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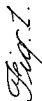
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CONTROL SYSTEM FOR COILING DOORS

Filed March 4, 1926

6 Sheets-Sheet 1



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6 Sheets-Sheet 2

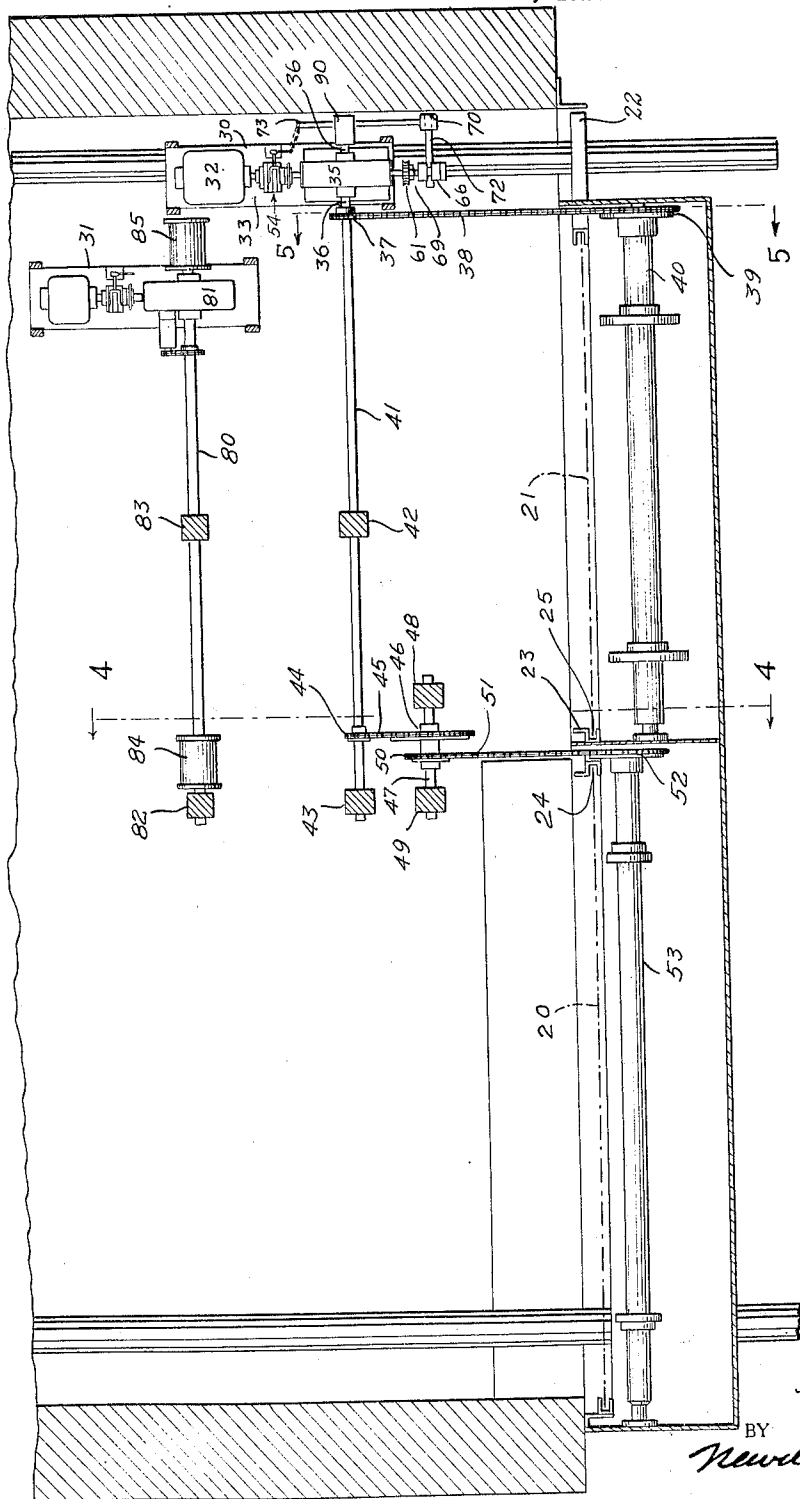


Fig. 3.

