Feb. 20, 1962 R. C. PARKES ET AL 3,021,609

ADJUSTABLE AIR DISCHARGE NOZZLE FOR A DRYING MACHINE

Filed April 22, 1958 5 Sheets-Sheet 1

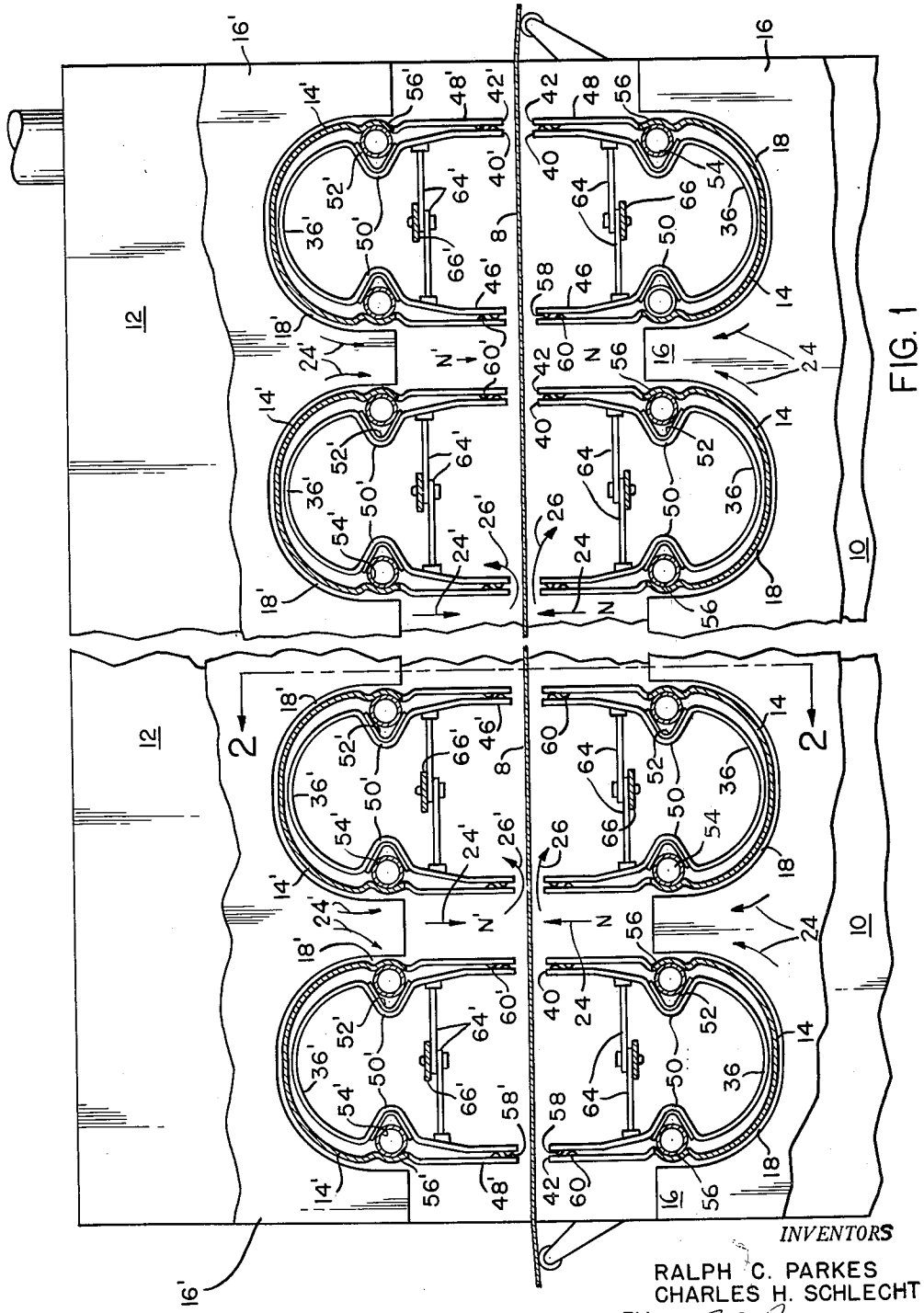


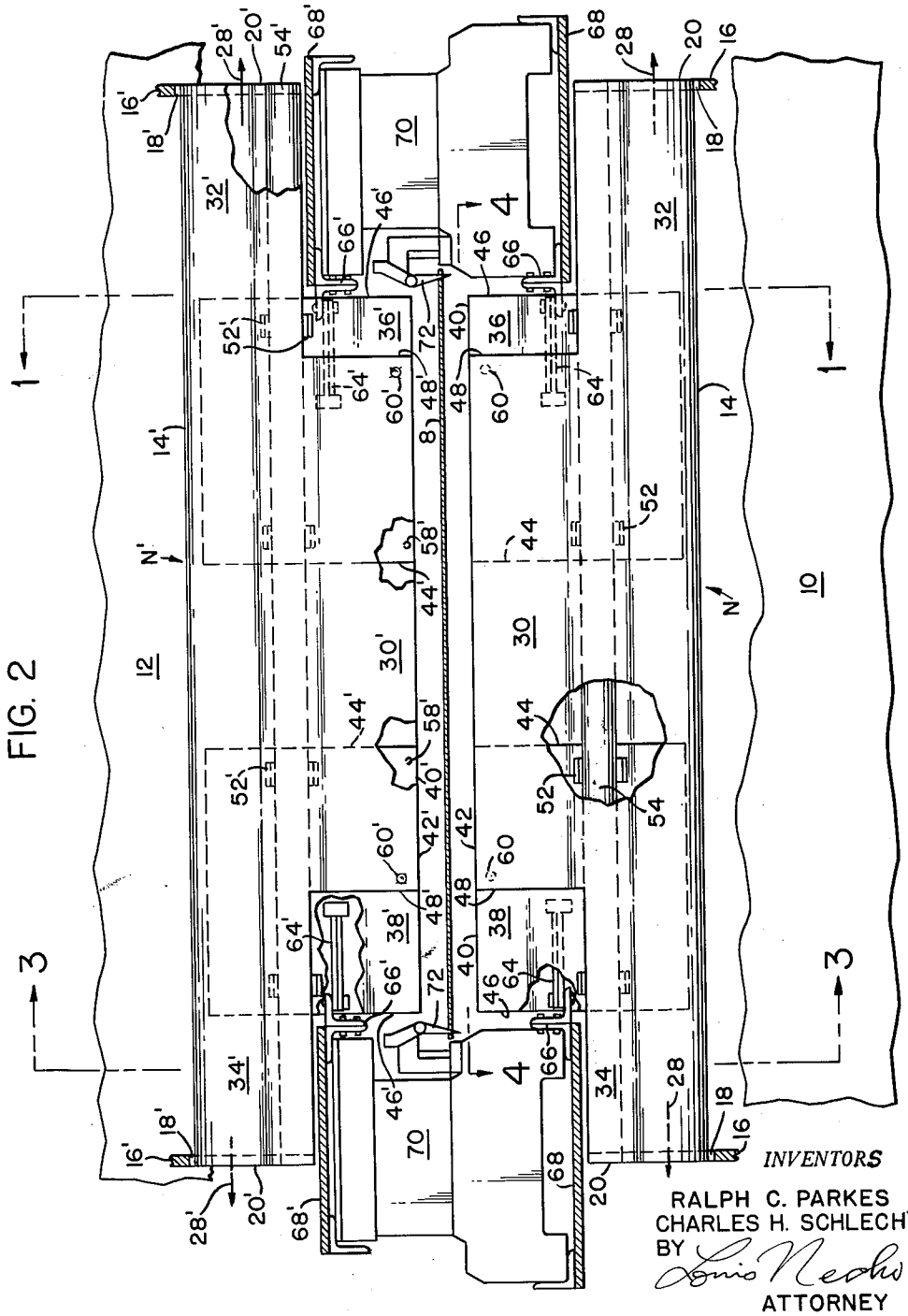
FIG. 1

