June 18, 1957 B. COOPER 2,796,488

TREADLE AND TREADLE PROCESS

Filed Dec. 1, 1953 2 Sheets-Sheet 1

FIG. 1.

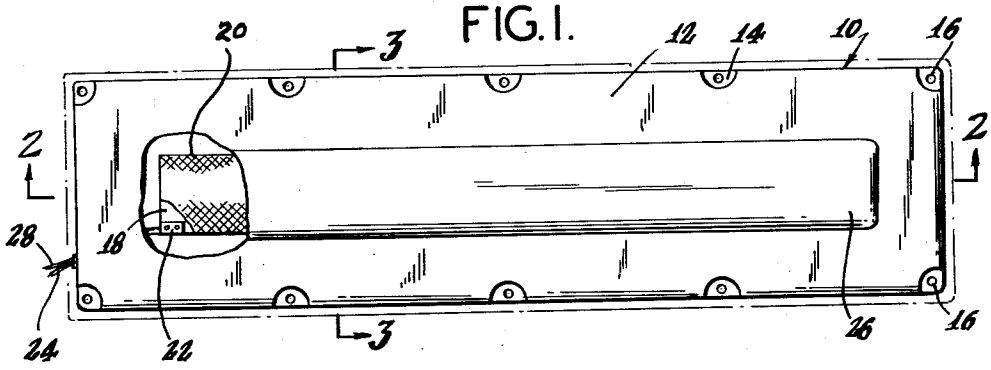


FIG. 2.

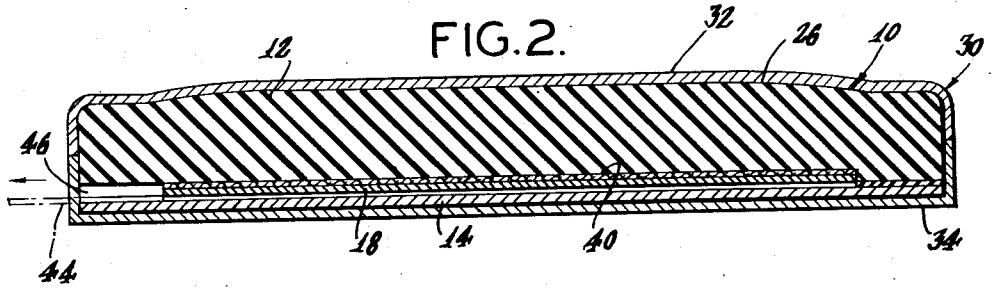


FIG. 3.

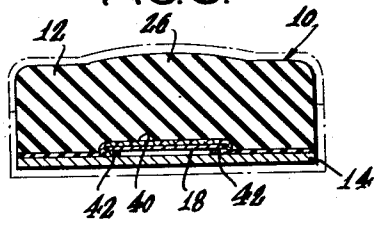


FIG. 4.

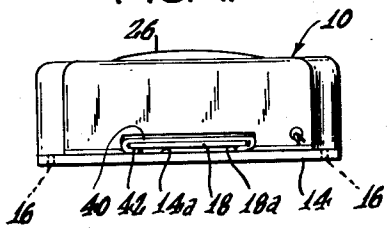


FIG. 5.

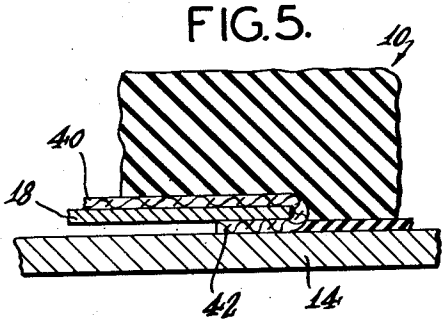
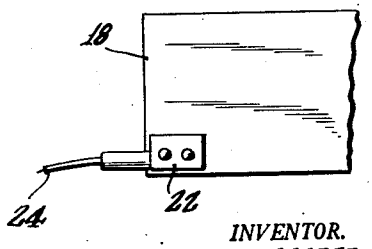


FIG. 6.



INVENTOR.
BENJAMIN COOPER

BY

ATTORNEY.

June 18, 1957 B. COOPER 2,796,488

TREADLE AND TREADLE PROCESS

Filed Dec. 1, 1953 2 Sheets-Sheet 2

FIG. 7.

