

May 18, 1965

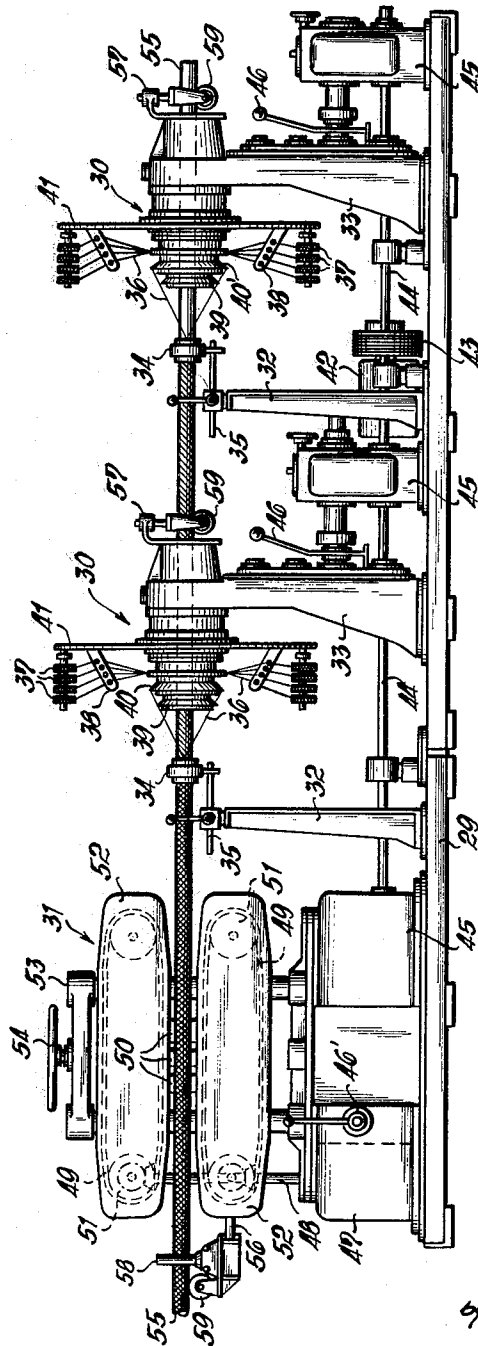
M. OSTERMANN
MACHINE FOR PRODUCING ARMoured HOSES, PARTICULARLY
HIGH-PRESSURE HOSES

3,183,583

Filed March 12, 1962

4 Sheets-Sheet 1

FIG. 1



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FIG. 2

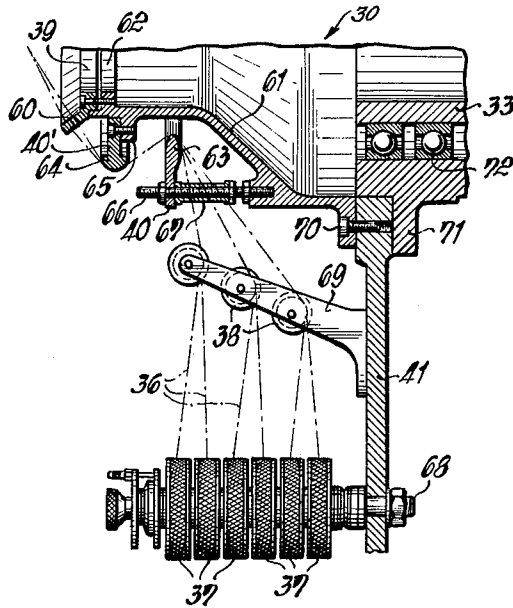
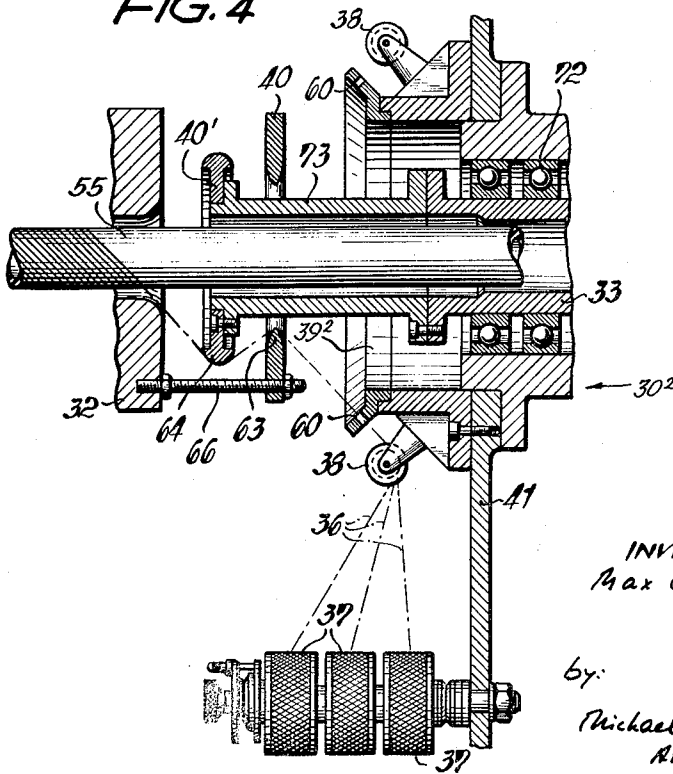