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6_Sheets-Sheet 3

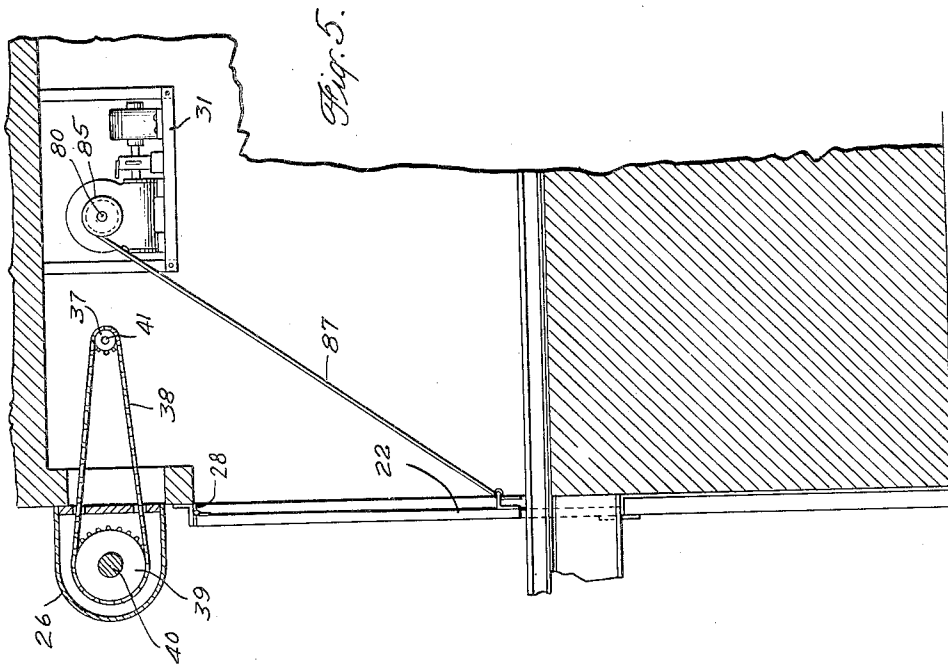
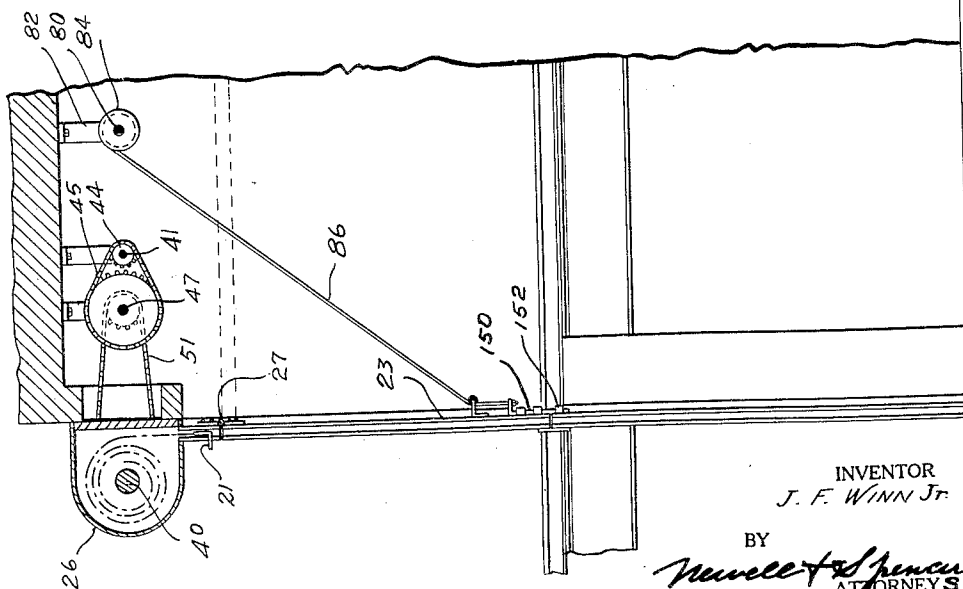


Fig. 4.