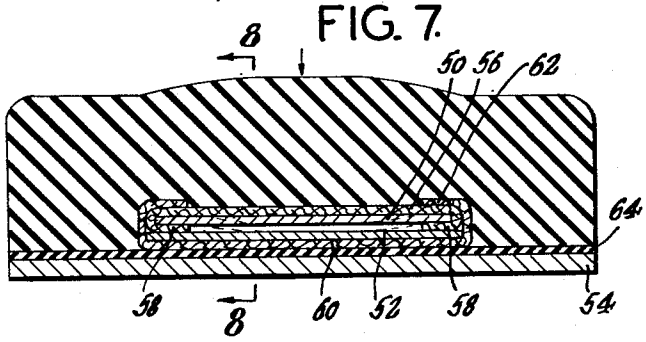


FIG. 12.

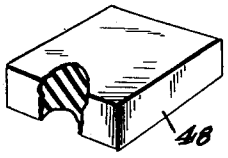


FIG. 8.

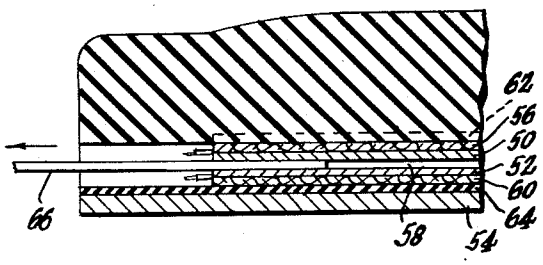


FIG. 9.

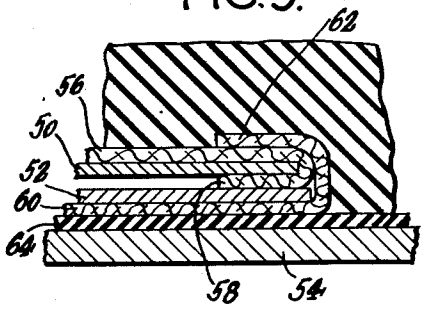


FIG. 10.

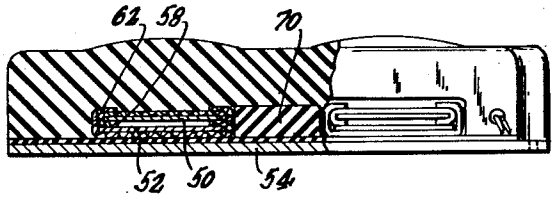
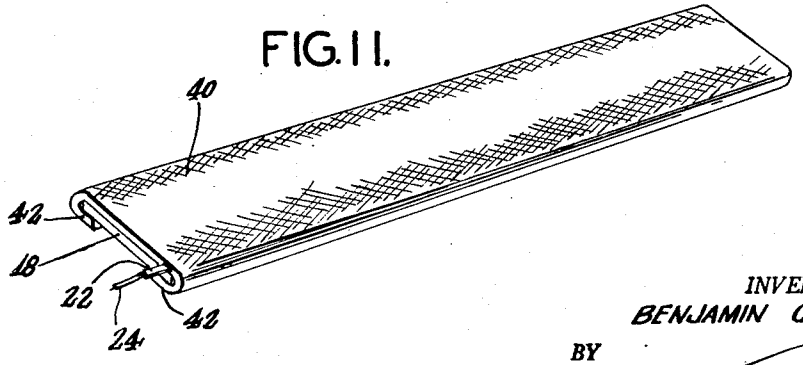


FIG. 11.



INVENTOR.
BENJAMIN COOPER
BY
J. B. Fehlmann
ATTORNEY.

United States Patent Office 2,796,488
Patented June 18, 1957

2,796,488

TREADLE AND TREADLE PROCESS

Benjamin Cooper, Brooklyn, N. Y.

Application December 1, 1953, Serial No. 395,474

11 Claims. (Cl. 200—86)

This invention relates to a process for making treadles having electrical contacts therein and to the treadle made by such process.

Treadles generally comprise one or more pairs of normally open contacts that are mounted within a sealed resilient envelope that is adapted to be embedded in a roadway whereby vehicles traversing the roadway will roll over the resilient envelope thereby effecting a closure of the normally open switches therein. Heretofore extraneous means have been utilized to maintain the spacing between the contact strips during manufacture and since these contacts could be effected by moisture a rubber resilient envelope is molded therearound. Previously, difficulty has been experienced in securing contacts to the rubber envelope and to the spacing of each related pair of contacts. Treadles generally are made by assembly of the contact strips with uncured rubber in a mold which is subsequently heated under pressure to a point where the uncured rubber fuses into a homogeneous mass.