INVENTORS
RALPH C. PARKES
CHARLES H. SCHLECHT
BY Louis Mechs
ATTORNEY

ADJUSTABLE AIR DISCHARGE NOZZLE FOR A DRYING MACHINE

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FIG. 2



INVENTORS
RALPH C. PARKES
CHARLES H. SCHLECHT
BY Louis Neohs
ATTORNEY

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ADJUSTABLE AIR DISCHARGE NOZZLE FOR A DRYING MACHINE

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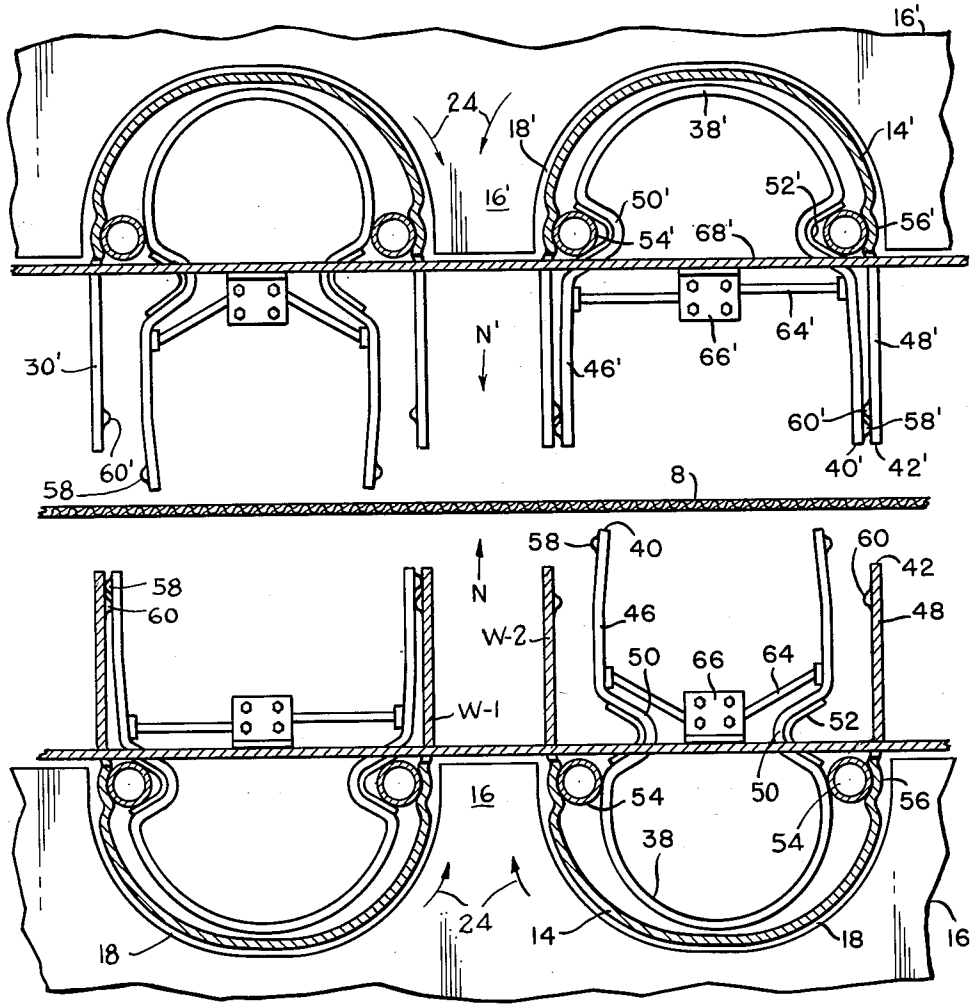