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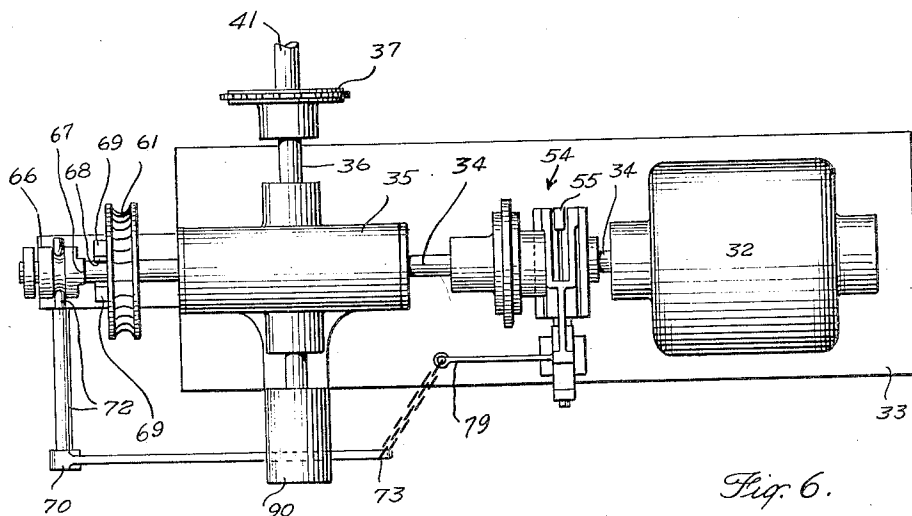


Fig. 6.

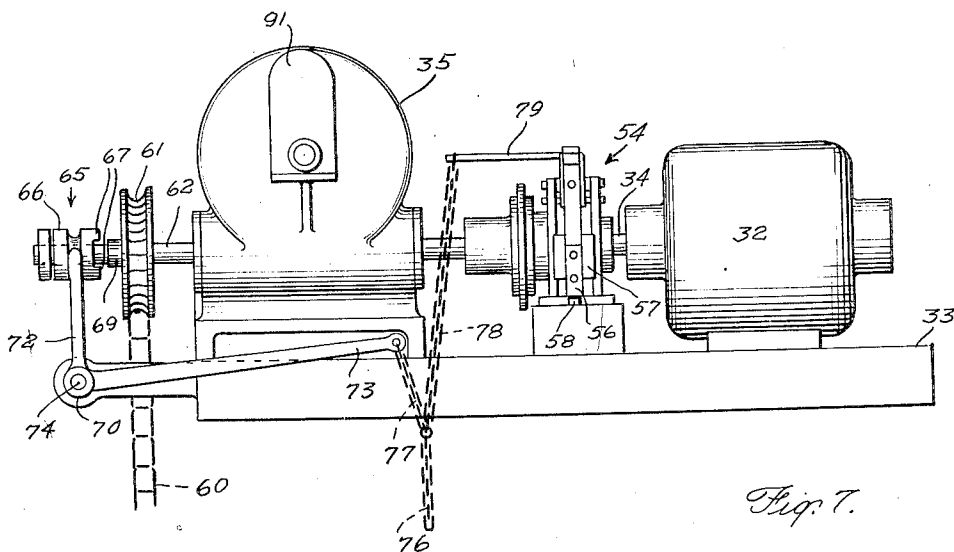


Fig. 7.