FIG. 4



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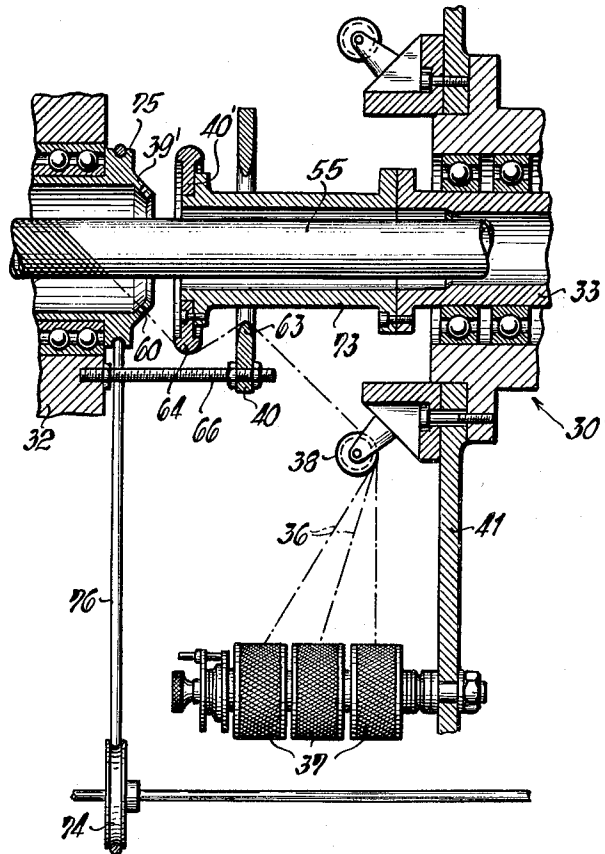
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FIG. 3



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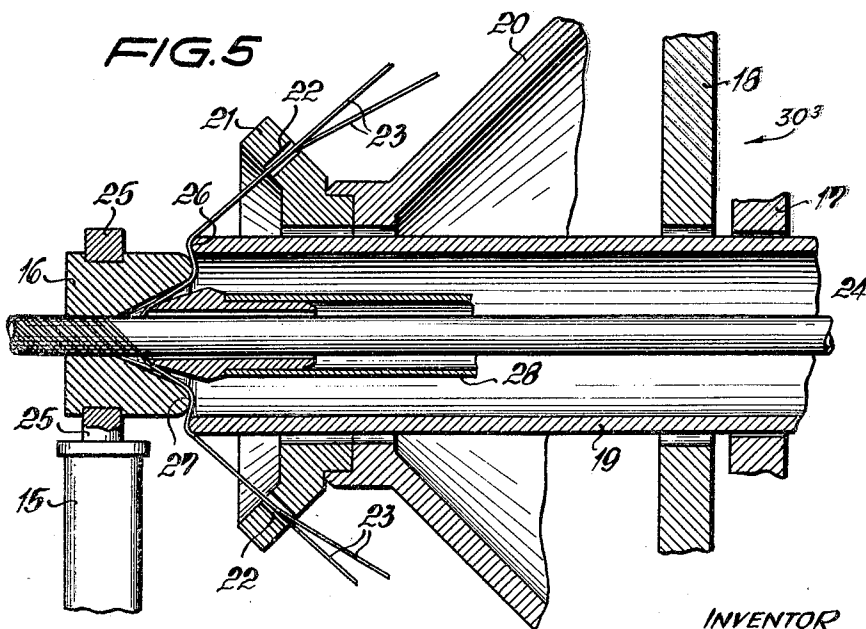
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MACHINE FOR PRODUCING ARMoured HOSES, PARTICULARLY HIGH-PRESSURE HOSES