FIG. 3

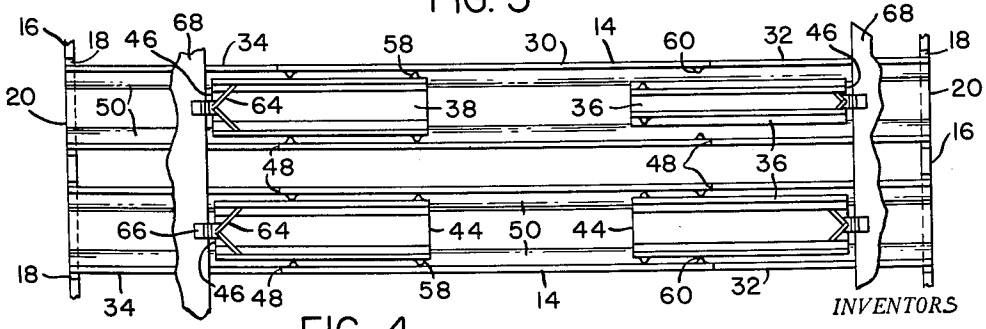


FIG. 4

INVENTORS

RALPH C. PARKES
CHARLES H. SCHLECHT

BY Louis Necho

ATTORNEY

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ADJUSTABLE AIR DISCHARGE NOZZLE FOR A DRYING MACHINE

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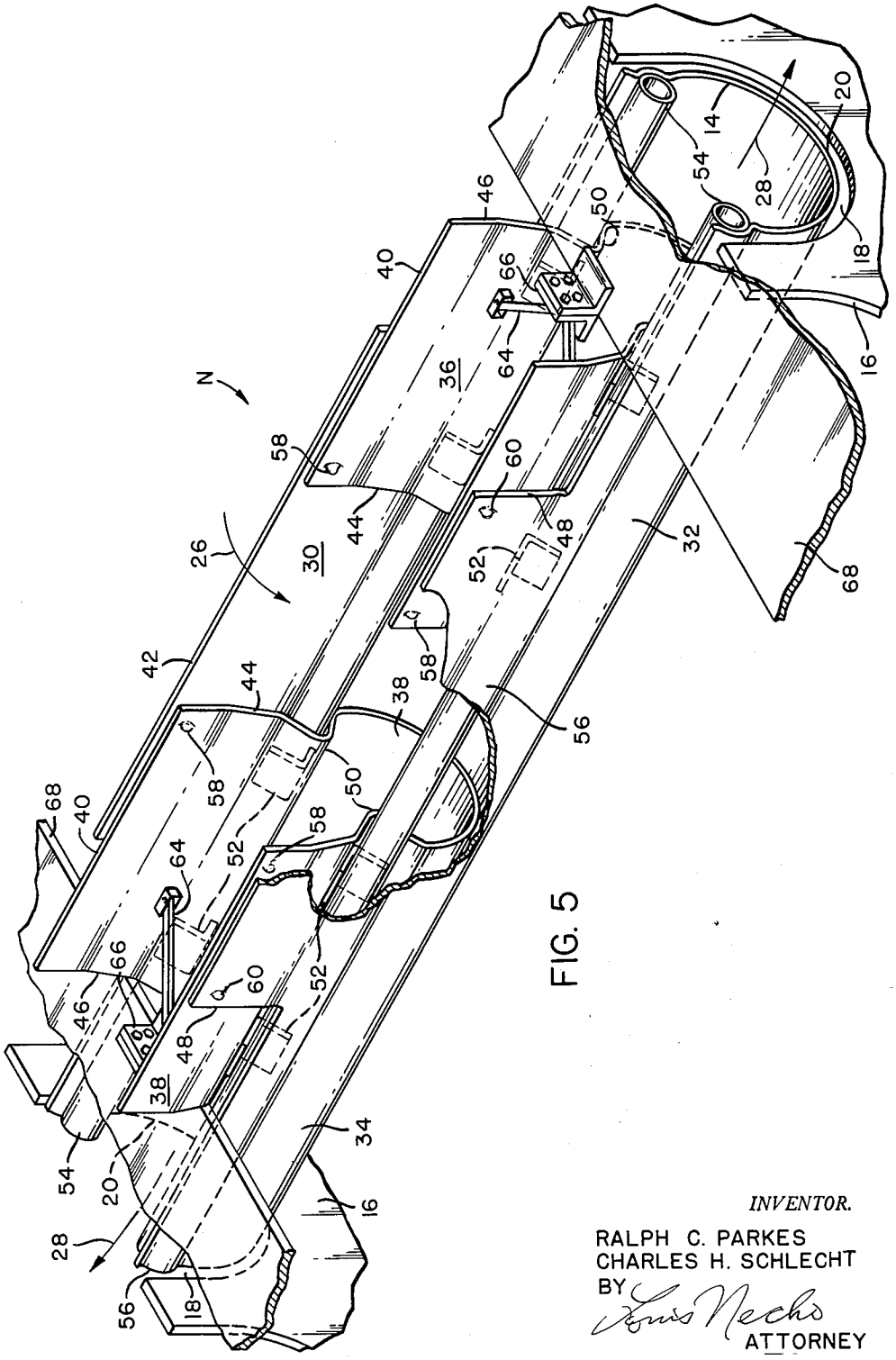


FIG. 5

INVENTOR.

