Dec. 17, 1968 H. FOURNIER 3,416,573

LOOM

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Fig. 1

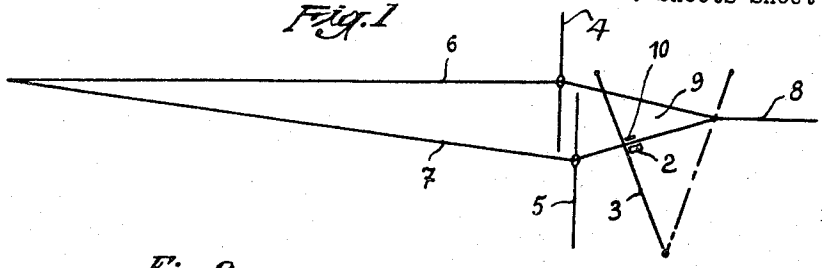
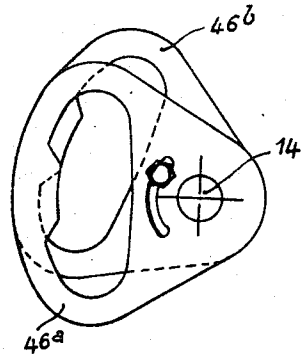


Fig. 8



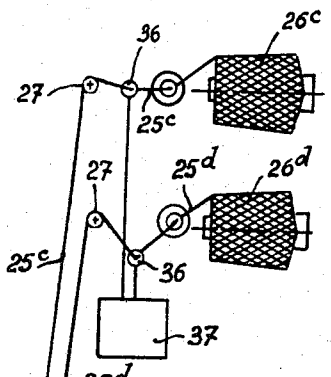


Fig. 6

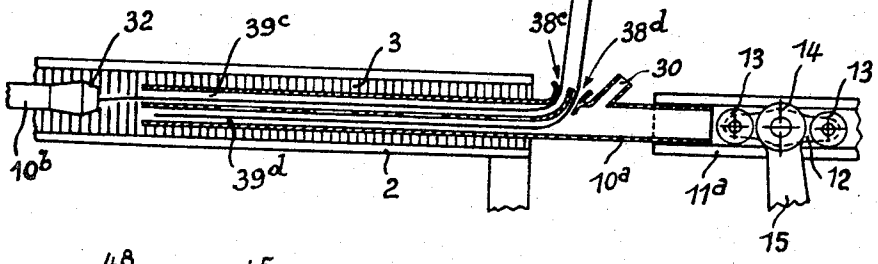
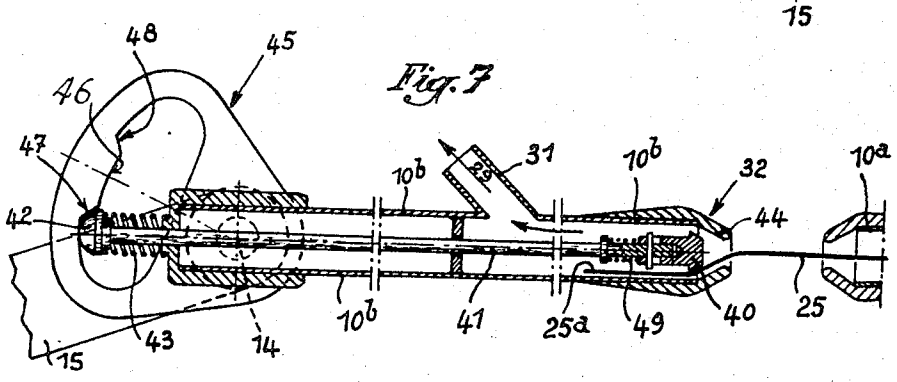