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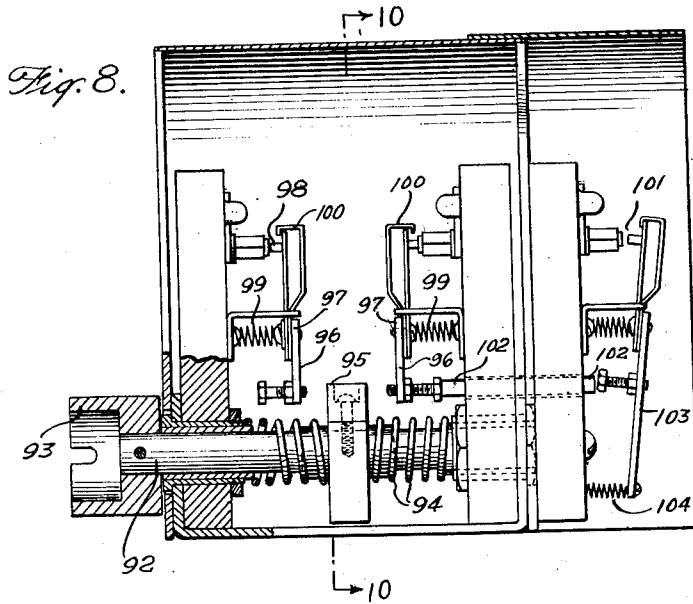
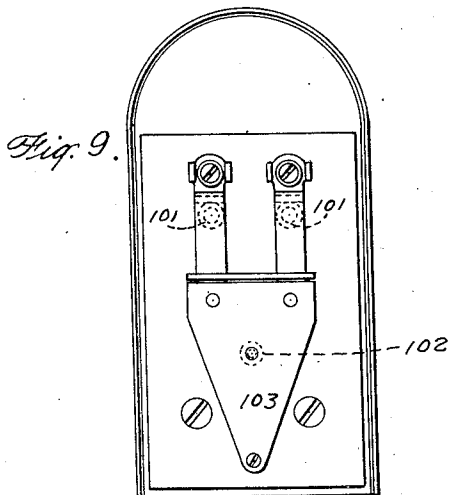
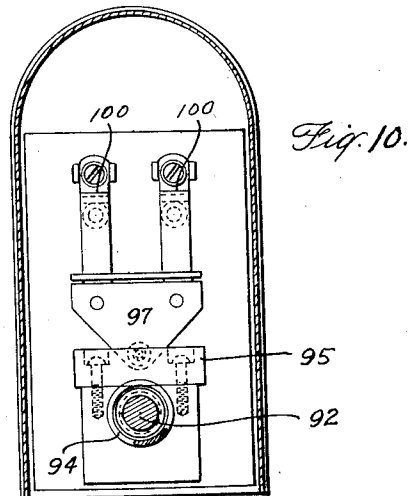
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6 Sheets-Sheet 6

