Oct. 18, 1966 E. S. HANNIS 3,278,988

MONITORING ATTACHMENT FOR AN EXTRUSION APPARATUS

Filed July 8, 1965 3 Sheets-Sheet 1

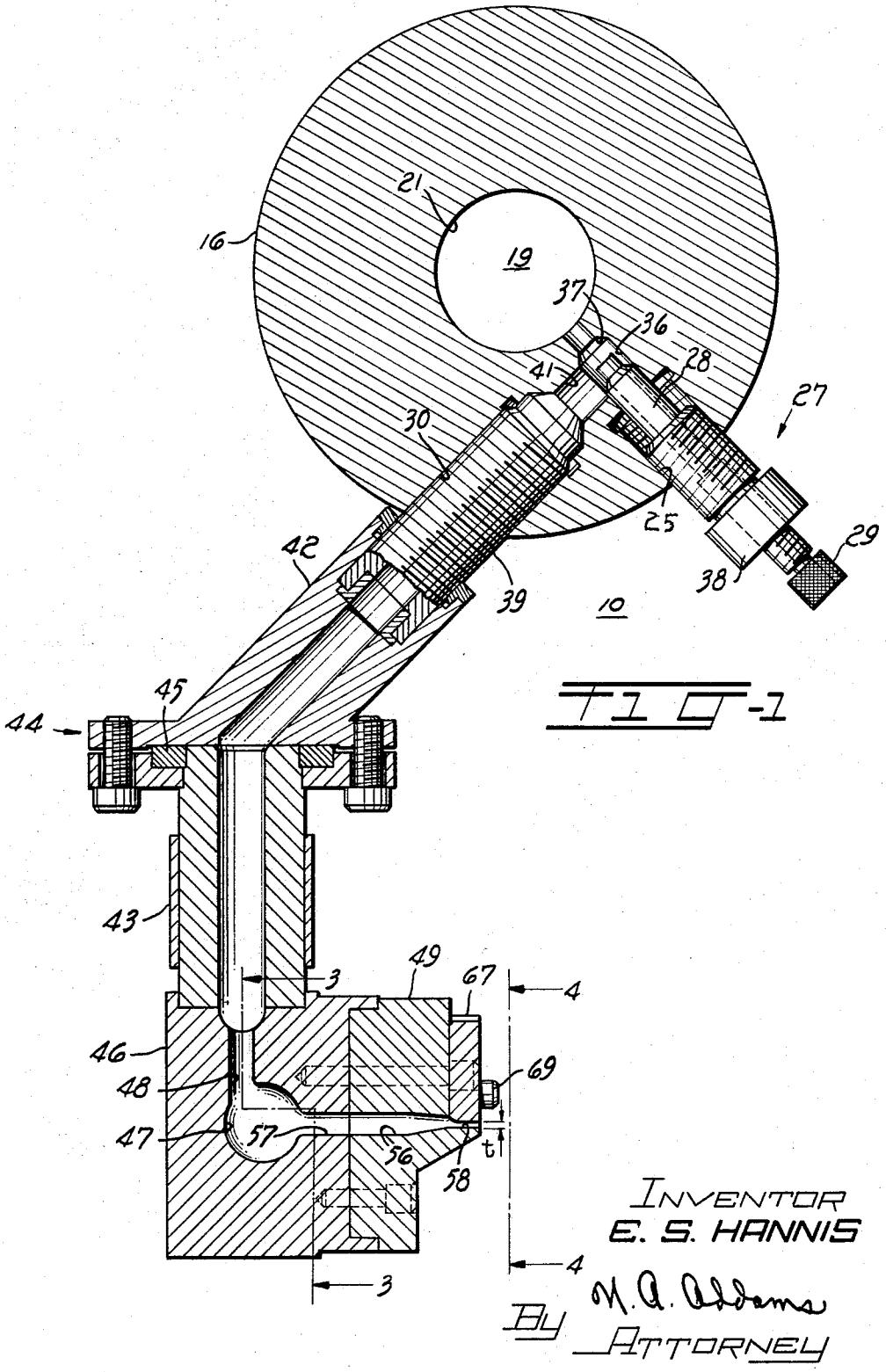


