Aug. 8, 1961 J. J. NAWALANIC 2,995,173

ADJUSTABLE SPRAY HEADS WITH ALIGNING MEANS

Filed March 27, 1959 3 Sheets-Sheet 1

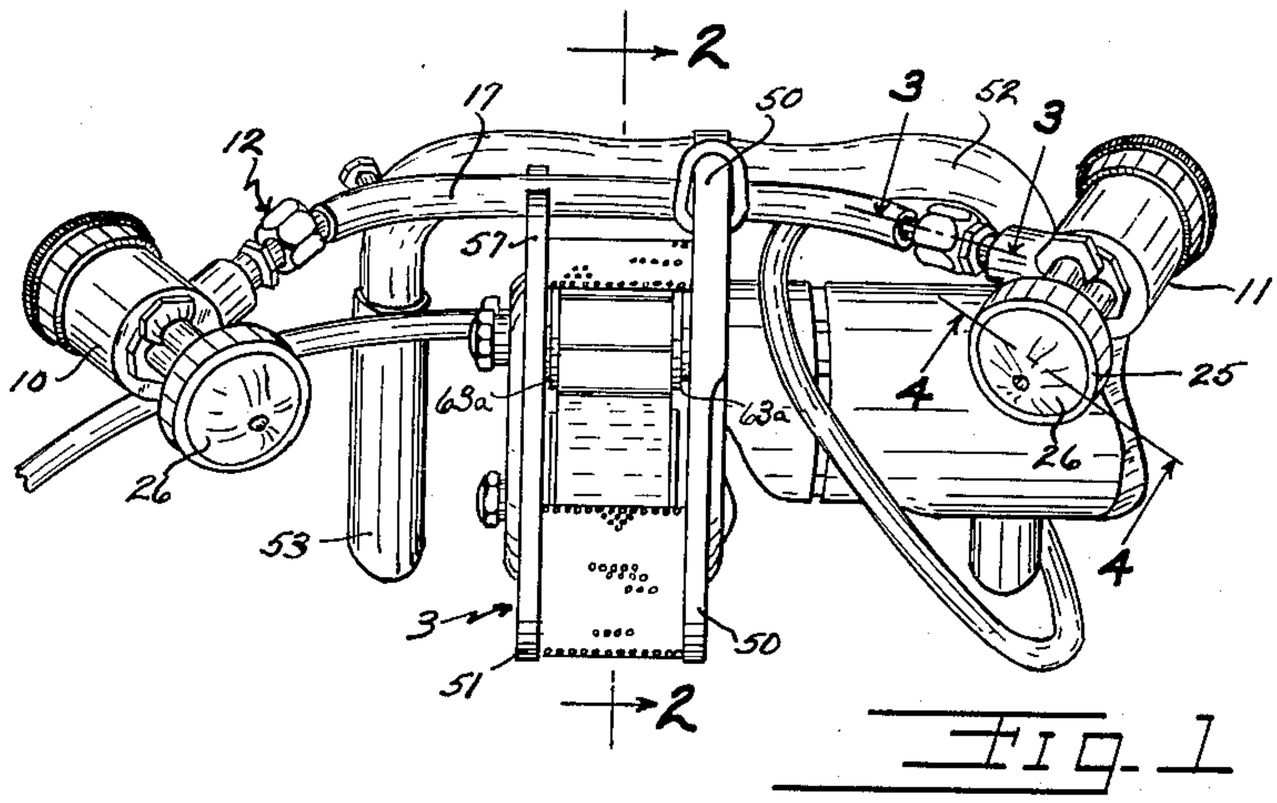

FIG. 1

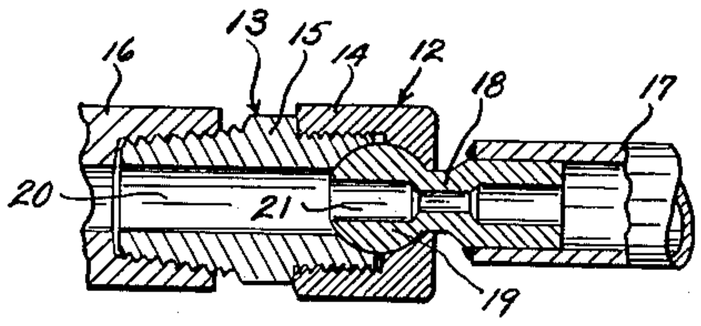

FIG. 3

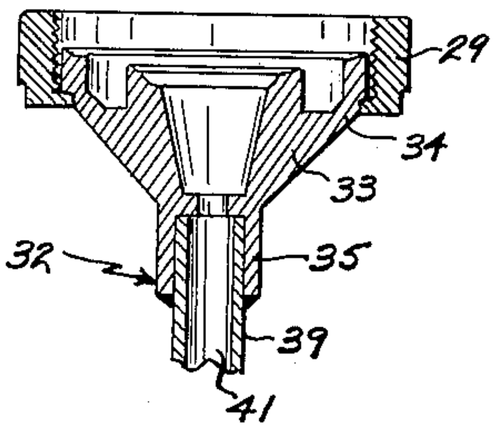