Fig. 7



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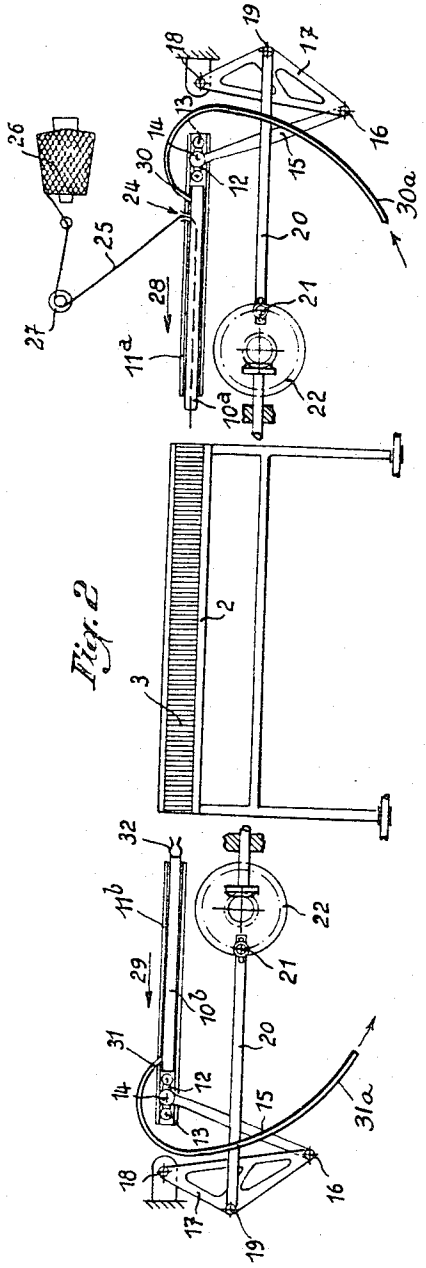

Fig. 2

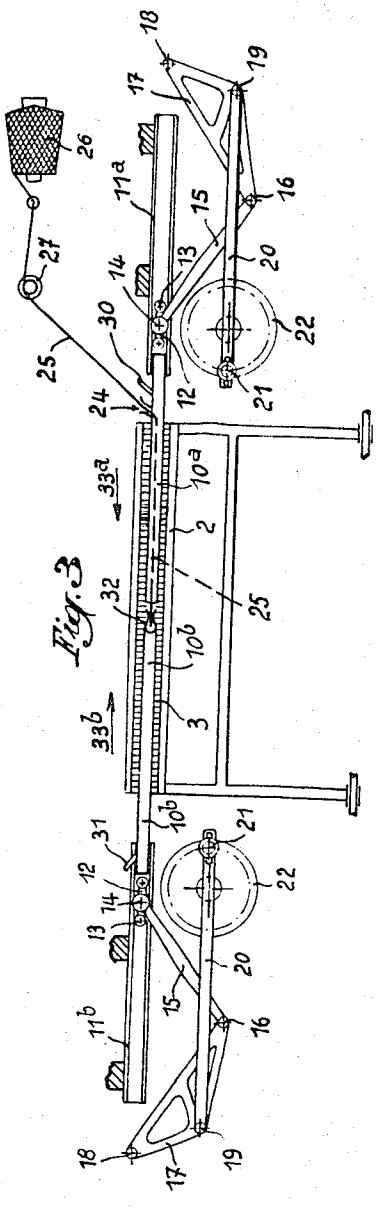

Fig. 3

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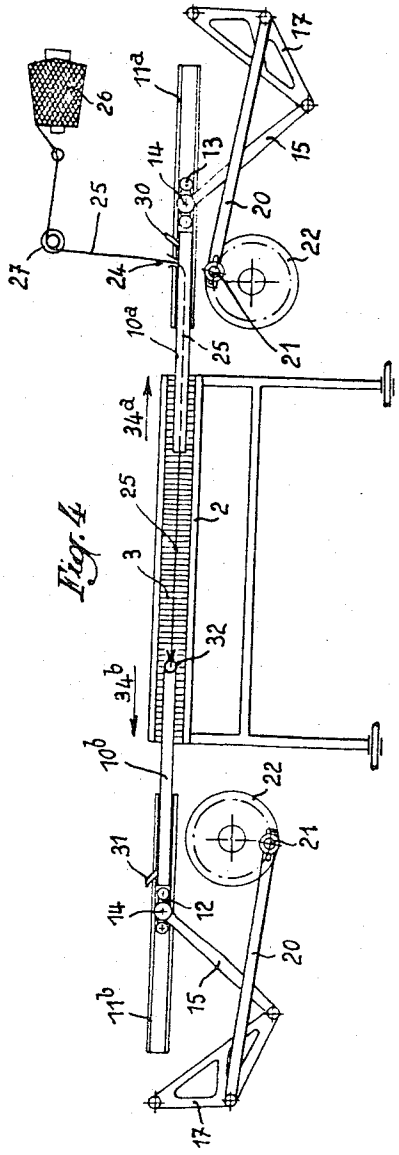