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20 Claims. (Cl. 29—202.5)

This invention relates to machines for producing armoured hoses, particularly high-pressure hoses, the armoring of which consists of continuous windings of permanently deformable strands, such as wires and tapes.

Winding machines have become known in which rubber hoses are reinforced by several layers of piano wires which are passed through a forming device and wound on to the hose by means of a rotatable mandrel.

It is the object of the present invention to improve the known winding machines and to provide a machine for producing armoured hoses, particularly high-pressure hoses, which is reliable in operation and can be manufactured at relatively low cost and permits a stationary mandrel or tube to be wound with strands of wires or the like.

The machine according to the invention comprises an extractor for non-rotatingly guiding and extracting a hose to be armoured, at least one rotatable member for winding the strands around said hose, and a deforming device for each armoured layer, associated with said rotatable member and having at least one ring-shaped deforming member, said deforming device being adapted to permanently deform the strands just before having been wound on to the hose while passing over said ring-shaped deforming member.

The deforming members may be provided with beads having different degrees of curvature. Expediently, at least one of the deforming members is stationary and provided with a conveniently shaped surface permitting the strands to roll off thereon.

Several preferred embodiments of the invention will now be described by way of example and with reference to the accompanying drawings, in which:

FIG. 1 is an elevational view of the general construction of a machine for producing armoured hoses according to the invention;

FIG. 2 is a similar view, partly in section and on a larger scale, of the winding head of the machine shown in FIG. 1;

FIG. 3 is a similar view of a modification of the winding head;

FIG. 4 is a similar view of another embodiment of the winding head; and

FIG. 5 is a sectional view of a further embodiment of the winding head.

FIG. 1 shows a winding machine in horizontal arrangement. Two rotatable members serving as winding heads 30 and a caterpillar extractor 31 are arranged symmetrically to the main and winding axis on a split base plate 29. Supports 32 and 33 are associated with each winding head 30. Each support 33 serves as a carrier for one winding head 30 and each support 32 serves to carry collecting rings 34 which are axially movable and lockable in various positions on respective arms 35. The collecting rings 34 serve in a known manner for collecting wires or strands 36 which are supplied from bobbins 37 and pass over rollers 38 and a deforming device comprising at least one ring-shaped deforming member such as rings 40 and 40¹ and discs 39. The bobbins 37 and the rollers 38 are rotatably supported on a winding plate 41 concentrically secured to each winding head 30 so as to be rotatable therewith. The discs 39 and the rings 40 and 40¹

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are exchangeably mounted on the winding heads 30 and serve for guiding and permanently deforming the wires 36 just before being applied on to a hose. The deformation is brought about when the wires 36 are pulled over the rings 40.

A motor 42 is provided for driving the winding heads 30 and the caterpillar extractor 31 by means of a V-belt 43 and a shaft 44 which is connected through the intermediary of variable gears 45 to the winding heads 30 and the caterpillar extractor 31. Connected to the driven side of each variable gear 45 is a clutch 46 capable of being engaged and disengaged and a further clutch 46¹ is associated with the caterpillar extractor 31. The clutches 46 and 46¹ are preferably multiple-disc clutches and serve for throwing in and out of gear the winding heads 30 and the caterpillar extractor 31. The variable gears 45 serve to infinitely vary the speed of the winding heads 30 and of the caterpillar extractor 31.