In assembling the contact strips, prior to the molding thereof in the envelope, complex means were utilized to secure the strips in spaced relationship to the resilient envelope.

The present invention provides a simple and inexpensive process for attaching contact strips to a resilient envelope and for spacing said strips one from the other.

Therefore, one of the principal objects of the invention resides in the provision of a process for attaching metallic contact strips to a rubber envelope during the molding of said envelope.

Still another object of the invention is to provide a highly improved method for spacing the contact strips one from the other, consisting in the application of folds of rubber impregnated canvas between the respective contact strips and curing the impregnated canvas with the rubber envelope to form a homogeneous mass.

Yet another object is to provide in the process of making a treadle, a canvas cover for each of the respective canvas strips, folding the edges of the cover over and under the respective strips whereby metallic surfaces of each contact strip are exposed in a complemental manner one to the other and placing the covered contact strips in a mold with uncured rubber, applying heat and pressure to the mold whereupon the impregnated canvas covering is effectively fused with the rubber to seal the contact strips in the envelope thereby preventing viscous uncured rubber from getting in between the contact strips during the molding process.

Still another object of the invention is to provide a treadle having improved contact mounting means therein.

Other ancillary objects will be, in part, hereinafter apparent and will be, in part, hereinafter pointed out.

In the drawings:

Figure 1 is a plan view of a treadle embodying the invention;

Figure 2 is a cross-section taken along line 2—2 of Figure 1, illustrating the relationship of the contact strips in the envelope;

Figure 3 is a cross-sectional view illustrating a single contact treadle;

Figure 4 is an end view of a treadle before a plug has been inserted to seal the envelope;

Figure 5 is an enlarged fragmentary view of a single contact illustrating the method of mounting said contact relative to the treadle ground plate;

Figure 6 is a fragmentary plan view of a contact strip illustrating the method of attaching a conductor thereto;

Figure 7 is a cross-sectional view of a treadle embodying a two contact assembly insulated from the treadle ground plate and illustrating the method of covering the contact strips when a pair of strips is utilized;

Figure 8 is a cross-sectional view taken along line 8—8 of Figure 7, particularly illustrating the withdrawal of the core employed to maintain the spacing between contact strips during the molding process;

Figure 9 is an enlarged fragmentary cross-sectional view of the two contact assembly and the method of preparing said assembly with the rubber impregnated canvas;

Figure 10 is an end elevation partially cut away to illustrate a further embodiment of a treadle wherein a pair of two contact strips is utilized;

Figure 11 is an isometric projection of a single contact strip having thereon the impregnated canvas cover illustrating the fold of canvas flaps;

Figure 12 is an isometric projection of the rubber plug that is inserted in the hole that is left in the end of the envelope after the spacer core has been withdrawn.

Referring to the drawings in detail, **10** generally designates a treadle comprising a rubber envelope **12** that is affixed to a ground plate **14** provided with mounting holes **16** and having embedded therein a contact strip **18** covered by a rubber impregnated canvas duck **20**. Attached to the contact strip **18**, by riveting or the like, is a connector **22** and affixed to the connector is a conductor **24**. The conductor may be connected to extraneous equipment, not shown, and not forming a part of this invention. The treadle **10** is embedded in a roadway whereby the upper surface thereof is substantially disposed in the plane of the roadway with a central raised portion designated as **26** being disposed slightly above the plane of the roadway whereby the wheels of vehicles rolling over the treadle will compress center portion **26** and effect a contacting of the exposed portion **18***a* of strip **18** with a complementally exposed portion **14***a* of ground plate **14**.

Thus, ground plate **14** and contact strip **18** effectively form the necessary two contacts of a switch. A conductor **28** is attached to the ground plate in a similar manner to the attaching of conductor **24** to contact strip **20**. Conductor **28**, accordingly, provides a means for connecting the ground plate **14** to the extraneous counting equipment, not shown.