FIG-1

INVENTOR
E. S. HANNIS

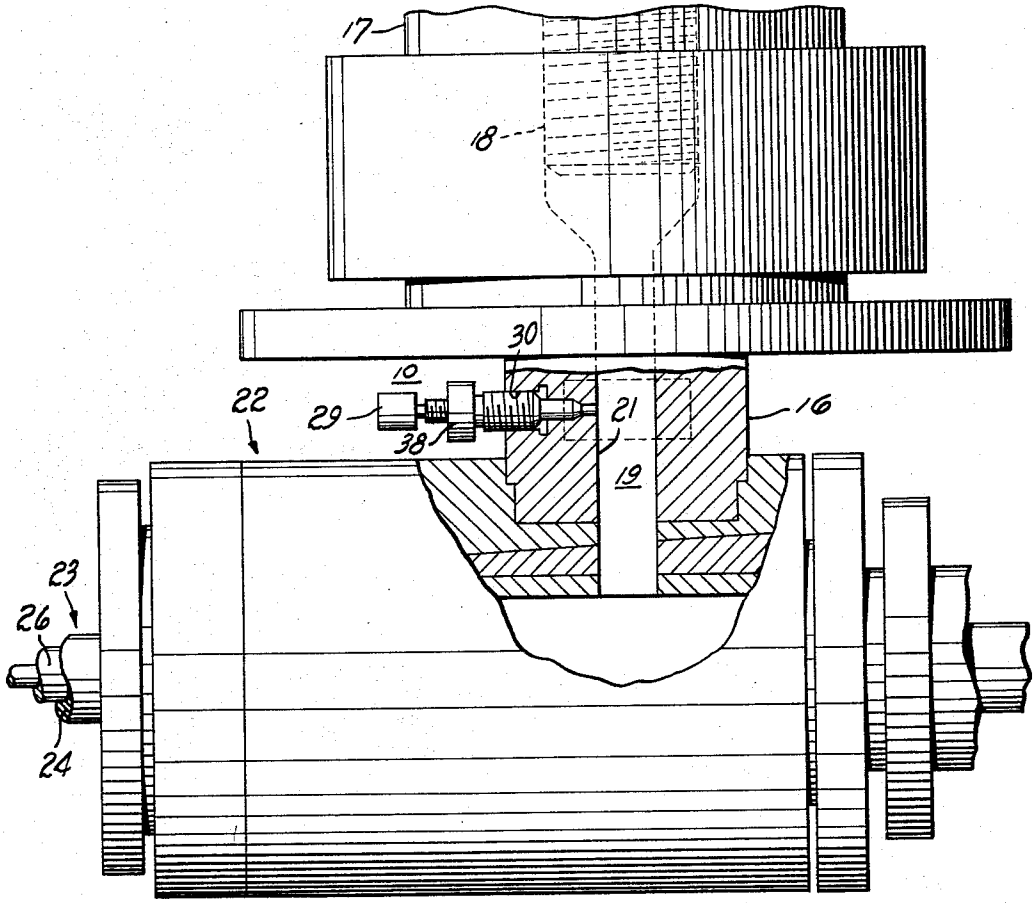
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MONITORING ATTACHMENT FOR AN EXTRUSION APPARATUS