FIG. 8

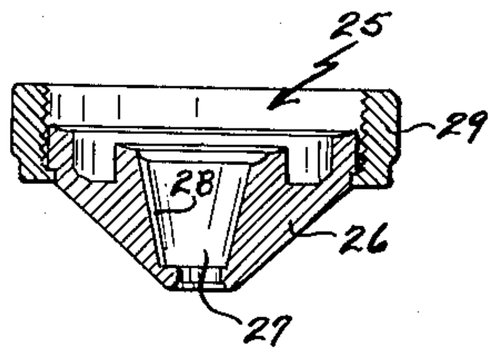

FIG. 4

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ADJUSTABLE SPRAY HEADS WITH ALIGNING MEANS

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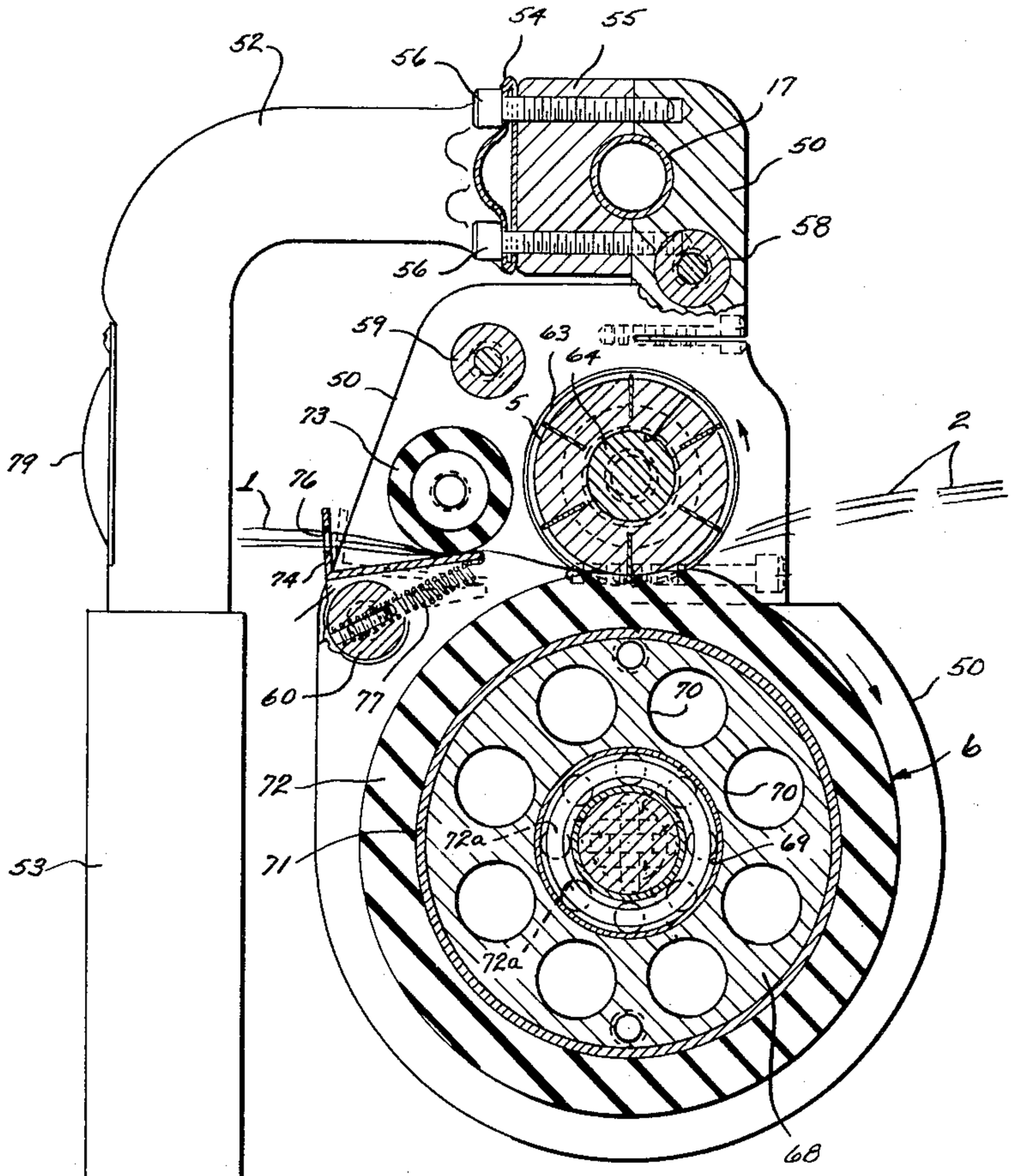