Referring to Figure 2, there is shown a treadle **10** disposed in a mold **30**, which comprises an upper shell **32** and a lower shell **34**. In making the present invention, the conventional method of providing a rubber envelope is utilized, i. e., layers of uncured rubber are assembled to provide substantially the dimension of the treadle. The layers of uncured rubber are positioned on top of the treadle contact strips. The assembled structure then is placed within a mold and the mold mounted in pressure means, not shown. A pressure of approximately 50,000 pounds is applied to the respective halves of mold **30** while the mold is heated to approximately 300 degrees for a predetermined period of time.

The uncured layers of rubber that have been manually assembled in the shell are cured by the heating pressure to form a homogeneous mass having the shape of the mold. This process is conventional and widely used in the making of treadles. The present invention appertains to the steps of the process for making a treadle

wherein the contact strips are especially prepared with a covering that effectively bonds the strips to the homogeneous mass and further insulates one strip from the other as hereinafter appearing.

The embodiment of the invention illustrated in Figures 1 through 6 comprises the making of a single contact-grounded treadle. This embodiment consists in applying a rubber impregnated piece of duck **40**, of substantially greater width than the width of the contact strip, and folding the margins thereof under the contact strip **18**. As shown in Figure 3, the folds **42** of the impregnated duck **40** extend under the contact strip **18** for a relatively small distance compared to the overall width of the strip **18**.

The strip **18**, together with the enfolded duck, is manually placed on the steel ground plate **14** in proper relationship. The folds **42** of the impregnated duck are placed on a coating of ty-ply which is a commercial well known rubber bonding agent previously applied to the steel plate **14** except for that portion of the plate which will be contacted by the underside of the contact strip **18**. The layers of uncured rubber are positioned on top of this assembly and the curing process as hereinbefore set forth is performed. The curing process effectively bonds the uncured rubber to the impregnated canvas duck, the canvas duck to the covered portions of the contact strip **18**, and the folds **42** to the ty-ply bonding agent and subsequently to the steel ground plate **14**. To prevent collapse of the spaced contact strip **18** during the curing process, a removable strip **44** is inserted under strip **18** between said strip and the ground plate. Strip **44** merely reinforces the strip **18** during the curing process wherein the extremely high pressures exert force on strip **18**. The strip **44** is withdrawn through a hole **46** that is formed in one end of the treadle during the curing process. The hole **46** results from the presence of a mold plug, not shown, but which effectively forms the desired hole during the curing process. The provision of such a hole **46** is well known to those skilled in the art. After the cured treadle is removed from the mold, a plug **48** of rubber such as shown in Figure 12, is inserted in the hole **46**, of course, after the removal of the spacer strip **44** and then the plug **48** is vulcanized to effectively seal the contact strip within envelope **12**.

The bonding qualities of the rubber impregnated duck and the folds **42**, while permitting an effective homogeneous assembling, prevents the flowing of the uncured rubber between the contact strip **18** and the ground plate **14**. Heretofore special extraneous means have been necessary to seal out the cured rubber during the pressurized curing operation.

The contact strip **18** is now bonded over a maximum surface to the remaining elements of the treadle and the folds **42** provide an accurate spacer for maintaining the desired spacing between the insulated contact strip **18** and the grounded plate **14**. The application of pressure on the top of the envelope **12** compresses the contact strip **18** and effects the engagement thereof with ground plate **14**, thereby completing an electrical circuit through said contact strip and ground plate **14**. Obviously, suitable conductors connected respectively to the contact strip **18** and ground plate **14**, connect the treadle switch to the external counting apparatus, not shown.