Fig. 4

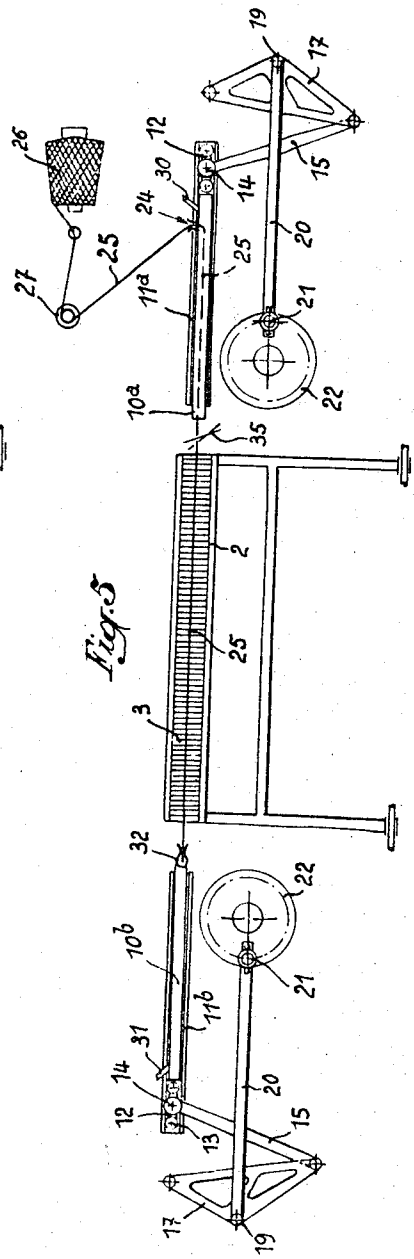

Fig. 5

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3,416,573

LOOM

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Filed Feb. 9, 1967, Ser. No. 614,973
Claims priority, application France, Feb. 21, 1966, 46,964
6 Claims. (Cl. 139—127)

ABSTRACT OF THE DISCLOSURE

A loom having two tubular weft guides recipricating along the same axis in opposite directions. A thread from at least one weft bobbin passes continuously lengthwise through one of said tubular guides and is maintained in such guides with a free end extending beyond the end of such guide, while the other weft guide is provided with a gripper adapted to grip the projecting end of said thread when the two weft guides are closest to each other but not in contact at the end of their inward strokes, and to complete the insertion of the weft in the shed by drawing thread from the supply during the return stroke of said weft guides.

The present invention relates to looms of the shuttleless type, that is, having a large weft thread reserve, and more particularly to improved means for inserting the weft in the shed in such a loom.

Looms of said type are already known, wherein the weft is inserted by many various means, including fully pneumatic means. This latter method, however, is suitable in the practice only for looms of small width. It has been proposed to use such pneumatic means in large width looms by combining the blowing effects and the suction effects respectively by means of two telescopic weft guiding tubes reciprocating in opposite directions. Such an arrangement, however, is rather complicated and requires a weft distributing device which on each insertion releases a length of thread corresponding substantially to the width of the cloth being woven.

Pneumatic devices have also been designed, which are associated with mechanical or electro-mechanical devices, but they are difficult to make and the operation thereof is rather complex and, consequently, somewhat unreliable.

The object of the present invention is to provide a shuttleless loom in which the weft insertion device, though it uses a stream of air, is not actually a pneumatic device, since said stream of air is only used for keeping the thread supported and for positioning same without ensuring the movement thereof.

The loom of the invention, which to this end includes two tubular weft guides reciprocating along a common axis but in opposite directions, at least one thread from at least one weft bobbin passing continuously lengthwise through one of said guides, is characterized in that a stream of air passes through said latter weft guide so as to maintain said thread supported and extending beyond the end of said weft guide, while the other weft guide is provided with a gripper adapted to grip the projecting end of said thread at the moment said two weft guides reach the end of their outstroke and come very close to each other but without any mutual contact, and to complete thus the insertion of the weft in the shed through forced mechanical traction during the return stroke of said weft guides.