FIG. 2

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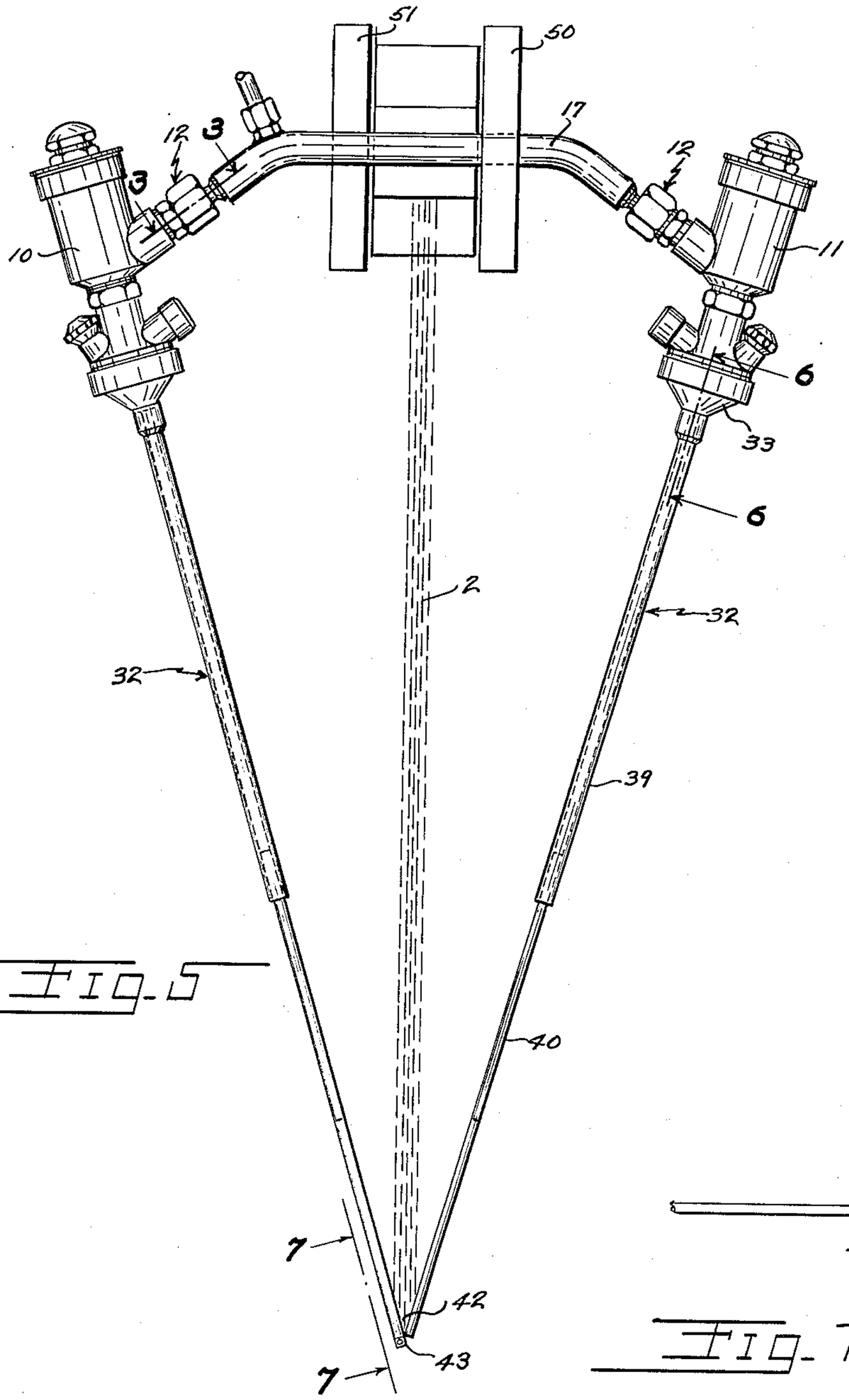

