

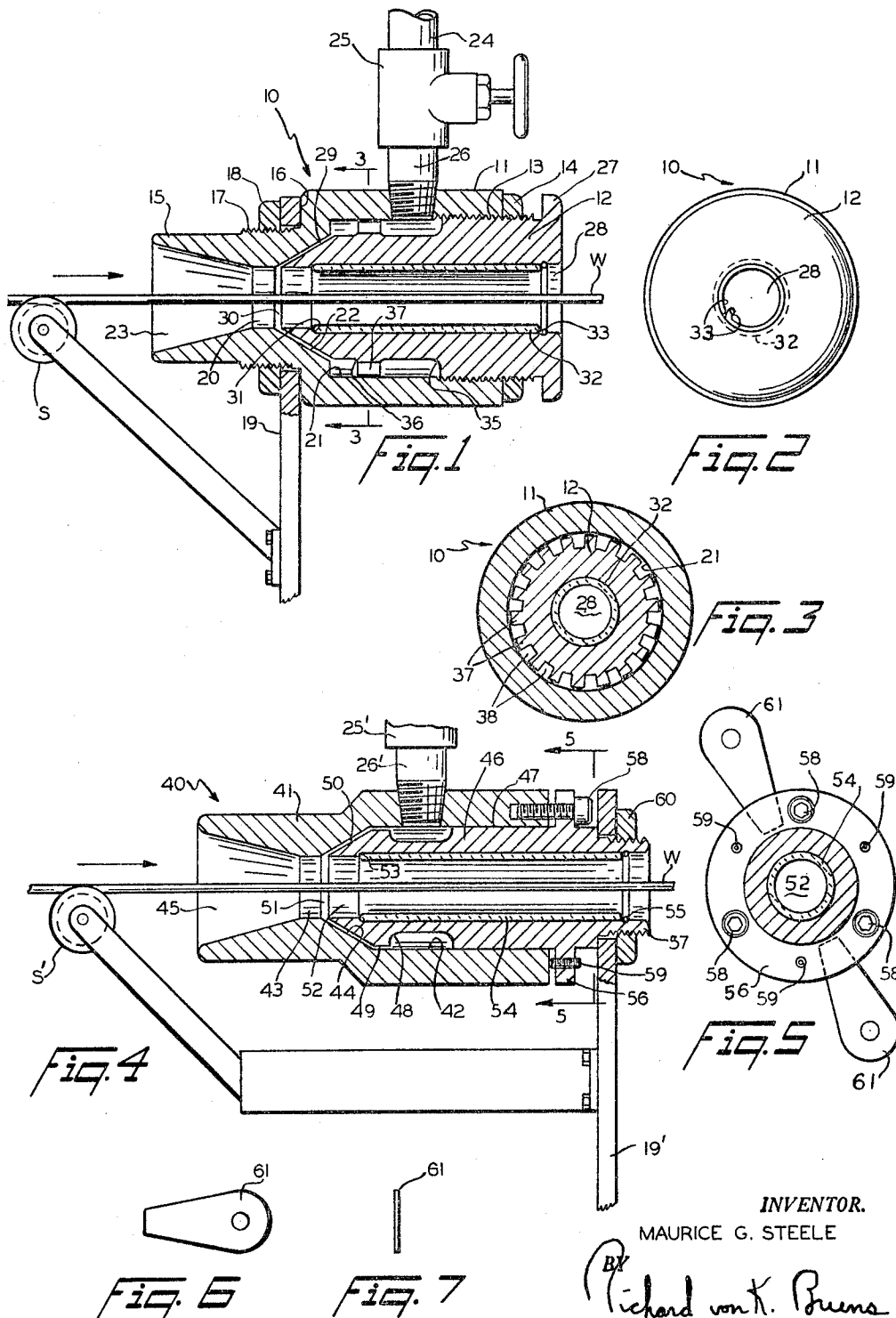
Sept. 6, 1966

M. G. STEELE

3,270,364

AIR WIPE DEVICE FOR WIRE

Filed Aug. 12, 1964



INVENTOR.
MAURICE G. STEELE

BY *Richard von K. Burns*
att.

1

2

3,270,364

AIR WIPE DEVICE FOR WIRE

Maurice G. Steele, 312 N. George St., Rome, N.Y.

Filed Aug. 12, 1964, Ser. No. 389,163

2 Claims. (Cl. 15—306)

This invention relates to an improvement in devices by means of which a wire may have excess or undesired materials blown from its surface by a jet of air.

The principal object of the present invention is to provide means connected to a source of air under pressure and having an axially extending passage through which wire may be drawn while the air is directed through an annular orifice around the wire and expelled under pressure at an acute angle against the wire.