RALPH C. PARKES
CHARLES H. SCHLECHT
BY Louis Necho
ATTORNEY

Feb. 20, 1962 R. C. PARKES ET AL 3,021,609

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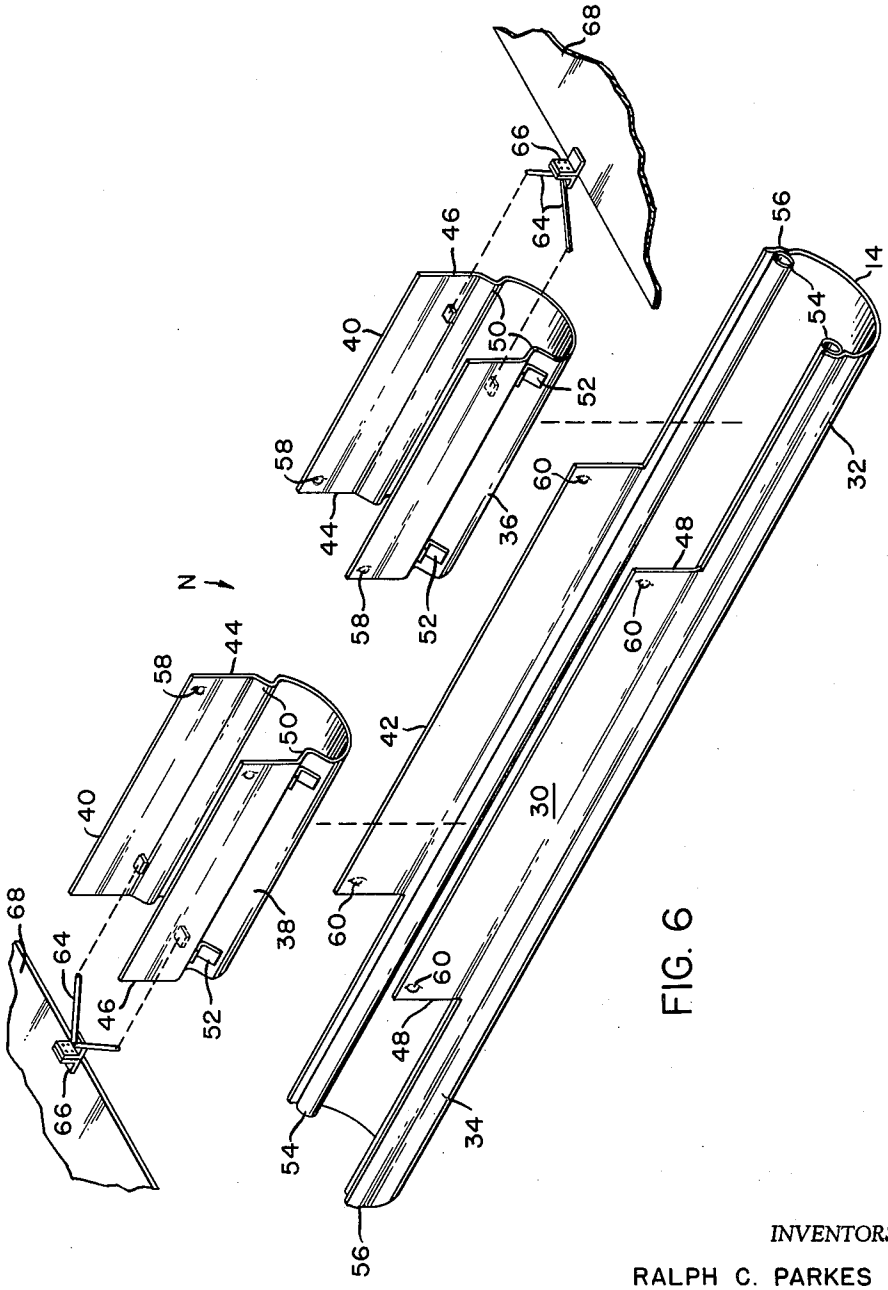