FIG. 5

FIG. 7

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ADJUSTABLE SPRAY HEADS WITH ALIGNING MEANS

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7 Claims. (Cl. 154—1)

This invention relates to improvements in means for adjustably mounting and aiming spray guns for coating a stream of cut fibers preferably provided by a fiber breaker of a fiber-plastic depositor device or other means of projecting cut fibers in a stream.

It is an object of the present invention to provide improved mounting means and sighting means for aiming spray guns to coat cut fibers, moving in a stream, with liquid plastic or other suitable adhesive material.

One object of the present invention is to provide an improved means for coordinating the spraying of liquid plastic on a stream of cut fibers emerging from a fiber-breaker device used to cut fiber rovings into shorter lengths.

It is a further object of this invention to provide an improved assembly for cutting fiber roving and coating the cut fibers with plastic in which spray heads are adjustably mounted to easily provide correct aiming of the spray heads so that streams of plastic spray from the guns will converge in a common point in the stream of cut fibers.

It is an object to provide a means of adjustably mounting spray heads for use in combination with the fiber-breaker and to provide a means of determining where streams of plastic spray will hit the stream of cut fibers without having to actually spray the liquid plastic, thereby providing an easy and convenient means of adjusting the spray head positions to obtain a common meeting point for the sprays and the stream of cut fibers.

These and other objects will be apparent from the specification, appended claims, and the drawings in which:

FIG. 1 is a perspective view of a fiber-breaking device taken at its discharge side and showing the spray guns assembled for use therewith according to the present invention;

FIG. 2 is a transverse sectional view of the fiber-breaking device taken along the lines 2—2 indicated in FIG. 1;

FIG. 3 is an enlarged sectional view of an adjustable means of mounting spray guns on a common frame in accordance with the present invention and taken along the line indicated at 3—3 in FIG. 1;

FIG. 4 is an enlarged sectional view showing a spray head used on the spray guns and taken along the line indicated at 4—4 in FIG. 1;

FIG. 5 is a plan view of a fiber-breaker and spray gun combination in which the spray heads are substituted by telescoping rod members used to aim the guns so that streams of liquid plastic converge in a common point in a stream of cut fibers;

FIG. 6 is a sectional view taken along the line indicated at 6—6 in FIG. 5; and

FIG. 7 is a transverse elevational view taken along the line indicated at 7—7 in FIG. 5.

The present invention provides an adjustable means of mounting spray guns on a common frame preferably for use with a fiber-breaking device so that guns can easily and conveniently be aimed to converge streams of liquid plastic emitting from the guns at a common point in the stream of cut fibers being ejected from the fiber-breaker device. By the use of adjustable mounting means, the guns can be pre-aimed without the necessity of test spraying liquid plastic into the stream of cut fibers in order to correctly position and aim the guns by trial and error. By pre-aiming the guns, considerable time is saved, and in addition the formation of sticky, messy plastic coated fibers that are generally scrapped is avoided.