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FIG. 2



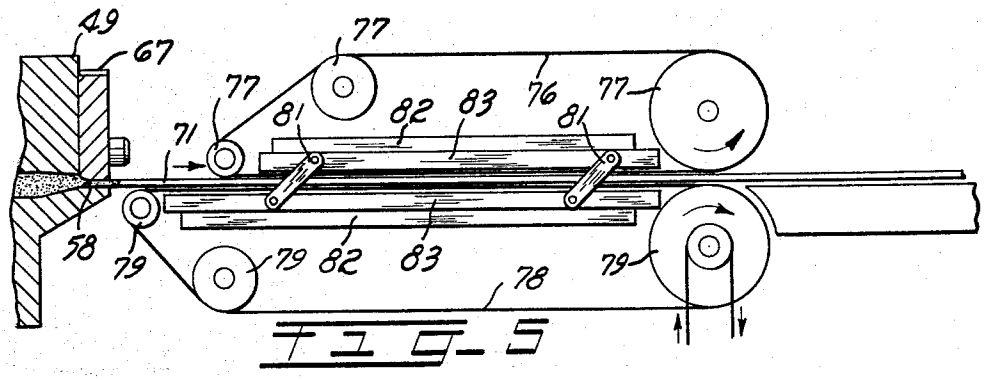


FIG. 5

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FIG-3

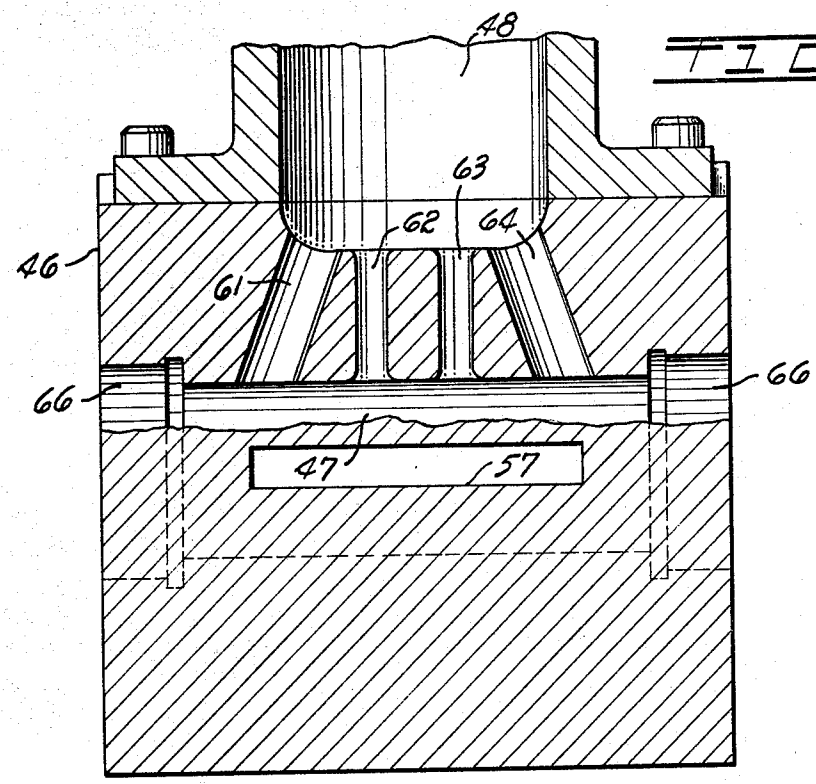
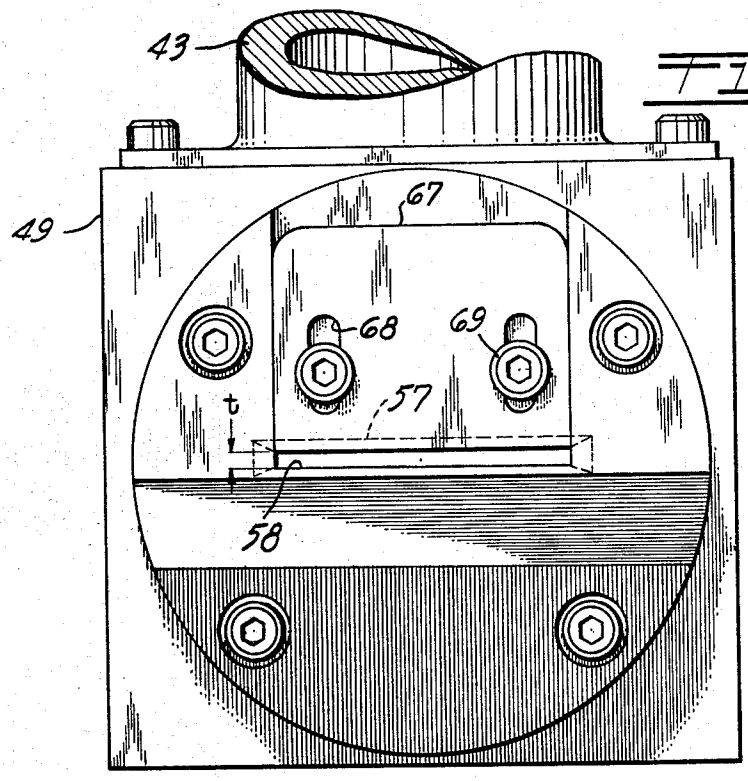