Another important object is to provide an air wipe device of the foregoing character having means for regulating the rate of flow of air at the annular orifice to obtain the most economical use of the air.

A still further object is to provide an air wipe device of the foregoing character in which the air regulating means is protected from unauthorized manipulation.

Other objects and advantages will become apparent from the following description, taken in conjunction with the accompanying drawing, in which:

FIGURE 1 is a longitudinal sectional view of a device according to the invention;

FIGURE 2 is an end view thereof;

FIGURE 3 is sectional view on the line 3—3 of FIGURE 1;

FIGURE 4 is a longitudinal sectional view of a modified form of the device;

FIGURE 5 is a sectional view on the line 5—5 of FIGURE 4 and showing gauge means for determining the air flow adjustment; and

FIGURES 6 and 7 are plan and end views respectively of the gauge means of FIGURE 5.

In FIGURES 1—3 of the drawing the air wipe device 10 is shown together with a wire W being drawn there-through. It will be understood that the wire is being drawn in the direction of the arrow in FIGURE 1 from a coolant bath subsequent to being coated with plastic insulation or from a tinning operation or directly from a drawing operation. In any event, it is led through the device 10 to remove the coolant, excess of hot tin, or coating of copper dust from the drawing process.

A sheave S supports the wire W as it enters the device and a take-up reel, not shown, draws the wire from the other end of the device. It is intended that the wire W be kept taut as it passes through the device 10, but it will be understood that this is not always possible and frequently the wire drags against the air wipe device resulting in rapid wear in wiping devices of conventional construction.

The device 10 of FIGURE 1 comprises an outer body member 11 and an inner body member 12 threadedly and adjustably secured together at 13. A lock nut 14 is provided on the threaded portion of the inner member for locking the latter member in its adjusted position within the outer member.

The outer body member 11 has a reduced anterior (with respect to the travel of the wire) portion 15 providing an annular shoulder at 16. The interior portion is exteriorly threaded at 17 and a clamping nut 18 secures the device on a support bracket or plate 19.

An axially extending passage 20 is reduced in diameter in the anterior portion of the outer member and has an enlarged portion 21 which contains the inner member 12. The enlarged and reduced portions of passage 20 are connected by an annular tapered portion, whose sidewall forms an annular tapered female valve seat 22. The por-

tion of passage 20 anterior to the valve seat 22 is tapered outwardly therefrom to form a venturi portion 23.

An air intake pipe 24 leading from a source of air under pressure is provided with an air shut-off valve 25, and a nipple 26 threadedly engaged in the side wall of the outer member 11 leads to the enlarged portion 21 of the passage 20.

The inner member 12 is provided posteriorly with a flange 27 for turning the inner member with respect to the outer member thereby adjusting the relative axial position of the members.

Member 12 is provided with an axially extending wire-receiving passage 28, and the anterior end of member 12 is provided with a tapered male valve seat 29 around the axial passage forming an annular orifice 30 between valve seats 22 and 29.

Adjacent the orifice 30, passage 28 is provided with a shoulder 31, and a tubular insert 32 of wear-resistant ceramic material is secured in the passage against shoulder 31 by means of a snap ring 33, at the posterior end of passage 28, engaged in a suitable annular groove in the passage wall.

The inner member 12 is provided with a first annular groove 35 therearound in its outer wall anterior to the threaded portion at 13 and a second annular groove or reduced portion 36 posterior to and communicating with the orifice 30. Groove 35 forms an annular air distribution chamber with passage 21 in the outer member 11 communicating with the air inlet nipple 26.

Between grooves 35 and 36 an interrupted annular flange 37, best seen in FIGURE 3, forms a series of spaced teeth-like portions interrupted between each tooth by axially disposed passages 38 connecting grooves 35 and 36. The outer perimeter of flange 37 formed by the extremities of the teeth has a close sliding fit in the passage 21 so that the inner member 12 is accurately centered in the passage, the air passages 38 providing means for the passage of air from nipple 26, air chamber 38 and groove 36 to the tapered orifice 30 which is disposed at an angle of approximately thirty degrees to the line of travel of the wire.

In operation, the wire is first threaded axially through the device. Lock nut 14 is loosened and the inner member 12 turned by means of the flange 27 so as to close the orifice 30. Valve 25 is then fully opened and the wire is started through the device to the winding reel. As the wire passes through the device, the inner member 12 is backed off, on its threads at 13, to open the orifice 30 until the maximum efficiency in cleaning the wire of unwanted coating material is observed. Lock nut 14 is then tightened to fixed the device in its most efficient position.

Air blown under pressure at an acute angle to the wire removes the unwanted material and blows it out the venturi end 23 of passage 20 in the direction toward the approaching portion of the wire. The tapered venturi passage 23 forms a low pressure point at the orifice 30 which draws air in through the hollow insert 32 to assist in the drying or cleaning of the wire in well-known manner.