A second embodiment of a treadle utilizing the present novel process is shown in Figures 7, 8 and 9 wherein an insulated-contact type treadle is shown. In this latter embodiment of the invention, a pair of steel contact strips **50** and **52** are assembled in a treadle wherein both strips are insulated from the ground plate **54**. Here again, the same curing process is employed. However, the novel steps of coating the contact strips with the impregnated rubber duck differs from the steps hereinbefore described. The upper strip **50** is wrapped with the rubber impregnated duck **56** in a manner hereinbefore described wherein the margins **58** thereof are folded over and under the contact strip. This covered strip is then placed on the lower contact strip **52** and a second piece of rubber impregnated duck **60** is wrapped around the bottom surface of strip **52** and folds **62** thereof are disposed over the margin of the covered strip **50**. Thus, the strip **50** is spaced and insulated from the strip **52** by means of the folds **58**. The assembled contact strips are positioned on the ground plate **54** after a coating of ty-ply shown as **64** is applied over the entire surface thereof. The layers of uncured rubber are then positioned on the contact strip assembly and a curing process as hereinbefore set forth is performed. A spacer strip **66** is disposed between the respective strips **50** and **52** to maintain said strips in their properly spaced relationship during the pressurized curing process. When cured, the duck surrounding the contact strips is effectively bonded thereto and to the homogeneous mass of cured rubber. The upper contact **50** is distorted by pressure of a vehicle rolling over the treadle to engage the lower contact strip **52** as shown in dotted line in Figure 7 and effectively closes the electrical circuit for actuating the external counting apparatus, not shown. The insulated contact strips **50** and **52** are so bonded through the medium of rubber impregnated duck that a sealed unit results. Furthermore, this successful bonding cannot loosen by repetitious actuation and accordingly provides a treadle having long lasting qualities.

A two-switch contact treadle is shown in Figure 10 wherein two sets of insulated strips are disposed in a single rubber envelope. In assembling this dual embodiment, a further step is provided wherein a rubber block **70** of cured rubber is interposed between the respective sets of contacts. In the curing operation, this rubber block **70** is integrally bonded to the rubber envelope while maintaining the correct spacing relationship between the respective sets of contacts.

While the process hereinbefore described appertains to single and a dual contact strip treadles, it will be understood that the process is equally applicable to multiple-type treadles.

It will be seen, therefore, that there is provided a process in which the several objects of this invention are achieved and which is adapted to meet the conditions of practical use.

The invention claimed is:

1. A process for making a treadle switch consisting in placing a rubber impregnated flexible strip over the top surface of an elongated metallic contact member, folding the margins of the strip over the margins of the contact member and partially under said contact member and leaving a portion of the underside of said contact member uncovered, placing the covered contact member with the uncovered portion facing downwardly on a ground plate wherein the contact member is spaced from the ground plate by the strip margins, placing uncured rubber over the covered contact member and beyond the margins of the contact member and on the ground plate to form a rubber envelope, and curing the uncured rubber by heat and pressure whereby the rubber impregnated strip is bonded to the rubber envelope.

2. A process for making treadle switches consisting in covering a metallic contact member with a cover of flexible rubber impregnated duck, folding the duck over the margins of the metallic member and partially under said metallic member adjacent to the margins thereof and leaving a portion of the underside of said contact member uncovered, applying a bonding agent to portions of one side of a metallic ground plate, placing the covered contact member on the ground plate wherein the uncovered portion of the contact member is disposed over the uncovered portion of the ground plate and the covered portion of the underside of the contact member is disposed on the bonding agent, placing uncured rubber over the covered contact and beyond the margins of the contact member and on the bonding agent on the ground plate to form a rubber envelope, and curing the uncured rubber by heat and pressure whereby the rubber impreg-

nated duck is bonded to the rubber envelope and to the bonding agent and the bonding agent is bonded to the ground plate.

3. A process for making a treadle switch consisting in placing a rubber impregnated flexible strip over the top surface of an elongated contact member, folding the margins of the strip over the margins of the contact member and partially under said contact member and leaving a portion of the underside of said contact member uncovered, placing the covered contact member with the uncovered portion facing downwardly on a second contact member, placing the first and second contact members on a second rubber impregnated flexible strip, folding the margins of the second strip up and over the first covered strip, coating a ground plate with a bonding agent, placing the covered first and second strips on the bonding agent on the ground plate, placing uncured rubber on the covered first and second strips and on the bonding agent to form a rubber envelope, and curing the uncured rubber by heat and pressure whereby the rubber impregnated strips are bonded one to the other and to the rubber envelope and said envelope and the portion of the strip on the bonding agent is bonded to the ground plate.

4. A process for making a treadle switch consisting in covering a contact member with a flexible rubber impregnated cover having central portion on one side thereof cut away to expose the contact member, placing the covered contact member on a ground plate with the uncovered portion facing downwardly, coating the remainder of the ground plate with a bonding agent, placing uncured rubber over the contact strip and the ground plate to form a rubber envelope, and curing the assembled envelope to bond the rubber impregnated cover to the contact member and to the rubber envelope and bonding the remaining portion of the rubber envelope to the ground plate.