That tubular weft guide carrying the gripper is advantageously subjected to a suction effect, the purpose of which is to ensure that the thread end projecting from the first-mentioned thread guide is duly held out to said gripper.

According to a further feature of the invention, the weft thread from a stationary reserve passes over a guide located above the first-mentioned tubular weft guide at a distance such from the latter that the path of said thread between said further guide and the inlet through which said thread enters said tubular weft guide forms with the latter a sharp angle such that, when said tubular weft guide moves forward and reaches its farthest position in the shed, said thread is not drawn since it passes to an angular position which is symmetrical but opposite to its starting position.

Said guide above the tubular weft guide may be adapted to have its position adjusted as regards its distance from said tubular weft guide, with a view to enabling cloths of different widths to be woven. It acts also as a brake to stop any untimely unwinding which could occur either as a result of the movement of the tubular weft guide or under the effect of the stream of air prevailing inside the latter, any unwinding being obtained only through the mechanical traction exerted by the gripper of the other tubular weft guide during its coming out of the shed.

Of course, a cutting device is provided laterally with respect to the loom, on the side of the weft bobbin or bobbins, to cut off the weft thread a few centimeters from the end of the corresponding tubular weft guide when the latter completes its return stroke.

The invention will now be described in further detail, with reference to the appended diagrammatic drawings which illustrate, in a very schematic way, an embodiment of the essential members of said type of loom. In the drawings:

FIGURE 1 is a diagrammatic side elevation showing the essential members of a loom;

FIGURES 2, 3, 4 and 5 are front elevations of the loom according to the invention, showing four of the successive positions taken by the weft guides thereof;

FIGURE 6 shows, on a larger scale, and partially in section, a portion of a loom adapted for weaving with two different wefts in alternation;

FIGURE 7 illustrates, in section, an embodiment of the gripper of the loom; and

FIGURE 8 is an elevation view of a cam arrangement by which the period of opening of the gripper of FIGURE 7 is adjusted.

In FIGURE 1, **2** designates the lay of the loom, **3** its sword, **4** and **5** indicate healds through which the warp threads **6** and **7** pass, while **8** designates the fabric obtained by laying the weft in the shed **9**.

The present invention relates precisely to the means for the laying of the weft. Said means are indicated generally at **10** in FIGURE 1.

In the practice, as shown in FIGURES 2 to 5, said means comprise two tubular weft guides **10***a* and **10***b* sliding each within a stationary slide, **11***a*, **11***b* respectively. The sliding of each of said weft guides is obtained through a respective carriage **12** carrying rollers or shoes **13** moving inside the above-mentioned slides. An arm **15** is pivotally mounted at **14** on each of said carriages **12**, the other end of said arm **15** being hinged at **16** to a lever **17** hanging from a stationary spindle **18** around which it is adapted to rock. A connecting rod **20** is linked at **19** to said lever **17**, said connecting rod **20** being mounted on the crank pin **21** of a fly wheel **22** adapted to rotate continuously. The two fly wheels **22** controlling the two weft guides **10***a*, **10***b* respectively rotate in accurate synchronism with respect to each other, under the action of a motor (not illustrated).

The two tubular weft guides **10***a*, **10***b*, are thus driven with rectilinear alternating motions along a common

axis but in opposite directions with respect to each other. The arrangement is such that during their outstroke above the lay **2** the weft guides **10***a*, **10***b* slide towards each other till they come very close to each other without coming into mutual contact, while their return stroke is such that they are completely clear of said lay.

The tubular weft guide **10***a* is provided laterally with at least one port **24** through which the weft thread **25** from a reserve bobbin **26** passes, while a guiding and braking device **27** is provided between said bobbin and the tubular weft guide **10***a*, above the latter.

Furthermore, a stream of air blown in the direction of the arrow **28** passes through said tubular weft guide **10***a*, while a stream of air passes through the second tubular weft guide **10***b* in the direction of the arrow **29**. To achieve this, the two tubular weft guides **10***a* and **10***b* are connected, at **30** and **31** respectively, with a blower (not shown) and the other with a suction device (not shown), by means of flexible lines **30***a* and **31***a* respectively.