FIG-4



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3,278,988
MONITORING ATTACHMENT FOR AN EXTRUSION APPARATUS

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14 Claims. (Cl. 18—12)

This invention relates to a monitoring attachment for an extrusion apparatus, and more particularly, to a monitoring attachment which simultaneously extrudes a reference tape as an insulating jacket is extruded on an elongated article, such as a cable.

In the manufacture of certain types of telephone cables, a core comprising a plurality of individually insulated conductors is covered by a conductive metal sheath. A non-conductive material is extruded onto the sheath to provide a jacket for the protection of the cable.

Occasionally, portions of the jacket "stress-crack," that is, minute cracks appear in the jacket which permit moisture to enter the cable, thereby rendering the cable unacceptable for service. If the cracks are detected prior to the installation of the cable in the field, it is relatively easy to repair the jacket; however, this is not the usual case. Sometimes, the cracks are not detected until after the cable has been installed and in these instances the cable must be replaced. Thus, it is desirable to ascertain the reasons for the stress-cracking of cable jackets.

In one method used to ascertain these reasons, the jacket material is molded into strips and chemical tests are performed on the strips. The results of these tests are inconclusive because (1) the strips are not produced under equivalent conditions as the cable jacket, (2) there is no correlation between the batch of material used for making the strip and the jacket which has stress-cracked, and (3) the molding of the jacket material is not an equivalent process to the extrusion thereof.

The monitoring attachment of this invention produces a reference tape or strip of substantially the same thickness, and under substantially equivalent manufacturing conditions, as the jacket being extruded onto the sheath of a cable. The tape is numerically or otherwise correlated to the particular cable being produced. If a particular cable stress-cracks, the appropriate tape is analyzed to ascertain the reasons for such stress-cracking; i.e., whether the stress-cracking was due to the extrusion process, the jacket material, the field environment of the cable, or the like.

Accordingly, an object of this invention is to provide a new and improved monitoring attachment for an extrusion apparatus.

Another object is to provide a new and improved monitoring attachment for an extrusion apparatus wherein a reference tape is extruded simultaneously with, and under substantially equivalent manufacturing conditions, as the extrusion of an extrudable material onto an article.

Another object is to provide a new and improved monitoring attachment for an extrusion apparatus which simultaneously extrudes a reference tape as the insulating jacket on a cable is extruded. A corollary object is to provide such a monitoring attachment wherein the reference tape is substantially the same thickness as the jacket.

With these and other objects in view, a monitoring attachment for an extrusion apparatus, illustarting certain features of the invention, includes a device which bypasses a portion of an extrudable material at a predetermined rate from the extrusion apparatus. The bypassed material is fed to a facility which produces a reference tape simultaneously with the extrusion of the material onto an article.