It is to be understood that while streams of cut fiber described here are produced preferably by a fiber-breaker and ejected therefrom, the adjustable mounting means and sighting means for the spray guns of the present invention can be used in combination with other means of projecting a stream of cut fibers such as by blowing cut fibers from a tube.

In the present invention, continuous lengths of fiber 1, preferably glass fiber roving, are broken into shorter lengths of cut fibers and projected from the fiber breaking device in a stream 2 of cut fibers, as indicated in FIG. 2. A fiber breaking device 3 comprises a frame 4, a co-acting generally cylindrical cutter 5 and a backup roll 6. A motor 7 drives the cutter so as to carry continuous lengths of fiber 2 between the cutter 5 and roll 6 where they are cut and ejected from the device in a stream 2 of cut fibers. Generally it is preferred that the stream of cut fibers be carried from the cutter a horizontal distance of at least 15 to 20 inches for most operating circumstances.

In combination with the fiber-breaking device 3 or other suitable means carried by the frame and used to provide a stream of cut fibers 2, the present invention provides a pair of spray guns 10 and 11 which are arranged to direct converging streams of liquid plastic at a common point in the stream of cut fibers 2. The guns 10 and 11 are arranged by adjustable mounting means to be easily and quickly adjusted so the streams of coating material hit the stream of cut fibers at a common point. The adjustable mounting means is adapted to swivel, swing or turn the gun relative to the frame into a position where streams of liquid plastic emitting from the guns strike the fiber material at a desired point.

As seen in FIGS. 1, 3, and 5, an adjustable mounting means for the spray guns comprises a ball and socket joint 12 including a generally swingable socket member having a semi-spherical pocket or socket 13 formed by a collar member 14 having a C-shaped cross section and tubular member 15. The interior portion of the flange of the C-shaped collar 14 is threaded and adapted to engage the threads of the socket end of tubular member 15 to fasten the collar 14 to tubular member 15. The opposite end of tubular member 15 is rigidly connected to an air conduit 16 which delivers air from the joint 12 to spray gun 11. An air pipe or manifold 17 is used to deliver the air to the joint 12.

The ball and socket joint 12 also includes a generally stationary ball swivel member 18 having a ball portion 19 which is adapted to turn inside socket 13. Both the tubular member 15 of the socket member and the ball member 18 have internal bores 20 and 21, respectively, which communicate with air manifold 17 and air pipe 16 to form a part of the conduit used to supply air to the guns. Thus ball 19 pivots inside socket 13 and turns the spray gun, rigid with pipe 16, relative to the frame to cause spray from the gun to strike the stream of cut fibers at a desired point. It is noted that the spray gun 11 can be rotated and moved in an up-and-down direction or a side-to-side direction by oscillating the swingable socket member about the ball 19.

Each of the spray guns can be traversed about 180 degrees from one extreme to the other extreme position. The spray guns may be swung 180 degrees in a horizontal direction or plane and they may also be swung up and down (in a vertical direction) about 180 degrees. According to the present invention the guns can easily be

pre-set to an approximate position, so that only minor adjustment is required, by swinging the guns up or down slightly or turned to one side slightly. The change in angle made by the gun from the old position to new position need be only a few degrees, namely about 1 to 10 degrees in most cases. The angle of rotation is measured, for instance, in horizontal plane by taking the center of the ball and socket joint as the apex of the angle and measuring the angle between the original longitudinal axis and the new longitudinal axis of the swingable member **13**.

As best seen in FIGS. 1 and 4, the spray guns **10** and **11** have spray heads **25** comprising a spray cap nozzle **26** having an internal bore **27** for receiving the resin discharge tip, and with axially spaced grooves **28** for passage of air therethrough. The spray heads **25** also include a retaining ring **29** used to secure spray caps **26** to the body of the associated spray gun **10** or **11**.