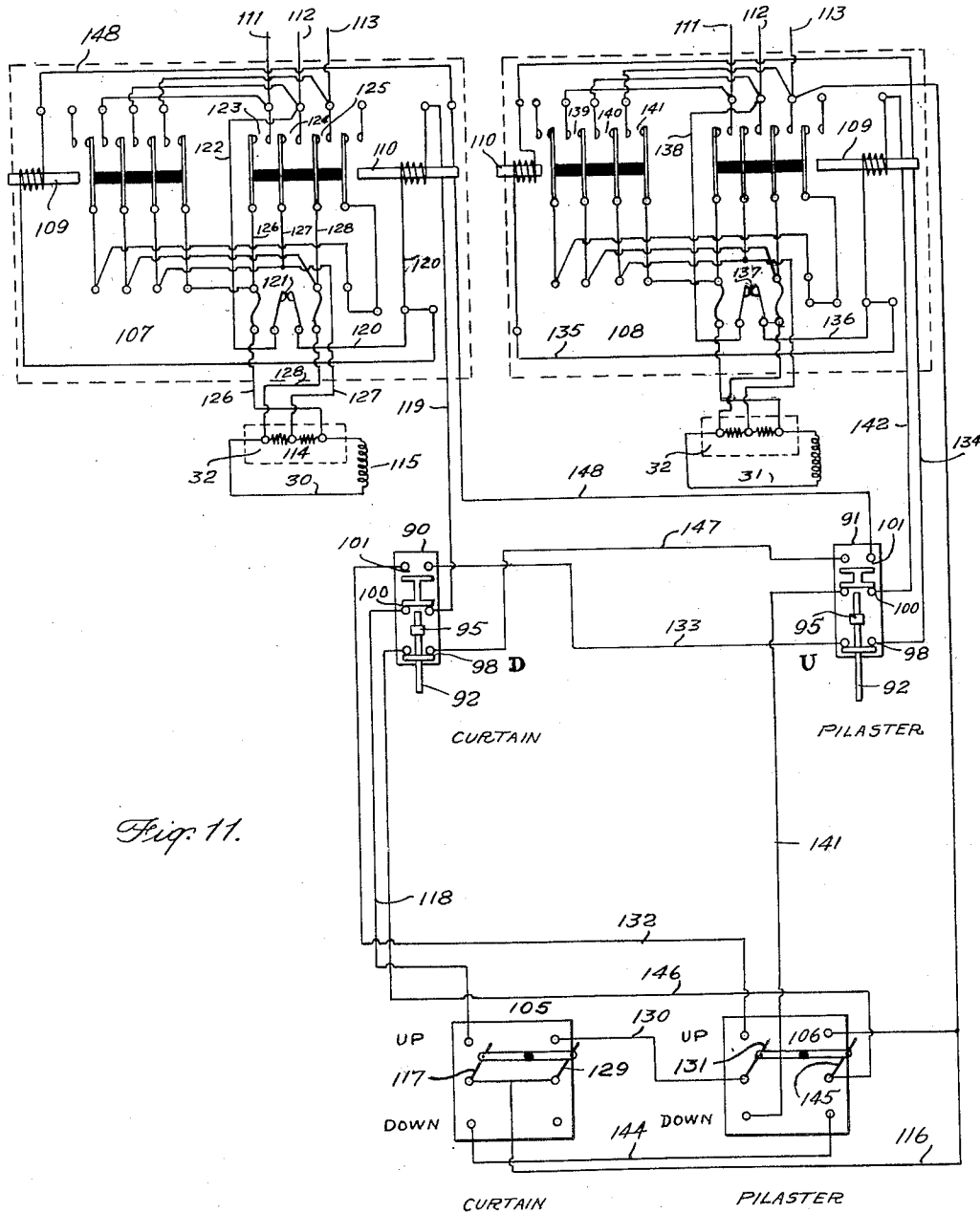


Fig. 11.

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UNITED STATES PATENT OFFICE.

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CONTROL SYSTEM FOR COILING DOORS.

Application filed March 4, 1926. Serial No. 92,319.

This invention relates to control systems, and more particularly to a control system for coiling doors of the type in which the door rolls up into a coil from the top of the doorway.

In closing very wide openings, or where one portion of the opening is to be used at certain times, and at other times the entire opening is to be used, it is usually desirable to divide the door up into a number of separate sections which may be opened either independently or in concert when necessary. In such cases, the pilasters or posts which carry the guides for the edges of the doors are arranged so that they may be moved out of the way when all of the sections of the door are lifted in order to provide a clear opening.

In this art, it is generally preferable that the movable pilasters be pivoted at their upper ends to the wall of the building and arranged to be swung inwardly and upwardly into a substantially horizontal position adjacent the roof, to permit unobstructed use of the opening. However, these pilasters may also be pivoted to swing to either side of the opening, or they may be mounted for vertical movement so that they may move vertically upward between the door, or they may be mounted to slide or roll to one side or the other of the opening.

In the drawings and description of this application, there are illustrated inwardly swinging pilasters. It is to be understood that the invention is not limited in its application to this particular manner of mounting the pilasters, but that the invention also may be applied to door constructions in which the pilasters are mounted in other ways in order to enable them to be moved out of obstructing position.