FIG. 6

INVENTORS

RALPH C. PARKES
CHARLES H. SCHLECHT

BY Louis Necho

ATTORNEY

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3,021,609

ADJUSTABLE AIR DISCHARGE NOZZLE FOR A DRYING MACHINE

Ralph C. Parkes, Glenside, and Charles H. Schlecht, Cheltenham, Pa., assignors to The National Drying Machinery Company, Philadelphia, Pa., a corporation of Pennsylvania

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5 Claims. (Cl. 34—158)

This invention relates to a tenter dryer for drying, curing, or otherwise treating a natural or synthetic web, such as cloth or other sheet material.

Since the essential elements of the invention are the same regardless of the nature of the web to be treated or the nature of the treatment to which the web is subjected, the invention will be described in connection with the drying of ordinary cloth by means of heated air with the understanding that "cloth" includes any kind of web, that "drying" includes any kind of treatment, and that "heated air" includes any kind of fluid treating medium.

A tenter drying machine includes a pair of horizontally spaced tenter frames, a pair of endless sprocket chains supported by and longitudinally movable relative to said frames, tenter clips carried by said chains for engaging the opposite selvedges of the cloth, sprocket wheels for propelling said sprocket chains to move the cloth through the drying chamber, and suitable nozzles for blowing heated air against one, or against both sides, of the cloth.

One object of this invention is to produce an improved adjustable air discharge nozzle for a machine of the type set forth.

In addition to varying the length of the nozzles, it is also necessary to vary the distance between the nozzles and the cloth. The nozzles which discharge against the underside of the cloth can be brought as close to the cloth as desired and, hence, present no problem. But, since the tenter clips, which are about four inches high, project above the path of movement of the cloth, the upper nozzles cannot be brought closer to the upper surface of the cloth than about five inches unless the nozzles are shortened so as to clear the upper ends of the clips. If this is done, the marginal portions of the cloth will not be subjected to the full and direct blast of drying air to which the intermediate portions of the cloth are subjected and, therefore, the cloth will not be dried uniformly.

It is, therefore, a further object of the invention to produce a sectional nozzle which can be shortened to clear the tenter clips and which, after being brought as close to the cloth as necessary, may be lengthened to make the blast of air coextensive with the width of the cloth.

The sections of a nozzle of this type are mounted for sliding on each other and/or on a fixed external support, and, due to the length and weight of the sections, and because the nozzle sections are made of relatively light sheet metal, friction must be minimized if the sections are to be moved without excessive force and consequent damage to the parts.

It is, therefore, a still further object of the invention to produce an improved construction in which friction between the relatively movable nozzle sections and between the nozzle sections and their extraneous support is reduced.

The moisture evaporated during the drying operation may carry volatile chemical components other than water vapor. The components referred to condense on the nozzle sections and on their extraneous supports, in the form of gummy deposits, and this makes the movement of the nozzle sections difficult, if not impossible.

It is, therefore, a still further object of the invention to provide means operable on movement of the nozzles for scraping off said gummy deposits to facilitate movement of the nozzle sections relative to each other and to their supports.

Under certain conditions, the gummy deposits referred to become too hard, or too thick to be readily scraped off and, as previously stated, the application of major force to move the nozzle sections will damage the sheet metal nozzles.

It is, therefore, a still further object of the invention to produce an improved construction in which the movable sections of the nozzle are made yielding and resilient to facilitate their removal for cleaning and replacement.

These and other objects are attained by this invention as set forth in the following specification and illustrated in the accompanying drawings in which:

FIG. 1 is a fragmentary and highly diagrammatic longitudinal, vertical sectional view of a drying machine provided with adjustable nozzles embodying the invention, the view being taken on line 1—1 on FIG. 2.