According to the present invention, correct positioning of the spray guns **10** and **11** can be determined before any spraying is done by removing spray cap **26** and substituting for it a telescoping rod member **32** having a funnel shaped connecting member **33** at one end interchangeable with cap **26**.

In accordance with the present invention, each of the telescoping rod members **32** is used to simulate the direction of the stream of sprayed coating whereby the spray guns may be adjusted before using any fiber coating. An enlarged end **34** of the funnel-shaped member **33** is circular in cross section and is fastened to the spray gun body by ring **29** so that it is held in place in the same manner as nozzle or spray cap **26** is held in place. An opposite end **35** or a relatively small diameter end of connecting member **33** is rigidly connected to a hollow rod **39** of suitable diameter. The small end **35** is tubular and has an internal bore only slightly larger than the external diameter of rod **39**, thereby providing a tight force fit or welded fit to securely hold the rod **39**. The telescoping rod number **32** is shown in an extended position in FIG. 5. Also in FIG. 5, there is shown a relatively small rod **40** connected to the rod **39** and adapted to telescope into a collapsed position within the internal bore **41** of rod **39** as shown in dot dash lines in FIG. 5. Thus, the rod **40** has external dimensions slightly smaller than the internal dimensions of the larger rod **39** to provide a snug but slidable fit so that the rod **40** can be moved in and out of bore **41** as desired.

It can be seen that spray guns **10** and **11** can be easily aimed in predetermined position so that the streams of liquid plastic resin emitting from the guns converge at a common point as indicated at **42** in the stream of cut fibers **2**.

Another feature of telescoping rod members **32** which aids the members in simulating streams of plastic coating is shown in FIGS. 6 and 7. In these figures, the far end of one of the small rods **40** is provided with a relatively small diameter tell-tale rod **43** which fits tightly in an opening located nearly at the end of the rod **40**. The rod **43** is preferably held in a position generally perpendicular to the plane formed through the longitudinal axis of the telescoping rod members **32** so that by observing the point at which the stream of cut fibers hits the tell-tale rod **43**, the spray guns can be aimed to cause the streams of coating material to meet at a point, and to insure that point is properly positioned with respect to fiber stream **2**. In this manner, the guns can be aimed to converge the streams of spray coating at a common point substantially in the center of the stream of cut fibers if desired.

When projecting the fiber stream while using sighting rods **32**, if the upper end of rod **43** is more heavily coated with fibers, the joints **12** should be adjusted to raise the rods **32** until the upper and lower ends of rod **43** (FIG. 7) are about equally coated. It should be understood that glass fibers, for instance, often have a static charge causing them to cling to rod **43**, but in any case the fibers are so forcibly projected at **2** in FIG. 2 that they cling to rod **43**.

As illustrative of a preferred size of the tell-tale rod **43**, the rod **43** is about 6 inches in length and has a diameter of about $\frac{3}{32}$ of an inch. As illustrative of the size of the tell-tale rod relative to the rest of the telescoping rod members, the rod **40** may be $\frac{1}{4}$ inch in diameter and 15 inches long, while rod **39** may be $\frac{5}{16}$ inch in diameter and 12 inches long.

I have chosen to illustrate my improved adjustable mounting means for spray guns and my sighting means for pre-aiming the guns as adapted for use in apparatus similar to that shown for forming a fiber reinforced plastic article in United States Patent No. 2,787,314 granted April 2, 1957, to David F. Anderson. It should be understood, however, that my improved adjustable mounting means and sighting means for spray guns may be used for its intended purpose whether or not it is associated with the fiber-breaker or cutter of the above-mentioned Anderson patent.

For simplicity of expression, the rotatable roll **5** which carries a plurality of cutting blades will hereinafter be referred to as the cutter roll, although, in handling certain types of fiber with the apparatus herein disclosed, the action more a breaking of the fiber than a cutting action.