In electrically operated doors of this type heretofore in use, separate controls have been provided for each section of door and for each mounting or pilaster. With such an arrangement of separate control, it is quite possible that an unthinking operator might throw the control switch for moving the pilasters before the curtain or door has been fully raised and, in the reverse movement, throw the curtain switch before the pilasters have been fully replaced. The obvious result in such cases would be destruction of the curtain, or at least, a serious injury thereto.

It is one object of this invention, therefore, to provide a control system in which such conditions are effectually prevented. The manner of accomplishing this and other objects of the invention will become apparent upon consideration of the following description, taken in conjunction with the accompanying drawings, in which—

Fig. 1 is a front elevation of a doorway showing a covering therefor, comprising three sections;

Fig. 2 is a section on line 2—2 thereof;

Fig. 3 is a plan view of the overhead control for raising and lowering the curtains;

Fig. 4 is an enlarged sectional view along line 4—4 of Fig. 3;

Fig. 5 is a similar view along line 5—5 of Fig. 3;

Fig. 6 is a plan view of the motor and control unit for imparting power to the curtains and pilasters;

Fig. 7 is an elevation of the unit of Fig. 6;

Fig. 8 is a side elevation of an automatic switch for use in the control circuits;

Fig. 9 is an end view thereof;

Fig. 10 is a section along the line 10—10 of Fig. 8; and

Fig. 11 is a diagram of the controlling circuits for a system in accordance with the invention.

The particular type of doorway chosen for illustrating this invention comprises, as shown in Fig. 1, a craneway opening, the upper part of which is much wider than the lower part. For this reason, it is desirable to divide up the curtain into a number of separate sections, the first, 20, being a short one, extending about half way down the front of the building, the second, 21, extending full length, and a third, a small hinged flap 22, which is adapted to close the space above the crane rail on the right-hand side, and which carries a guide 22^a for one edge of the curtain 21.

Between the sections 20 and 21, it is necessary to provide a post or pilaster 23 in grooves 24 and 25 of which the edges of the sections 20 and 21 are caused to slide. When it is desirable to run a crane through such building, the sections 20, 21 and 22, and the pilaster 23, must be lifted out of the way. Curtains 20 and 21 are arranged to roll up in coils beneath cylindrical hood 26 while pilaster 23 and flap 22 and attached guide

22* swing inwardly and upwardly on their hinges 27 and 28 respectively.

Each of the sections 20 and 21, as shown, are driven by means of rotating shafts and chains under the control of a common motor mechanism 30 and the pilaster and flap by a common motor mechanism 31, both of which may be identical in construction if desired. It is to be understood, of course, that each of the sections and the pilaster and flap may have individual motor mechanism if desired.

In Figs. 6 and 7 is shown a motor 32 mounted on a bench 33. Suitably connected to the motor shaft 34 is a reduction gear housing 35 of well-known construction, having a shaft 36, carrying a sprocket wheel 37 over which is caused to pass an endless roller chain 38. This chain 38 also passes over a second sprocket wheel 39 which is rigidly keyed to the shaft 40 upon which the curtain 21 is arranged to coil. It is evident, therefore, that whenever motor 32 is energized, shaft 40 will be rotated, correspondingly raising or lowering the curtain 21, depending upon its direction of rotation.

A shaft 41 may also be suitably driven from shaft 36, as shown in Fig. 3, being suitably journaled in bearings 42 and 43. Mounted on this shaft 41 is a sprocket wheel 44, which drives by means of chains 45, a second sprocket wheel 46 mounted upon and rotating with a shaft 47, suitably journaled in bearings 48 and 49. Rigidly carried on this shaft 47 to rotate therewith is another sprocket wheel 50 which drives by means of chains 51, a sprocket wheel 52, which in turn drives curtain roller shaft 53 for operating curtain 20.