In a specific embodiment of the monitoring attachment, a valve is connected to the throat of an extrusion apparatus for bypassing therefrom a portion of the extrudable material at a predetermined rate to a series of ducts which terminate in a reservoir. The bypassed mateiral is fed from the reservoir through a guideway which terminates in an outlet to produce a reference tape. One of the dimensions of the outlet is adjustable such that the reference tape has a thickness substantially equal to that of a jacket being extruded onto the sheath of a cable.

In order to prevent the edges of the reference tape from curling due to the tape being air cooled on one side when fed to a takeup conveyor, a new takeup device has been provided. The new takeup device cooperates with the monitoring attachment of this invention, to subject both sides of the tape to substantially identical thermal conditions to prevent curling of its edges.

Other objects and advantages of the invention will become apparent by reference to the following detailed specification and drawings, wherein:

FIG. 1 is a cross-sectional view, incorporating certain features of the invention, of a monitoring attachment for an extrusion apparatus;

FIG. 2 is a partial schematic view of a conventional extrusion apparatus showing the monitoring attachment of the invention connected to the throat of the apparatus;

FIG. 3 is a vertical section view taken along line 3—3 of FIG. 1;

FIG. 4 is a vertical section view taken along line 4—4 of FIG. 1; and

FIG. 5 is a schematic view of an apparatus for maintaining a reference tape, produced by the monitoring attachment, in a flat condition.

Referring to FIG. 2, there is schematically shown the monitoring attachment of the invention, generally indicated by reference numeral **10**, connected to the neck **16** of a conventional extrusion apparatus. The extrusion apparatus includes a barrel **17**, containing a screw **18** for advancing extrudable material **19** to a throat **21** of the apparatus. Material **19** is then advanced to a crosshead **22**, through which a cable **23** passes, and in which material **19** is extruded to provide a protective jacket **24** on a metal sheath **26** of a cable **23**. Material **19** may be any of a number of suitable materials, for example, rubber, a plastic such as polyethylene or polyvinylchloride, or the like.

In FIG. 1, neck **16** of the extrusion apparatus includes an opening **25** which receives a throttle valve **27**. Throttle valve **27** includes a plug **28** whose end surface is machined to the same arcuate radius as the inner periphery of throat **21**. Plug **28** is movable toward or away from the inner periphery of throat **21** by a screw-type plug control **29**. Valve **27** also includes a valve face **36** which is movable towards or away from a valve seat **37**, formed in opening **25**, by a screw-type valve control **38**.

Neck **16** of the extrusion apparatus also includes an opening **30** which receives a hollow conduit **39**. One end of the conduit communicates with a channel **41** of opening **30** which is adjacent to valve seat **37**.

One end of upper hollow duct **42** is connected to conduit **39**, and its other end is connected to a lower hollow duct **43**. Ducts **42** and **43** are joined together by a coupling **44** which includes a bearing **45**, such that lower duct **43** is rotatable about upper duct **42**.

A housing **46** is connected to lower duct **43**, and contains a cylindrical reservoir **47** having an upper passageway **48** extending from the top thereof which communicates with the opening in lower duct **43**.

Thus, when plug **28** is withdrawn such that its end surface is flush with valve face **36**, and valve face **36** is withdrawn from its valve seat **37**, as shown in FIG. 1,

there is a continuous passageway from throat **21** to reservoir **47**.

A die **49** is secured to housing **46** and contains a tapered guideway **56** which communicates with a lateral passageway **57** extending from reservoir **47**, the guideway terminating in a flattened outlet **58**.

With reference to FIG. 3, upper passageway **48** of reservoir **47** comprises four bores **61–64** which feed reservoir **47**. The two outer bores, **61** and **64**, are of a greater diameter than the two inner bores, **62** and **63**, to provide a proportionally greater flow of material **19** towards the ends of reservoir **47**, thus insuring substantially equal pressure throughout the reservoir. A removable plug **66** is mounted in each side of housing **46** to define the edges, and hence the capacity, of reservoir **47**. Since plugs **66** are removable, cleaning of reservoir **47** is facilitated.