The essential parts of the fiber-breaker apparatus about to be described are the above-mentioned cutter roll **5** and a resilient coacting back-up roll **6** against which the cutter blades operate. The cutter roll and back-up roll cut fiber roving into predetermined short lengths and act in combination with the adjustable mounting means of the present invention to provide a fiber reinforced plastic article. A suitable frame must be provided to rotatably support the cutter and back-up rolls and in the present disclosure, this comprises two generally parallel plates **50** and **51**, which serve as brackets to support the rest of the coacting apparatus. In order to support my improved device so that the fiber-breaker or cutter may be disposed intermediate two resin sprays, I have shown a handle bar **52** having handles **53** at opposite ends to be gripped by the operator. The handle bar **52** is flattened near its midpoint as indicated at **54**. The air pipe **17** is held in place against bracket **50** near point **54** by a block **55** which is secured thereto by screws **56**.

Three rigid spacer members **58**, **59** and **60** are secured between the plates **50** and **51** to provide a rigid framework for the coacting rollers about to be described.

The cutter roll **5** comprises a smooth cylindrical body **5** having a plurality of radially extending slots running the entire length of the body and opening toward the outer periphery of the body and adapted to receive standard safety razor blades **63** which are held in place by end caps **63***a*.

The cutter roll **5** is rotated by a shaft **64** which fits tightly in a bore **65** of the roll **5**. The shaft **64** is connected to and driven by the driven shaft of motor **7**. The shaft **64** extends beyond the body **5** at its end opposite the drive shaft to receive a bearing (not shown) which is a press fit on the shaft.

The back-up roll **6** comprises a rigid annular body **68** which is preferably made of aluminum and has an internal bore **69**. The body **68** may have holes **70** which are cut away to save on the amount of metal required. A circular band **71** of suitable metal covers the body **68** and an annular ring of resilient material **72** is bonded to the band **71** to provide a resilient cover or sleeve **72** for the back-up roll which operates in combination with the razor blades **63** to cut or break the fiber roving. The cutter roll **5** and back-up roll **6** are assembled so that there is an interference at their point of tangency so that the cutter roll drives its back-up roll and so that cover **72** is compressed slightly but yet offers enough resistance to each of the blades that the roving is severed between the rubber cover and the blade.

The back-up roll **6** is rotatably mounted inside of plates

50 and 51 by a suitable means. For instance, the internal bore 69 may have shoulder at each end against which a friction reducing ball bearing 72*a* is a force fit.

Means is provided to drive the cutter roll and the back-up roll in a direction to feed continuous lengths of fiber between them from left to right as viewed in FIG. 2. In other words, the cutter roll travels in a counterclockwise direction and the back-up roll in a clockwise direction as viewed in FIG. 2 and as indicated by arrows in that view.

Means for guiding and feeding continuous lengths of fiber roving to the cutter and back-up rolls is shown which comprises a rubber covered roll 73 and a combined roving guide and brake 74. The guide and brake 74 is L-shaped in section and has an opening 76 in the shorter leg of the member 74 for feeding the continuous roving 1 therethrough. The longer leg of member 74 is lightly pressed against the bottom of roller 73 to guide the roving and provide a slight drag thereon. The longer leg of member 74 is held in a biased position by a spring 77 which urges it in a counterclockwise direction as shown in FIG. 2.

When beginning the fiber-cutting operation, a new length of roving 1 is passed through opening 76 and carried between roll 73 and the long leg member 74 to the junction of the cutter roll and the back-up roll and then to the broken line position indicated in FIG. 2. Thereafter, the fiber-breaking device may be started by a control switch 79 to provide the stream of cut fibers 2.

As previously explained, the spray guns can be properly aimed and positioned before actually spraying any liquid plastic so that once the guns are positioned and the cutter ready to produce a stream of cut fibers as above described, production of plastic reinforced fiber article can begin immediately with no need for production of scrap material in order to properly use the guns in combination with the fiber-breaking device.

It is understood that in accordance with the provisions of the patent statutes the particular form of apparatus shown and described is presented for purposes of explanation and illustration and that various modifications of said apparatus can be made without departing from my invention.

Wherever in the specification and claims I have used the term "spray gun," I intend to include a "spray nozzle."