In order to stop the coasting movement of the curtains after the power has been shut off, a brake 54, comprising two semi-circular hinged drums 55 and 56 is preferably mounted on the motor shaft 34. The brake may be controlled magnetically so that when the current is applied to the motor, a magnet 57 is energized to lift the drums off the shaft against the pressure of a spring 58. Upon the de-energization of the motor 32, the magnet 57 is also de-energized, permitting spring 58 to force the drums against the shaft to stop its rotation.

The curtain may be hand operated in an emergency, there being provided a depending emergency hand operating chain 60 which passes over a sprocket wheel 61 loosely mounted on an extension 62 of motor shaft 34. Clutch mechanism 65 comprising a member 66 slidably keyed to the end of the shaft extension 62 is adapted to cause sprocket wheel 61 to become effective. Member 66 is provided with protruding members 67 which are adapted to register with notches 68 formed in an extension 69 on wheel 61.

Connected to member 66, in any suitable manner, is a rod 72 which extends down-

wardly and perpendicularly towards a shaft 74 to which it is keyed. Shaft 74, mounted for rotation in suitable bearings, has rigidly mounted at one extremity an arm 73 which may be actuated to rotate shaft 72 against the action of a spring (not shown) to cause clutch member 66 to engage wheel 61, thereby permitting the turning of shaft 34 and consequently shafts 40 and 53 to operate the curtains manually.

A chain 76, having a section 77 attached to the end of arm 73 is provided for ease in operation. Since, it will be remembered, brake 54 is applied by spring 58, upon the de-energization of motor 32, a lever 79 connected to and operated from chain 76 by means of chain section 78, is arranged to exert a lifting pressure against spring 58 to release the brake drums and permit free rotation of shaft 34.

As hereinbefore stated, a similar motor mechanism 31 is provided for actuating the pilaster 23 and flap 22. A shaft 80, suitably coupled to reduction gear mechanism 81 of motor mechanism 31, rotates in bearings 82 and 83, carrying thereon winding drums 84 and 85, the former controlling the pilaster 23 and the latter the flap 22. Rotation of the shaft 80, in one direction under the control of mechanism 31, winds up chains 86 and 87 suitably attached respectively to the spring-returned bolts 150, slidably mounted on pilaster 23 and flap 22, thereby first lifting the bolts out of their sockets 152 and then raising the pilaster and flap. Rotation of the shaft 80, in the opposite direction, unwinds chains 86 and 87, thereby lowering the pilaster and flap.

It is apparent that control of the motor mechanisms 30 and 31 should be so effected that with the curtains, pilaster and flap in position as shown in Fig. 1, mechanism 30 should be operated first to raise the curtains before mechanism 31 is operated to raise the pilaster and flap and, when curtains, pilaster and flap are all raised, mechanism 31 should be operated before mechanism 30. An efficient and careful operator is, therefore, necessary to see that the control switches are properly operated.

In Figs. 8, 9, 10 and 11 are shown a diagrammatic representation of the circuits and control mechanisms, whereby the proper sequence of operation may be assured, regardless of the manner in which the operator performs his duties.

Limit switches 90 and 91 mounted as shown in Figs. 6 and 7 on the shafts 36 of reduction gearings 35 are arranged to be driven in synchronism with their respective motor mechanisms 30 and 31 and, therefore, in synchronism with the curtains and pilaster.

These switches comprise (Figs. 8, 9 and 10) a rotatable shaft 92 suitably coupled to

shaft 36 at 93, having an external screw thread 94 over which travels a nut 95 to the right or the left, depending upon the direction of rotation of shaft 92. Nut 95 is adapted to strike at one limit of its travel one end of a lever 96 which, pivoted at 97, is arranged upon engagement with nut 95 to open a contact 98 at its other end. A spring 99 tends to restore the contact when nut 95 reverses.

A similar contact 100, at the other extremity of travel, is also opened by nut 95. At the same time, nut 95 opens this contact 100, it closes a contact 101 through the agency of a rod 102 engaging lever 103. The contact is restored by means of spring member 104 as soon as the pressure of nut 95 is relieved.

