

In operation and under the assumption that the blower **16** and the burner **19**, are energized and operated and the fabric to be heat set is threaded through the machine as shown in FIG. 3, and the temperature of the drums raised to a predetermined degree by the circulation of the heated products of combustion forced at relatively high static pressure into manifold **23** and thence to each duct **11** by the action of blower **16** where the hot gas is then distributed through the foraminated baffle **12** against the inner surfaces of the drums. The gas, now at relatively low static pressure, is directed through the open ends of the drums into the enclosure **18** by the induction into the intake side of the blower **16** for recirculation into the manifold **23** for flow into ducts **11**.

When the drums have reached a predetermined temperature, the power driven chain means is then started simultaneously with the mechanism means for feeding the fabric to and from the machine. When the fabric has reached the aforesaid predetermined speed, the preheater burners **29** are energized to a predetermined infra-red output which heat energy is impinged on both sides of the fabric across the entire width thereof.

Thus the counter transverse flexing of the fabric with both sides thereof in alternate contact with the surface of two pairs of drums anneal all memory stresses in the fibers of the fabric into planar alignment, which establishes a highly desirable planar set in the fabric.

Although the heated products of combustion are continuously recirculated in all of the drums, it is apparent that the exhaust stack **26** provides for the escape of surplus products of combustion under the precise control of the damper assembly **27**.

In order that the infra-red burner and the drum temperatures be maintained within narrow limits an infra-red sensing device, not shown, is focused on and responsive to the surface temperature of the drums for controlling the output of the burners. The maintenance of precision temperature control is aided by the insulating housing **30** previously mentioned.

Thus the combination operation of the foraminated baffle within each drum and the recirculation of the products of combustion therein provide an economical means for the transverse uniform heating of the moving fabric for the uniform and efficient heat setting of the synthetic material components thereof.

It is understood that certain modifications of the above construction, utilizing the features above described, are intended to come within the scope of the appended claims.

Having described my invention, I claim:

1. A machine for heat setting synthetic fabric comprising a means forming a frame,

a plurality of parallel spaced hollow drums journalled for rotation in said frame about the principal axes thereof with a predetermined opening in a like end of each of said drums,

a longitudinal duct fixed to said frame positioned in each of said drums having a foraminated baffle along one side thereof in close proximity to the inside cylindrical surface of each said drum with the inlet portion thereof extending from the said opening in each of said drums,

a gas burner means for burning a predetermined mixture of pressurized flammable gas and air when operated and including an outlet orifice for conducting the products of combustion therefrom,

a mixing means having an outlet and first and second inlets with said first inlet connected to said burner orifice,

a power driven blower means having an inlet and outlet with the outlet thereof connected to said second inlet of said mixer means,

a manifold connecting each said duct with the said outlet of said mixing means,

a casing enclosure with openings therein corresponding with and in close proximity to each said opening in each of said drums and connected to the said inlet of said blower means,

power means operatively associated with said drums for rotating same at a predetermined speed when operated whereby the products of combustion of said mixture of gas and air by said burner means will be carried through said mixing means and said manifold means and distributed into each said duct for conduction through each said foraminated baffle against the inside cylindrical surface of corresponding drums for return through each said opening therein into said casing for recirculation by said blower through said mixing means and whereby linear fabric threaded around the outer surface of said drums and driven thereby through said machine will be heat set when said burner, blower and power means are operated.

2. The construction recited in claim **1** including an exhaust stack connected into said casing,

an adjustable damper means in said stack for regulating the escape of said products of combustion from said casing when said machine is operated.

3. The construction recited in claim **1** including a longitudinal infra-red heater positioned in the fabric entrance of said machine parallel said drums in predetermined spaced relation to said fabric for preheating the latter prior to heat setting by said drums when said machine is operated.

4. A machine for heat setting synthetic fabric comprising a means forming a frame,

a plurality of parallel spaced hollow drums journalled for rotation in said frame about the principal axes thereof with a predetermined opening in a like end of each of said drums,

a longitudinal duct fixed to said frame positioned in each of said drums having a foraminated baffle along one side thereof in close proximity to the inside cylindrical surface of each said drum with the inlet portion thereof extending from the said opening in each of said drums,

a manifold means having an inlet and a separate outlet connecting each said duct,

a power driven blower means having an inlet and outlet with said outlet thereof connected to said manifold inlet,

a casing enclosure connecting each said opening in each of said drums to said inlet of said blower means,

a gas burner means for burning a predetermined mixture of pressurized flammable gas and air connected into said inlet for transmitting the resultant products of combustion into said manifold means when operated,

power means operatively associated with said drums for rotating same at a predetermined speed when operated whereby the said blower means will move the said products of combustion in said manifold through each said duct for passage through each said baffle for impingement against the inside surface of each of said drums when operated and whereby the said products of combustion will move from each of said drums through each said opening therein into said casing for movement into the inlet of said blower means for recirculation thereby through said drums when said power means is operated for setting synthetic fabric carried on the outer surface of said drums when said blower, burner and power means are operated.

5. In a machine for heat setting synthetic fabrics of the character described

a means forming a frame,

a hollow drum journalled in said frame about the principal axis thereof with a predetermined opening in one end thereof,

a longitudinal duct fixed to said frame positioned in said drum having a cylindrical shaped foraminated baffle along one side thereof positioned in close proximity to the inside cylindrical surface of said drum with the inlet of said duct extending from the said opening,

a gas burner means for burning a predetermined mixture of flammable gas and air including an outlet orifice for conducting the products of combustion therefrom when operated,

a manifold having the outlet thereof connected to said inlet of said duct and having a common inlet thereof connected to said orifice,

a power driven rotary blower means having an inlet and outlet with the latter connected into said common inlet of said manifold means,

a casing enclosure connecting the opening in said drum to the inlet of said blower means whereby the products of combustion of said burner means will

be circulated and recirculated through said drum for heating same when said blower means and said burner means are operated.

6. The construction recited in claim 5 including an axial flow mixing means connected between the inlet of said manifold and the outlet of said blower and said orifice for mixing the products of combustion of said burner means with the recirculated products of combustion from said blower means,

an exhaust stack connected in said enclosure casing including an adjustable damper therein whereby the products of combustion of said burner will be mixed with the products of combustion from said blower when said machine is operated and said damper means is adjusted for the predetermined escape of said products of combustion from said enclosure.

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JOHN J. CAMBY, *Acting Primary Examiner.*