FIG. 2 is an enlarged view, partly in section and partly in elevation, looking in the direction of line 2—2 on FIG. 1.

FIG. 3 is a fragmentary and highly diagrammatic view, partly in elevation and partly in vertical section taken on line 3—3 on FIG. 2.

FIG. 4 is a reduced horizontal sectional view taken on line 4—4 on FIG. 2.

FIG. 5 is a perspective view of one of the lower ducts shown in FIGS. 1 and 3.

FIG. 6 is an exploded, perspective view showing details of the parts forming the structure illustrated in FIG. 5.

A drying machine of the type referred to includes a drying chamber which is only schematically shown in FIG. 1 and through which the cloth 8 to be dried moves from left to right, as viewed in FIG. 1. The machine also includes means for heating the air and blowers for moving the heated air over the upper and/or lower surface of the cloth. Since these elements are conventional; since they are not needed for understanding the present invention; and since they are not claimed, they are not shown nor described. It is sufficient to say that the drying chamber includes a lower plenum 10 and an upper plenum 12, both of which are supplied with air of the desired temperature and under the desired pressure.

In order to form longitudinally adjustable nozzles for discharging heated air against the upper and lower sides of the cloth, means are provided for dividing the lower and upper plena transversely to form lower and upper banks of nozzles N and N', which open on the lower and upper sides of the cloth, respectively, as best shown in FIGS. 1 and 3. Nozzles N and N' are identical and are formed by the same means and, therefore, it is thought that a description of the formation of one of the lower nozzles N will suffice, the parts forming upper nozzles N' being designated with the prime of the reference characters used to designate the parts which form lower nozzle N.

With this in mind, reference is had to FIGS. 1, 5 and 6 from which it will be seen that the lower plenum 10 is provided with a bank of spaced, parallel, U-shaped shells 14, the length of which, as viewed in FIGS. 2 and 6, is equal to the maximum length of the nozzle to be formed between said shells. Shells 14 are confined between walls 16 which form the sides of the drying chamber and which are scalloped to form openings 18 through which the opposite ends 20 of shells 14 communicate with the low pressure side of a closed, air recirculating system or with a suitable exhaust, both not shown. It will be evident, especially from an inspection of FIG. 3, that the juxtaposed vertical walls W–1 and W–2 of adjacent shells 14 coact with walls 16 to form a nozzle which, if not restricted as hereinafter set forth, will be coextensive with the maximum width of the drying chamber, or, at least, with the maximum width of the cloth for the drying of which the machine is designed. Nozzle N discharges air against the lower side of the cloth 8 in the direction of arrows 24 which, after impinging against the underside of the cloth enters into shells 14 in the direction of arrows 26 and escapes through the end openings 20 of the shells in the direction of arrows 28.

As will be seen from FIGS. 2, 5 and 6, each shell 14 includes one central U-shaped trough 30 of maximum height and two, integral, end, reduced U-shaped trough 32 and 34 of reduced height. Each shell 14 has slidably associated with it two movable U-shaped troughs 36 and 38, the upper edges 40 of which are substantially flush with the upper edges 42 of central trough 30. The length of each of troughs 36 and 38 is slightly more than one half of the length of central trough 30 so that, when troughs 36 and 38 are moved toward each other until their inner ends 44 abut at the center of trough 30, the outer ends 46 thereof will almost coincide with the outer ends 48 of central trough 30 to reduce the effective length of the nozzle to its minimum, which is dictated by the length of central trough 30. Conversely, movable troughs 36 and 38 can be pulled apart until their outer edges 46 coincide with the ends 20 of shell 14 to extend the effective nozzle to its maximum length.