Connected to the outlet side of the clutch 46¹ for the caterpillar extractor 31 is a bevel gearing 47 with a vertical shaft 48 for driving the caterpillar extractor 31. The caterpillar extractor 31 comprises two endless caterpillars 49 having presser elements 50 and arranged to circulate about rollers 51. Each caterpillar 49 is mounted in a housing 52 and guided in a common frame 53. A hand wheel 54 serves for the relative adjustment of the caterpillars 49 and for pressing the presser elements 50 against a mandrel 55 which latter is introduced into the winding heads 30 and adapted to be coupled to a second mandrel (not shown) to which the inner rubber layer for the hose is to be applied. Brackets 56 and 57 with rollers 58 and 59 are provided for guiding the mandrel 55 and the hose. The bracket 56 is secured to the stationary lower housing 52 and one of the brackets 57 is secured to each of the supports 33.

As can be seen from FIG. 2, each disc 39 for guiding the wires 36 is arranged on the winding head 30 in the immediate vicinity of the point of application of the wires 36 on the hose and provided with passages 60 in relative radially staggered arrangement in two concentric circles. This arrangement is intended to urge the wires 36 apart and to pass them within a very narrow space to the point of application on the hose. The discs 39 are exchangeably bolted to the end face of a connecting member 62 of an intermediate member 61. Exchangeably bolted to the intermediate member 61 are further the rings 40 and 40¹ serving for deforming the wires 36. The rings 40 and 40¹ are provided with beads 63 and 64. The bead 63 is formed within the circumferential portion of the ring 40 and the bead 64 by the circumferential portion of the ring 40¹ itself. The bead 63 is closer to the winding axis than the bead 64 and has a smaller curvature than the latter one. The ring 40¹ is mounted on an annular flange 65 and the ring 40 is axially slidable on bolts 66 and can be locked thereon by means of screws, a sleeve 67 being interposed to serve as spacer means.

A number of sets of bobbins 37 are distributed over the periphery of each winding plate 41. Each set is composed of six bobbins mounted on a bobbin carrier 68 and has an associated set of rollers 38 arranged on a cantilever arm 69 so that the wires 36, after being reeled off, are guided closely adjacent one another on the beads 63 and 64. Thus, any forming of grooves in the armoured hose is eliminated. The bobbins 37 are interconnected so as to rotate in opposite directions and to retard one another when the tension of a wire 36 slackens until it has become taut again. The wire 36 passes from each bobbin 37 over the associated roller 38.

The discs 39 and the rings 40 and 40¹ for distributing and deforming the wires 36 are together with the intermediate member 61 detachably secured by means of screws 70 to the winding plate 41 so as to be exchangeable as

a unit. By this arrangement the time for setting the machine in relation to the working time is considerably reduced and expenses are saved. The winding plate 41 is detachably connected to a flange 71 rotatably mounted on the supports 33 through the intermediary of a ball bearing 72.

FIG. 3 shows a winding head 30¹ in which like parts are designated by like reference numerals as in FIGS. 1 and 2. A disc 39¹ is rotatably mounted on the support 32 in the immediate vicinity of the winding point and the ring 40 is secured to the support 32 by means of bolts 66. The ring 40¹ is mounted on a tube member 73 on the adjacent support 33. The wires 36 are carried by three bobbins 37 and can be pulled off over the stationary rings 40 and 40¹ and their respective beads 63 and 64 and through the passages 60 in the disc 39¹ through the intermediary of the mandrel 55 which is non-rotatably guided by the endless caterpillars 49 shown in FIG. 1. The disc 39¹ may be carried along by the wires 36 as a dragged disc. The wires 36 will then slide on the beads 63 and 64 in axial as well as radial direction. By the sliding movement of the wires 36 the beads 63 and 64 are polished and the hardness of their material is increased so that an ideal surface is provided. By pulling the wires 36 over the beads 63 and 64 the wires 36 are permanently deformed before being wound on to the hose as in the embodiment according to FIG. 2. The deformed wires 36 will be uniformly distributed and wound adjacent one another on to the circumference of the hose by the rotation of the winding head 30¹ and the disc 39¹, the hose being pulled off together with the mandrel 55 and guided through the rollers 58 and 59. For the purpose of permanently deforming the wires 36 irrespective of the different diameters of the hoses actually to be armoured, the disc 39¹ and the rings 40 and 40¹ can be exchanged and axially adjusted, accurately maintaining the critical neutral winding angle.