Intermittent slackening of tension on the wire W, or careless adjustment of the position of the wire-aligning sheave S, may allow the wire to drag on the insert 32 but this member is of wear resistant material and damage to the inner and outer members is prevented. If the insert becomes worn after long use it may be replaced by removing the snap ring 33.

The passage of air, first through the annular distribution chamber formed by groove 35, then through passages 38 to the restricted orifice 30, is found to distribute the air under constant pressure completely and evenly around the wire so as to blow the unwanted coating material on the wire with minimum of splatter and with the minimum

flow of air consistent with the removal of water or other material from the wire.

It will be noted that the passage through the insert member 32, which forms the smallest portion of the continuous passage through the device, is substantially one-half inch in diameter, permitting a great range of wire diameters which may be wiped by the device. The micrometer-like adjustment of the size of orifice 30, provided by the threaded engagement of members 11 and 12, permits very accurate regulation of the air flow for each wire diameter, permitting extreme economy in the use of air. The comparatively long passage between the larger inner end of orifice 30 to the smaller outer end of the orifice between the continuously parallel valve seats 22 and 29, provides an angular direction to the annular jet of wiping air which is accurate for even the smallest diameters of wire.

A modified form of air wipe device 40 is shown in FIGURES 4 and 5. A wire W, supported by sheave S', is shown passing through the device 40 in the direction of the arrow in FIGURE 4.

An outer member 41 is provided with an air shut-off valve 25' and an entrance nipple 26' leading to an enlarged portion 42 of the central axial passage 43 through the outer member. An annular tapered valve seat 44 connects the enlarged portion 42 of the passage with a reduced portion 45 which is tapered outwardly from the valve seat anteriorly of the seat to form a venturi portion.

An inner member 46 has a close sliding fit at 47 within the passage 42, and an annular groove 48 around the outer surface of the inner member provides an air distribution chamber in communication with the inlet nipple 26'. Anterior of groove 48, the outer sidewall has a reduced diameter at 49, and the end of member 46 is provided therebeyond with an annular tapered male valve seat 50 forming an annular tapered orifice 51 with the female seat 44.

Member 46 is provided with an axially extending wire-receiving passage 52 having an annular shoulder 53. A wear-resistant ceramic tubular insert 54 is secured in passage 52 against shoulder 53 by a snap ring 55 engaged in a suitable annular groove in the member 46, as shown.

Posteriorly of the portion 47 which is slidable in the passage 42 of the outer member, the member 46 is provided with an annular flange 56 and a reduced outwardly threaded portion 57. Three equiangularly spaced cap screws 58 pass through the flange 56 and have a threaded connection with the end of the outer member 41 for securing the inner member thereto. Three set screws 59, equiangularly spaced around the flange 56 between the cap screws, are threadedly engaged with flange 56, as best seen in FIGURE 5, and bear against the end of outer member 41 for adjusting the inner member 46 axially with respect to the outer member.

The threaded portion 57 of member 46 passes through an appropriate hole in the support bracket or plate 19' and a clamping nut 60 locks the device in place on the support 19'.

One of a pair of like feeler gauges or spacers 61 are shown in FIGURES 6 and 7 for adjusting the air flow through the device 40 as will appear.

In operation the air under pressure is led in through the shut-off valve 25' and nipple 26' and is distributed around the inner member 46 through the groove 48 therein. The reduced portion 49, at the end of the inner member, provides a constricted annular passage for the air between outer and inner members which connects groove 48 with the annular tapered orifice 51 and an annular jet of air is directed toward the wire W as it is drawn through the device 40 as described hereinabove in connection with the device 10.

Adjustment of the inner member axially with respect to the outer member and the consequent regulation of the rate of flow of the air against the moving wire is accomplished by manipulation of the cap screws 58 and the set screws 59. Both set screws and cap screws are of the

Allen-head type, as shown, and access thereto is only possible after removing the clamping nut 60 and withdrawing the device 40 from its support 19'.

This arrangement is devised to prevent unauthorized tampering with the regulated flow of air by operating personnel after the flow has initially been regulated according to specifications laid down by the engineering staff for each diameter of wire to be wiped by the device 40.

For any wire to be wiped, having a given outside diameter, the operating personnel are furnished a pair of gauges 61—61 and, after cap screws 58 have been loosened, the gauges 61 are inserted between flange 56 and the end of the outer member 41, as shown in FIGURE 5. Cap screws 58 are then drawn up to clamp the flange 56 firmly against the gauges, which have a thickness exactly that of the desired clearance for regulating orifice 51. Set screws 59 are then screwed down tightly against the end of member 41 and the gauges 61—61 then withdrawn. The device 40 is then secured to the support 19' by nut 60 and the wire W led through the device 40 and the air turned on at the valve 25'. In this manner the optimum rate of flow of air may be determined in advance for each wire diameter at a predetermined speed of passage of the wire through the device.