5. A process for making a sealed envelope with a pair of spaced electrical contacts therein consisting in covering a contact member with a rubber impregnated strip, folding the margins of the strip over the margins of the contact member and partially under said contact member, placing the covered contact member with the folds of the covered strip facing downwardly on the upper surface of a second contact member to space one contact member from the other, placing the second contact member on a second rubber impregnated strip, folding the margins of the second rubber impregnated strip over the margins of the first covered strip, placing uncured rubber over the covered strips, and curing the uncured rubber by heat and pressure whereby the rubber impregnated strips and the uncured rubber form a homogeneous mass with the folds of the first rubber impregnated strip effectively spacing one strip from the other.

6. A process for making a mountable switch treadle consisting in placing a rubber impregnated flexible strip over the top surface of each of a plurality of contact members, folding the margins of the strips over the margins of the contact members and partially under said contact members and leaving a portion of the underside of said contact members uncovered, placing the covered contact members with the uncovered portions thereof facing downwardly on a metallic ground plate, placing strips of cured rubber between each adjacent contact member of said plurality of contact members, placing uncured rubber over the covered members and the cured rubber strips to form a rubber envelope, and curing the uncured rubber by heat and pressure whereby the plurality of contact members and the interposed strips are bonded to the rubber envelope.

7. A process for making a treadle switch consisting in placing a rubber impregnated flexible strip over the top surface of an elongated metallic contact member, folding the margins of the strip over the margins of the contact member and partially under said contact member and leaving a portion of the underside of said contact member uncovered, placing the covered contact member with the uncovered portion facing downwardly on a ground plate, inserting a spacer strip between the uncovered portion of the contact member and the ground plate, placing uncured rubber over the covered contact member and beyond the margins of the contact member and on the ground plate to form a rubber envelope, curing the uncured rubber by heat and pressure whereby the rubber impregnated strip is bonded to the rubber envelope, removing the spacing strip after the uncured rubber is cured and sealing the hole resulting in the envelope from the removal of the spacer strip with a plug.

8. A switch treadle comprising a ground plate, an elongated flat contact strip covered on one surface throughout its length by a flexible insulating rubber impregnated fabric, portions of said fabric overlapping the side margins of said contact strip and folded thereunder with the fabric terminal edges spaced one from the other to provide a linear uncovered portion throughout the length of the other surface on the underside of said contact member, said folded fabric portions further providing a predetermined parallel spaced relationship between the uncovered portion of the contact strip and the ground plate throughout the length of said contact strip, and a rubber envelope bonded to said fabric and covering said contact member on said ground plate.

9. A switch treadle comprising a ground plate, an elongated flat contact strip covered throughout its length by a flexible insulating rubber impregnated fabric, portions of said fabric overlapping the side margins of said contact strip and folded thereunder with terminal edges of the fabric spaced one from the other to provide a linear uncovered portion throughout the length of the underside of said contact member, said folded fabric portions further providing a predetermined parallel spaced relationship between uncovered portions of the contact strip and the ground plate throughout the length of said contact strip, a rubber envelope bonded to said fabric and covering said contact member on said ground plate, and conductor means connected to said contact member.

10. A switch treadle comprising a pair of flat elongated contact members, a flexible rubber impregnated cover on each of said contact members, portions of said cover overlapping the margins of each contact member and folded therearound with the cover terminal edges spaced apart equally throughout the length of each contact member and providing spaced adjacent uncovered portions of the pair of contact members, said folded cover portions of at least one cover being disposed between the pair of said contact members in aligned relation to space said parallel members equidistantly throughout their length one from the other, and a rubber envelope bonded to said rubber impregnated covers.

11. A switch treadle comprising a pair of flat elongated contact members, a flexible rubber impregnated cover on each of said contact members, folds of one of said covers disposed between said pair of contact members to space said members one from the other and providing adjacent uncovered portions of said contact members and said other cover being adapted to encompass both of said contact members, a rubber envelope bonded to said rubber impregnated covers, and a ground plate bonded to said envelope and electrically insulated from said contact members by said other cover.

References Cited in the file of this patent

UNITED STATES PATENTS

2,138,549	La Bell	Nov. 29, 1938
2,165,227	Cooper	July 11, 1939

FOREIGN PATENTS

639,212	Great Britain	June 21, 1950