In FIGS. 1 and 4, a plate **67** is slideably mounted on the face of die **49** and has elongated slots **68** formed therein. Slots **68** are slideable under headed bolts **69** such that plate **67** is slideable up and down to adjust the dimension (*t*) of outlet **58**.

Operation

With reference to FIG. 1, dimension (*t*) of outlet **58** is adjusted by positioning plate **67**, such that a reference tape **71** extruded from outlet **58** draws down to a thickness substantially equal to the thickness of jacket **24** which is being extruded onto sheath **26** of cable **23** (FIG. 2). Plug control **29** is rotated to move plug **28** until its end surface is flush with valve face **36**. Valve control **38** is then rotated to move valve face **36** until it is at a selected position across the opening of channel **41**, thereby permitting a predetermined amount of plastic material **19** to be bypassed from throat **21** at a predetermined rate.

Plastic material **19** flows into channel **41** and through the passageways in conduit **39** and ducts **42** and **43** to fill reservoir **47**; whereupon, plastic material **19** flows in guideway **56** and is extruded as a flat tape **71** (FIG. 5) from outlet **58**, tape **71** being substantially the same thickness as jacket **24**. Since ducts **42** and **43** are connected through bearing **45**, lower duct **43**, housing **46**, and die **49** are rotatable to a desired position to facilitate takeup of tape **71**.

In an illustrative use of the monitoring attachment, it is connected to the throat of a conventional extrusion apparatus in which plastic material **19** is under 10,000 p.s.i. Throttle valve **27** is selectively operated to position valve face **36** and plug **28**, such that plastic material **19** flows from throat **21** to outlet **58**. Under these conditions, approximately one inch of reference tape **71** (FIG. 5) is extruded from outlet **58** for every 25 feet of cable **23** produced.

It is to be understood that the pressures, dimensions, and rate of production, set forth above with respect to the operation of the monitoring attachment, are only illustrative, and may be varied depending upon actual manufacturing requirements.

Take-up apparatus for reference tape

With reference to FIG. 5, an apparatus for maintaining reference tape **71** in a flat condition is only shown schematically, since it does not form a part of the invention. An upper continuous belt **76** is rotated about a plurality of rollers **77**, opposite a lower continuous belt **78** which is rotated about a plurality of rollers **79**. The belts and rollers are mounted in frames (not shown) connected together by a hinge assembly **81**, which permits the adjustment of the space between belts **76** and **78** to accommodate reference tapes **71** of different thicknesses. Belts **76** and **78** may be made of any of a number of temperature stable material, for example "Teflon."

A temperature control device **82**, comprising a plurality of conventional heating elements and cooling elements (not shown), is mounted on supports **83** opposite one another to impose identical temperature conditions on the portions of belts **76** and **78** between which tape **71** passes. By imposing identical temperature conditions on both belts **76** and **78**, tape **71** emerging from outlet **58** has identical temperature conditions imposed on both sides thereof. Since identical conditions are imposed on both sides of tape **71**, the edges of the tape will not curl and it will be maintained in a flat condition.

It is to be understood that the monitoring attachment of the invention has generally utility for monitoring a wide variety of conventional apparatus for extruding material onto articles, and is not to be construed as being limited to use with an apparatus for extruding a plastic jacket on a telephone or other type cable. Further, the monitoring attachment need not necessarily be connected to the throat of an extrusion apparatus, but may be connected to other suitable portions of such apparatus.

It is to be understood that the above-described embodiment is only illustrative of the principles of the invention, and other embodiments may be devised without departing from the scope of the invention.