A pulley 74 is provided for synchronously driving the disc 39¹ and the associated winding head 30¹. The pulley 74 is connected to the gear for the winding head 30¹, which gear is located in the support 33. On the disc 39¹ there is provided a pulley rim 75 for a belt 76 which passes between the bolts 66 distributed over the circumference of the disc 39¹.

FIG. 4 shows another embodiment of the machine according to the invention, in which the rings 40 and 40¹ are mounted in the same manner as shown in FIG. 3, and are adjustable relative to each other. A disc 39² is centrally attached to a winding head 30² so as to be rotatable together with the winding plate 41, the rollers 38 and the bobbins 37. When the hose is pulled off by the caterpillar extractor, the wires 36 will pass in the same manner as shown in FIG. 3 over the beads 63 and 64 and are permanently deformed before having been applied on to the hose and wound about the latter by the rotating winding head 30². The hose is pulled off together with the mandrel 55 by the caterpillar extractor without being rotated.

FIGS. 2 to 4 show radially arranged deforming surfaces of the rings 40 and 40¹, whereas FIGS. 5 and 6 show axially arranged deforming surfaces.

FIG. 5 shows a winding head 30³ without bobbins and arranged between two supports 15 and 17. The bobbins may be arranged on a winding plate 18 and wires 23 reeling off from the bobbins may be guided over rollers in the same manner as shown in FIG. 4. On the support 15 an exchangeable single-piece shaped member 16 is mounted in a split holding member 25 and movable in the axial direction of a hose 24. Concentrically with the shaped member 16 and the hose 24 an exchangeable tube 19 is axially movably mounted in the support 17. The shaped member 16 fits with its outer diameter into the tube 19. The tube 19 and the shaped member 16 are provided on their adjacent ends with ring beads 26 and 27, respectively. The ring bead 27 of the shaped member 16 has

a considerably greater curvature than the ring beads 26 of the tube 19. At the end facing the tube 19, the shaped member 16 is provided with an internal funnel-shaped tapering converging towards the winding point.

The wires 23 passing between the tube 19 and the shaped member 18 can be permanently deformed by moving the shaped member 16 and the tube 19 relative to each other. Furthermore, the braiding angle is adjustable in a known manner. An intermediate member 29 and a guide disc 21 having passages 22 substantially directed towards the winding point are secured to the front end of the winding plate 18. By exchanging the guide disc 21 the individual wires 23 may be guided in a different manner: The guide discs 21 may be provided with different diameters and widths so that the wires 23 can be guided differently in the axial as well as in the radial direction. The guide disc 21 may also be centered or shifted in the axial direction.

Immediately in front of the winding point of the winding plate 18 there is provided a supporting tube 28 for the hose 24, which supporting tube 28 has on its end projecting into the funnel-shaped tapering of the shaped member 16 an outer cone along part of which the passing wires 23 are guided. When displaced by the following wire 23, each wire 23 is wound directly around the hose 24. By exchanging the shaped member 16 in the split holding member 25 and the tube 19, the deformation of the wires 23 can be adapted to the actual diameter of the hose 24. The wires 23 unreeling from the bobbins will pass through the passages 22 in the guide disc 21 and will be uniformly distributed over the circumference of the hose 24. The position of the point of application of the wires 23 on the hose 24 is adjustable by infinitely varying the speed of the winding head 30³ and the caterpillar extractor 31 (FIG. 1). The wires 23 are deformed because the tube 19 and the shaped member 16 overlap according to the preset displacement of the tube 19 relative to the shaped member 16 and the adjustment of the guide disc 21.

The mode of operation is as follows:

During the rotation of the winding plate 18 together with the bobbins and the guide disc 21 the wires 23 pass between the stationary overlapping ring beads 26 and 17 so that a sliding movement is obtained on the ring beads 26 and 27 in the axial as well as in the radial direction thereof. Thus, not only a permanent deformation of the wires 23 but also polishing and hardening of the beads 26 and 27 is obtained. The winding of the wires 23 around the hose 24 can also be effected without a mandrel.

The winding heads as proposed by the invention are adapted to permanently deform also wires and tapes of synthetic plastic material or metal, having sections capable, for example, of tightly gripping one another. Particularly with thermoplastic material it is possible in a simple manner to electrically heat the ring beads. Instead of using rotating bobbins these may be stationary while, in a kinematically inverse manner, the shaped member and the cooperating tube may be rotatably arranged. The resulting effect will be the same as illustrated and described herein. By adjusting and exchanging the rings with the beads or by appropriately selecting the diameter of the wire it is possible to obtain on the same machine either a loose or a tight fitting of the wires on the hose and to cause the wires to tightly grip the hose.