In order to minimize friction, movable troughs 36 and 38 are dished inwardly, as at 50, to form elongated depressions in which are mounted angles 52, the arms of which have minimum contact with suitable tracks 54, which, in the embodiment disclosed, are arcuate in cross section. As will be seen from FIG. 2, angles 52 are located at spaced intervals along the walls of troughs 36 and 38, the spacing of the angles being calculated to afford adequate support consistent with minimal friction. If supports 54 are completely round in cross section, the walls of shell 14 are preferably dished outwardly, as at 56, to form a seat, as clearly shown in FIG. 1. It will be appreciated that dishing the walls of shell 14, as at 56, and dishing the walls of movable troughs 36 and 38, as 50, strengthens the construction. Also, the inner ends of the vertical walls of movable troughs 36 and 38 are provided with outwardly facing projections 58 which bear against the inner surface of the vertical walls of central trough 30 and the outer ends of central trough 30 are provided with inwardly extending projections 60 which bear against the outer surface of movable troughs 36 and 38. Projections 58 and 60 thus constitute castors which have substantially point contacts with the relatively slidable vertical walls of the troughs, and thus further reduce the friction between said walls. Projections 58 and 60 may take any desired form, but, in a preferred embodiment, they will be provided with squared edges for scraping gummy deposits condense on their paths of movement and which may otherwise retard the movement of said projections against the corresponding walls.

The outer ends of troughs 36 and 38 are connected by means of straps 64 to angles 66, the other sides of which are connected to cover plates 68. Cover plates 68 are suitably secured to tenter frames 70 which support the

conventional sprocket chains which carry tenter hooks 72. The tenter frames are adjustable toward and away from each other to vary the distance between the tenter clips 72 according to the width of the cloth, the edges of which are engaged by the tenter clips.

The operation is as follows:

If the cloth to be dried is four feet wide, the tenter frames are moved to enable the tenter clips to engage the opposite selvedges of the cloth. If the length of shell 14, or the width of the drying chamber is in excess of four feet, movable troughs 36 and 38 will be moved into partial nesting position with reference to central trough 30 and will assume a position approximating the position shown in FIG. 5. Conversely, if the width of the cloth to be dried is more than 4 feet, troughs 36 and 38 will be pulled apart until their outer edges 46 coincide with the selvedges of the cloth.

It will be remembered that the movement of the tenter hooks and the cover plates result automatically from adjustment of the tenter clips by the conventional adjustment of the tenter frames according to the widths of the clothes to be dried.

When it is desired to remove troughs 36 or 38, it is merely necessary to collapse them transversely and lift them out, as shown at the upper left, and at the lower right, corners of FIG. 3.

It will be noted that the squared edges of angles 52 also scrape off gummy deposit from the surfaces of tracks 54 so as to facilitate movement of troughs 36 and 38 relative to said tracks.

What I claim is:

1. In a drying machine of the type which includes a drying chamber, a source of fluid drying medium, and means for propelling the material to be dried through said chamber, a plurality of separate elongated, hollow, generally U-shaped shells disposed with their mouths adjacent said material and spaced apart to provide unobstructed air discharged passages therebetween, and means closing the spaces between the adjacent ends of said shells and co-acting with the side walls of adjacent shells to form elongated nozzles leading from said source to said material, the ends of said shells being open to afford outlets for the fluid medium discharged against said material through said nozzles, each of said shells including a central portion having side walls of a predetermined height and end portions having side walls of a reduced height, the length of said central portion being at least equal to the minimum width of the cloth to be dried, and the combined length of said central and end portions being equal to the maximum width of the cloth to be dried, and end troughs slidable relative to said shell and adapted to be nested relative to said central portion, the side walls of said end troughs being of substantially the same height as the side walls of said central portion whereby when said end troughs register with said end portions of said shell they will constitute continuations of said central portion thereof.

2. The structure recited in claim 1 in which at least the inner ends of said end troughs are detachably and frictionally engaged with the outer ends of said central portion whereby said end troughs are engageable with and are detachable from said central portion without the use of any tools or fastening devices.

3. The structure recited in claim 1 in which at least said end troughs are resilient and recessed intermediate their longitudinal edges, and tracks carried by said shell and engageable with said recesses whereby compressive force exerted on the sides of said end troughs disengages said tracks from said recesses and disengages said end troughs from said central trough.

4. The structure recited in claim 1 and scrapers carried by said troughs and operative on movement of said troughs to said shell to scrape off matter deposited on said tracks.

5. The structure recited in claim 1 and covers con-

nected to the outer ends of said movable end troughs and movable therewith progressively to close the end portions of said shell as said movable end troughs are moved toward the central portion of said shell.

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