What is claimed is:

1. In an apparatus for extruding an extrudable material onto a moving elongated article, a monitoring attachment comprising:

means connectable to an extruding apparatus for bypassing a portion of teh material from the apparatus at a predetermined rate, and

means for receiving the bypassed material and for producing a reference tape therefrom simultaneously with the extrusion of the material onto the article.

2. The monitoring attachment according to claim **1**, wherein the bypassing means includes means for selectively controlling the predetermined rate of flow of bypassed material.

3. The monitoring attachment according to claim **1**, wherein the receiving and producing means includes means for controlling the thickness of the reference tape.

4. The monitoring attachment according to claim **2**, wherein the receiving and producing means includes means for controlling the thickness of the reference tape.

5. In an apparatus for extruding an extrudable material onto an article, a monitoring attachment, comprising:

a housing having a reservoir contained therein, the reservoir having an inlet and an outlet, and

means, connectable to an extruding apparatus, for bypassing a portion of the material from the extruding apparatus at a predetermined rate into the reservoir to extrude a reference tape from the outlet.

6. In the extruding of an extrudable material onto an article,

means for extruding an extrudable material,

means connected to the extruding means for bypassing from the extruding means an amount of material which is proportional to the amount of material being extruded onto the article, and

means for receiving the bypassed material and for producing a reference tape therefrom simultaneously with the extrusion of the material onto an article.

7. In an extrusion apparatus having facilities for advancing extrudable material to the throat of the apparatus and then to a crosshead, a continuously-running elongated article, such as a cable core, passing through the crosshead whereat the material is extruded onto the cable, the combination with the extrusion apparatus of:

a valve connected to the throat of the apparatus for continuously bypassing a predetermined amount of the material away from the throat,

a housing having a reservoir contained therein, the reservoir having an inlet and an outlet through which

the bypassed material is extruded to produce a reference tape, and

means connecting the valve with the inlet of the reservoir.

8. In the extrusion apparatus according to claim **7**, wherein the valve includes means for selectively adjusting the amount of material which is continuously bypassed from the throat to the reservoir, thereby controlling the rate at which the reference tape is extruded from the outlet.

9. In the extrusion apparatus according to claim **7**, further in combination, means for selectively adjusting the perimeter dimensions of the outlet, thereby controlling the thickness of the reference tape being extruded from the outlet.

10. In the extrusion apparatus according to claim **7**, further in combination:

means for controlling the valve to selectively adjust the amount of material which is continuously bypassed from the throat to the reservoir, thereby controlling the rate at which the reference tape is extruded from the outlet, and

means for selectively adjusting the perimeter dimensions of the outlet, thereby controlling the thickness of the reference tape being extruded from the outlet.

11. In an extrusion apparatus having facilities for advancing extrudable material to the throat of the apparatus and then to a crosshead, a continuously-running cable passing through the crosshead whereat the material is extruded onto the cable, the combination with the extrusion apparatus of:

a housing having a reservoir contained therein, the reservoir having an inlet passage and outlet passage,

a valve connected to the throat of the extrusion apparatus for continuously bypassing a portion of the material from the throat to the reservoir at a predetermined rate,

control means for the valve for selectively varying the rate of bypassing the material from the throat,

ducts for interconnecting the valve and the inlet of the reservoir,

a die, connected to the housing, having a guideway contained therein which communicates with the outlet passage of the reservoir, the guideway terminating in a die opening, the bypassed material being extruded from the die opening to produce a reference tape, and

a plate movably mounted on the die for selectively adjusting at least one dimension of the die opening, thereby selectively controlling the thickness of the reference tape, the rate of extruding the reference tape being selectively controlled by the valve control means.

12. In the extrusion apparatus according to claim **11**, wherein the valve has a plug whose end surface has the same contour as the inner periphery of the throat.

13. In the extrusion apparatus according to claim **11**, wherein the ducts are movable relative to each other to permit a selective orientation of the die opening.

14. In the extrusion apparatus according to claim **11**, wherein the die opening has a rectangular configuration.

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