The machines according to the invention can also advantageously be used for stranding, braiding and armouring cables. If required, for special applications, the fanning out of the wires or the like can also be increased in its effect by an inversely arranged overlap of the cooperating ring beads.

I claim:

1. A machine for producing armored hose, particularly high pressure hose the armoring of which consists of continuous windings of permanently deformed strands comprising, a combination, an extractor for non-rotatingly guiding and extracting a hose to be armored; at least

one rotatable means for winding the strands around said hose; deforming means associated with said rotatable means for permanently deforming said strands before the application thereof to the hose, said deforming means including at least two ring-shaped deforming members co-axially arranged with the hose spaced from each other and having each an annular deforming portion engaging said strands, said annular deforming portions of said two ring-shaped deforming members having respectively diameters differing from each other; and adjustable mounting means mounting said ring-shaped deforming members for adjusting the spacing between the same so that the degree of deformation of said strands may be changed.

2. A machine as claimed in claim 1 wherein said deforming portions are enlarged to form beads.

3. A machine as claimed in claim 2, wherein the beads are arranged in axially overlapping relation.

4. A machine as claimed in claim 2, wherein the beads are provided with different curvatures.

5. A machine as claimed in claim 4, wherein the bead having a curvature smaller than that of the other bead is arranged in front of the bead with the larger curvature in the delivery direction of the machine.

6. A machine as claimed in claim 1, wherein at least one of the deforming members is stationary and provided with a conveniently shaped surface permitting the strands to roll off thereon.

7. A machine as claimed in claim 1, wherein said annular deforming portions of said two adjustably spaced ring-shaped deforming members face each other.

8. A machine as claimed in claim 1, wherein said deforming means is movable with respect to the point at which the strands are applied on to the hose.

9. A machine as claimed in claim 1, wherein said deforming means further comprises a disc which is used as collecting ring at the point of application of the strands on the hose.

10. A machine as claimed in claim 1, wherein said annular deforming portions are arranged radially.

11. A machine as claimed in claim 1, wherein said annular deforming portions are arranged axially.

12. A machine as claimed in claim 1, wherein a disc is associated with said deforming means and provided with radially staggered passages for guiding the individual strands.

13. A machine as claimed in claim 1, wherein said deforming means is mounted on a winding plate.

14. A machine as claimed in claim 1, wherein said rotatable means further comprises a winding plate and an intermediate member and said deforming means is detachably mounted by means of said intermediate member on said winding plate.

15. A machine as claimed in claim 1, wherein said deforming device includes a stationary tube with a bead arranged concentrically to the winding axis.

16. A machine as claimed in claim 1, wherein a disc with passages therein and a support are associated with said deforming means and said disc is rotatably mounted in said support so as to be capable of being carried along by the strands.

17. A machine for producing armored hose as set forth in claim 1 in which said rotatable means includes a rotatable winding plate and a plurality of bobbins turnably mounted on said winding plate.

18. A machine for producing armored hose as set forth in claim 17 wherein said bobbins are arranged in groups and including a plurality of studs shafts mounted on said winding plate extending substantially normal thereto arranged angularly displaced from each other and respectively supporting said groups of bobbins rotatable about the axes of said shafts.

19. A machine for producing armored hose as set forth in claim 17 and including a plurality of guide rollers mounted on said winding plate for guiding said strands between said bobbins and said deforming means.

20. A machine for producing armored hose as set forth in claim 1 and including a support; a disc formed with guide passages therethrough rotatably mounted on said support for guiding the strands; and means for driving said disc synchronously with said rotatable means.

References Cited by the Examiner

UNITED STATES PATENTS

1,537,632	5/25	Turgeon	153—64
1,767,693	6/30	Morin	153—67 XR
1,990,514	2/54	Angell	153—64 XR
2,072,284	3/37	Voorhees.	
2,384,486	9/45	Norton	153—67

FOREIGN PATENTS

625,749	7/49	Great Britain.
48,932	1/31	Norway.

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