What is claimed is:

1. In a device for forming a fiber-reinforced plastic article comprising a frame, means carried by said frame for projecting a stream of fiber material and a pair of spray guns for spraying a fiber coating located on opposite sides of the means for projecting the stream of fiber material; the combination therewith of an adjustable mounting for each of said guns on said frame whereby each gun may be easily turned relative to said frame to cause the spray from said gun to strike said fiber material at a desired point, and telescoping sighting rods, each rod attachable to one of the guns to simulate the direction of the stream of sprayed coating, whereby said device may be adjusted before using any fiber coating spray.

2. In a device for formng a fiber reinforced plastic article comprising a frame, coacting cutter and back-up rolls rotatably mounted in said frame, and means for driving at least one of said rolls in a manner to carry continuous lengths of fiber between said rolls, said cutter adapted to cut the fiber into predetermined shorter lengtns and eject the cut fibers clear of the device in a stream; the combination therewith of two liquid plastic spray guns having spray heads and mounted on a common gun frame which in turn is supported by the frame of the device, adjusting means providing a swivel mounting the guns on the frame member adapted to change the position of the ends of the guns to direct streams of liquid plastic emitting from the guns so that the streams of liquid plastic converge at a common point in the stream of cut fibers,

each of said spray heads being replaceable by a telescoping rod member adapted to extend to an elongated position whereby the ends of both said rod members are positioned by said adjusting means to meet at a common point in the stream of cut fibers thereby providing means of aiming the streams of liquid plastic to hit the cut fiber stream without the necessity of spraying liquid plastic resin.

3. The combination of claim 2 in which sighting means adapted to determine the position of the streams of the plastic is located at the end of at least one of the telescoping rod members, said sighting means comprising a tell-tale rod member which is attached to said one rod in a position generally perpendicular to a plane formed by the longitudinal axes of the telescoping rod members and adapted to easily determine whether the streams of liquid plastic are aimed so as to converge at a common point substantially in the center of the stream of cut fibers.

4. A sighting device for use with a spray gun having a spray nozzle cap provided with a detachable connection with said gun, comprising a second cap having a connection for said gun interchangeable with said detachable connection, and a sighting rod carried by said second cap in position to simulate a stream of spray issuing from said spray nozzle cap.

5. In a device for forming a fiber reinforced plastic article comprising a frame, coacting cutter and back-up rolls rotatably mounted in said frame and means for driving at least one of said rolls in a manner to carry continuous lengths of fiber between said rolls, said cutter adapted to cut the fiber into prodetermined lengths and eject the cut fibers clear of the device in a stream; the combination therewith of at least one spray gun, a ball and socket joint for adjustably mounting said spray gun on said frame for changing the direction of the spray to cause the spray from said gun to meet the cut fiber stream at a predetermined point, and a telescoping sighting rod attachable to said gun to simulate the direction of the stream of sprayed coating whereby said device may be adjusted before using any fiber coating spray.

6. A device for forming a fiber reinforced plastic article comprising means for ejecting a stream of cut fibers, a pair of plastic spray guns adapted to spray streams of liquid plastic convergently into said stream of cut fibers, adjustable mounting means for aiming said guns, said guns having removable spray cap nozzles, connecting members interchangeable with said nozzles, said connecting members having outwardly projecting hollow members extending coaxially in the normal directions of said streams of liquid, longitudinally adjustable, telescoping rods mounted within said hollow members whereby said rods simulate said streams of plastic when said connecting members are mounted in place of said nozzles and are convergently adjusted to meet said stream of fibers at a common point to anticipate the paths of said streams of liquid without the necessity of ejecting said streams of liquid.

7. A device as set forth in claim 6 wherein at least one of said telescoping rods is provided with sighting means adjacent the distal end of said rod, said sighting means comprising a tell-tale rod member attached to said rod in a position generally perpendicular to the axis of said rod and adapted to be positioned in said stream of fibers to determine that both said streams of liquid plastic are aimed to converge in the center of said stream of fibers.

References Cited in the file of this patent

UNITED STATES PATENTS

1,881,345	Beatty et al.	Oct. 4, 1932
2,539,324	Pollock	Jan. 23, 1951
2,588,927	Houseweart	Mar. 11, 1952
2,776,168	Schweda	Jan. 1, 1957
2,787,314	Anderson	Apr. 2, 1957