Furthermore, the tubular weft guide **10***b* includes a gripper **32** the opening and closing of which takes place (as will be described hereinafter) at the moment said weft guide **10***b* comes close to the weft guide **10***a*, that is, substantially in the middle of the shed.

The operation of the device of the invention is as follows. In the position shown in FIGURE 2, the two tubular weft guides **10***a*, **10***b*, are at the end of their return stroke or at the beginning of their forward stroke, in which position the weft guide **10***a* carries the weft thread **25** which passes lengthwise therethrough, while the free end of said weft thread **25** projects beyond the end of said weft guide **10***a*.

The two tubular weft guides move then towards each other, in the direction of the arrows **33***a*, **33***b* respectively, (FIGURE 3), while entering the shed **9** above the lay **2**, owing to the movements of the arms **15**, levers **17**, connecting rods **20** and wheels **22**. The weft thread **25** is thus inserted into the shed **9** substantially over the first half of its length, while remaining still inside the tubular weft guide **10***a* within which it is supported and held by the stream of air acting in the direction of the arrow **28**, and without being subjected to any relative shifting with respect to said weft guide **10***a*.

When the two tubular weft guides **10***a*, **10***b* come close to each other, that is, at the end of their forward stroke, the end **25***a* of the weft thread **25** is caught by the gripper **32** of the weft guide **10***b* inside which a stream of air in the direction of the arrow **29** prevails, which stream of air is used only for positioning the thread along the axis of the gripper **32** before the latter closes.

The gripper **32** closes then and grips the end **25***a* without the two weft guides **10***a* and **10***b* having come into contact. Said two weft guides then perform their return stroke in the direction of the arrows **34***a*, **34***b*, respectively (FIGURE 4). The weft thread **25** is now drawn forcedly by the weft guide **10***b*. It is unwound from the bobbin **26** while overcoming the resistance offered by the braking device **27** and is thus laid over the whole width of the shed by sliding inside the weft guide **10***a* in a direction opposite to the motion of the latter. The gripper **32** then opens to leave the weft thread in the shed.

The two weft guides **10***a*, **10***b* reach thus the end of their return stroke, that is, the positions shown in FIGURE 2, at which moment a cutting member **35** cuts off the weft at a point near the end of the weft guide **10***a* adjacent the loom.

The loom is then ready for the insertion of a new pick.

Obviously, the arrangement mentioned hereinabove allows passing several weft threads from several bobbins through the tubular weft guide **10***a*, if necessary.

In such a case, when there are for instance two weft threads **25***c*, **25***d* from the bobbins **26***c*, **26***d* (FIGURE 6), the thread **25***d* which is not in use is held in place while the thread **25***c* is being used, this being obtained by the movement of a movable clamp part **36** controlled by the mechanism **37** driving the loom, so as to cause the gripper **32** to grip only the thread which has to be inserted into the shed to form the fabric being woven. The mechanism **37** is a conventional cording and heald mechanism which is well known to those skilled in the art. In such a case, each of said weft threads **25***c*, **25***d* passes first through a short elbow provided on the tubular weft guide **10***a* and opening thereinto at **38***c*, **38***d* respectively, and then into an individual channel **39***c*, **39***d* respectively, provided in said weft guide **10***a*.

FIGURE 7 illustrates an embodiment of the gripper **32** carried by the tubular weft guide **10***b*. Said gripper comprises a valve **40** carried by a rod **41** which passes throughout the tubular weft guide **10***b*, the other end of said rod **41** being provided with a head **42** projecting beyond said weft guide. The valve **40** is held open by the action of a spring **43**. When the rod **41** is pushed against the action of the spring **43**, the valve **40** comes to bear against the inner periphery of a mouthpiece **44** carried by the end of the tubular weft guide **10***b*. The thread end **25***a* which projects from the tubular weft guide **10***a* and has entered the weft guide **10***b* under the action of the stream of air prevailing inside the latter in the direction of the arrow **29** is caught by gripper **32**, whereby it is pulled upon the return stroke of the weft guide **10***b* in the direction of the arrow **34***b* (FIGURE 4).