An even distribution of air completely around the wire is obtained by the groove 48 and the constricted annular passage at 49. The annular jet of air is directed at the wire W at precisely the desired angle by the tapered orifice 51, the valve seats 44 and 50 being precisely aligned and properly centered by the close fit between inner and outer members at 47. While the angle at which the air jet is directed at the wire is shown as approximately thirty degrees, any angle from ten to forty-five degrees may be appropriate according to the nature of the material which is to be blown from the wire.

The ceramic insert 54 prevents accidental wear as described in connection with the insert 32 of the device 10. Wear-resistant ceramic materials usually contain a substantial proportion of hard materials such as aluminum oxide or tungsten carbide.

It will be noted that in both device 10 and device 40 the diameter of the tapered annular orifice at its larger end is substantially twice the diameter at its smaller end. The jet of air emerging from the smaller end of the orifice has therefore reached its peak velocity as it passes through this most constricted portion of the orifice and its direction of flow has been determined by its comparatively long path between the opposed tapered valve seats.

It will be understood that the air wipe devices 10 and 40 may be provided in a variety of sizes depending on the diameter of the wire which is to be cleaned of undesired material. However, each device may be used with a number of wire sizes. Each device having an axially extending central passage through the ceramic insert of a given diameter, and a tapered annular orifice whose smallest diameter is no less than the given diameter, may be used for air wiping wires having diameters ranging from one-tenth to one-third of the given diameter.

As will be apparent to those familiar with the art, the invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The embodiments disclosed are therefore to be considered in all respects as illustrative rather than restrictive, the scope of the invention being indicated by the appended claims.

What is claimed is:

1. An air wipe device for wire, comprising: An outer body member having an axially extending passage therethrough, said passage having an enlarged cylindrical portion at one end and a restricted portion at the other end, an annular tapered female valve seat forming the wall of a portion of said passage connecting said enlarged and restricted portions, said passage at its restricted end tapering outward from said valve seat, an air inlet passage through the sidewall of said member communicating with

5

the enlarged portion of the passage for receiving air under pressure; a tubular inner body member having a wire receiving axial passage therethrough and having an annular tapered male valve seat at one end aligned with the female seat and forming with said female seat a tapered annular orifice, the exterior of said inner body having a perimetrical portion closely fitting within the enlarged portion of the outer member passage and having on one side of said perimetrical portion an annular groove therearound in communication with said air inlet passage, said perimetrical portion having axially disposed grooves therein communicating with said annular groove; an annular space between said outer and inner members communicating with said axially disposed grooves and said annular orifice; said outer and inner members being threadedly connected for securing the inner member within the outer member and for axially positioning the inner with respect to the outer member; and means for supporting the device for the wire to pass therethrough.

2. An air wipe device for wire, comprising: An outer body member having an axially extending passage therethrough, said passage having an enlarged cylindrical portion at one end and a restricted portion at the other end, an annular tapered female valve seat forming the wall of a portion of said passage connecting said enlarged and restricted portions, said passage at its restricted end tapering outward from said valve seat, an air inlet passage through the sidewall of said member communicating with the enlarged portion of the passage for receiving air under pressure; a tubular inner body member having a wire receiving axial passage therethrough and having an annular tapered male valve seat at one end aligned with the fe-

6

male seat and forming with said female seat a tapered annular orifice, the exterior of said inner body having a perimetrical portion closely fitting within the enlarged portion of the outer member passage and having an annular groove therearound in communication with said air inlet passage; a restricted annular space between said outer and inner members communicating with said annular groove and said annular orifice; a radially outward extending flange on the other end of said inner body; cap screw means disposed axially of the device securing said flange to said outer member, axially disposed set screw means carried by said flange and forming means with said cap screw means for axially positioning the inner with respect to the outer member; and means for supporting the device for the wire to pass therethrough, said members being separably secured to said supporting means, said supporting means normally preventing access to said cap screw means and set screw means to prevent unauthorized adjustment of said members.

References Cited by the Examiner

UNITED STATES PATENTS

1,393,562	10/1921	Matthews.	
1,837,339	12/1931	Schlick.	
2,194,565	3/1940	Moss	134—15
2,624,178	1/1953	Bedson	134—64 X
3,044,098	7/1962	Stalson	115—302

FOREIGN PATENTS

889,905	2/1962	Great Britain.
---------	--------	----------------

ROBERT W. MICHELL, *Primary Examiner.*