The closing of the valve **40** is performed by a hollow cam **45** which acts on the head **42**. Said cam is integral with the arm **15** and pivotally mounted with the latter on the spindle **14**. The cam **45** thus follows the changes of direction of said arm **15**, and during such changes the boss **46** on said cam pushes back the rod **41**, which causes the valve **40** to close and to act thus as a gripper.

Said closing of the valve takes place at the moment the two weft guides **10***a*, **10***b* come close to each other in the middle of the shed, the head **42** of the rod **41** leaving then the rest **47** on the cam **45** and being pushed back by the boss **46**. The valve-gripper is held closed during the whole backward return stroke of the tubular weft guides, and opens only when the rest **48** on the cam **45** comes opposite the head **42** of the rod **41**.

To allow adjusting the period during which the valve-gripper should remain closed, that is, the angular extent between the two rests **47** and **48**, the cam **45** may be formed by two elementary parts **46***a*, **46***b* adapted to be angularly adjusted with respect to each other by pivoting around the spingle **14**.

It should be noted that the valve **40** is mounted on the end of the rod **41** with a certain amount of freedom in its axial movement, owing to a return spring **49**, which always ensures that said valve bears elastically on the inside of the mouthpiece **44** while absorbing any possible slight unevenness of the travel of the rod **41**.

As regards the control of the tubular weft guides **10***a*, **10***b*, the distances between the crank pins **21** and the centers of their fly wheels **22** are adjustable, which makes it possible to adjust the length of the strokes of the tubular weft guides **10***a*, **10***b*.

Obviously, it is possible to use driving means other than levers or connecting rods for the tubular weft guides. Likewise, provision may be made for simultaneously inserting several weft threads into the same set of tubular weft guides. Lastly, the latter may be flexible, which would reduce the space taken up by the loom.

According to the provisions of the patent statutes, I have explained the principle of my invention and have described what I now consider to represent its best embodiment. However, I desire to have it understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically described.

What I claim is:

1. A loom comprising means for insertion of weft threads in the sheds formed in the loom, said means including two hollow weft guides supported in alignment

on a common axis, means for driving said weft guides in reciprocation in opposite directions to cause said weft guides to alternately approach one another in one stroke and to move away from one another in the successive stroke, a stationary supply of weft thread, means for guiding and introducing weft thread from said supply into one of said guides, means for passing a stream of air through said one guide to support the weft thread in the stream, gripper means carried by the other of said guides for engaging thread in said one guide when the guides have approached one another at the ends of said one stroke, said gripper means drawing the thread therewith as the gripper means travels with said other guide in the successive stroke whereby thread is drawn from said supply of weft thread, means controlling said gripper means to release the thread at the end of said successive stroke, means for cutting the thread in said one guide at the end of said successive stroke, to leave a portion projecting therefrom which can be engaged by the gripper means at the end of the next stroke, and means for exerting a braking action on the thread between the supply and said one guide such that thread is wound from said supply to said one guide only by the action of said gripper means.

2. A loom as claimed in claim **1**, wherein said one guide has a port for the introduction of weft thread therein, said means which exerts a braking action on the thread being disposed above said one guide at a middle location between the positions of said port in successive strokes of said one guide.

3. A loom as claimed in claim **2**, wherein said means which exterts the braking action on the thread is located at a distance above said one weft guide such that the path

of said thread between said braking means and the port through which said thread enters said one weft guide forms an acute angle with the latter at the end of the stroke and when the guides are furtherest apart, so that when said guides move towards one another and reach the end of their stroke, said thread is not drawn from the supply since it passes to an angular position which is symmetrical but opposite that of its starting position.

4. A loom as claimed in claim **3**, wherein said means for guiding weft thread includes a guide wheel and said braking means acts on said guide wheel.

5. A loom as claimed in claim **1** comprising means for establishing a suction within said other weft guide to draw the portion projecting from said one guide to the gripper means.

6. A loom as claimed in claim **1**, wherein a plurality of supplies of weft threads are provided, the loom further comprising means defining a channel within said one guide for respective threads from each supply, and means for restraining those threads not to be inserted into the sheds.

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HENRY S. JAUDON. *Primary Examiner.*