Referring now to Fig. 11, there is represented two double-pole double-throw knife switches 105 and 106, two limit switches 90 and 91, as above described, and two motor control magnetic devices 107 and 108, one for the curtains and one for the pilaster.

The latter comprise two direction magnets 109 and 110, each controlling a series of contacts for directing the current from lines 111, 112 and 113 to the motor and brake windings 114 and 115 respectively.

The manner of control will be better understood by a description of operation.

Suppose it is desired to raise the curtains and pilaster and flap shown in Fig. 1. The operator throws switch 105 marked "Curtain" to its "up" position and a circuit is thereupon completed from line 113, conductor 116, switch blade 117 and its contact, conductor 118, contact 100 of curtain limit switch 90, which is now in its closed position, conductor 119, winding of magnet 110, conductor 120, contact 121, conductor 122 to line 112, thus energizing the magnet 110, causing it to close its contact. Winding 114 of curtain control motor 32 and brake winding 115, which is in parallel therewith, are now energized in a circuit which extends from lines 111, 112 and 113, through contacts 123, 124 and 125, conductors 126, 127 and 128 to windings 114 and 115. The motor 32 now begins to rotate in the up direction, driving the shaft 34 through reduction gearing 35 and shaft 36. As a result of the rotation of shaft 26, the winding shafts 40 and 53 are caused to wind up curtains 21 and 20 respectively. At the same time, nut 95 of the limit switch 90, which travels in synchronism with the motor 32, moves along the shaft 92 to the right (Figure 8). As soon as the curtains are fully raised, nut 95 contacts with the lever arm 96, controlling contact 100 and the rod 102 controlling contact 101. The opening of contact 100 opens the energizing circuit of magnet 110 which thereupon opens its contacts 123, 124 and 125,

through which the current was fed to the motor and brake windings. The latter are thereupon de-energized and the curtains brought to a stop. The operator, if he has not already done so, will now operate the pilaster switch 106 to its up position, whereupon a circuit extends over conductor 116, as before, through knife blade 129 and its contact, conductor 130, knife blade 131, and its contact, conductor 132, through contact 101 of limit switch 90, which is now closed, conductor 133, contact 98 of limit switch 91, conductor 134, winding of magnet 110 of pilaster control mechanism 108, conductors 135 and 136, contact 137, conductor 138 to line 112. Magnet 110 of mechanism 108 is energized in this circuit and closes its contacts 139, 140 and 141, thereby completing an obvious circuit to the windings of the motor and brake magnet of the pilaster motor mechanism 31. Pilaster 23 and flap 22 are now raised through the agency of shaft 80 and chains 86 and 87. As soon as the pilaster and flap are fully raised, nut 95 of pilaster limit switch 91, engages lever arm 96 to open contact 98. The opening of contact 98 opens the circuit of magnet 110 of mechanism 108, thereby causing the de-energization of motor mechanism 31. If now it is desired to lower the curtains, the operator moves switch 106 to its down position, thereby completing a circuit over conductors 116 and 130, as before, through knife blade 131 and its down contact, conductor 141, contact 100 of limit switch 91, conductor 142, through the winding of magnet 109 to the line 112 over conductors 136 and 138. The energization of magnet 109, in this circuit, causes its associated contacts to close, thereby connecting current from lines 111, 112 and 113 to motor mechanism 31 in a rotation to cause motor mechanism 31 to rotate in the opposite or down direction. Pilaster 23 and flap 22 are thereby simultaneously lowered and nut 95 of limit switch 91, traveling in unison therewith, will, when the pilaster and flap are in their fully lowered position, open contact 100 and close contact 101. The curtains may then be lowered by moving switch 105 to its down position, thereby completing a circuit from line 113 over conductor 116, knife blade 117 and its corresponding down contact, conductor 144, knife blade 145 and its corresponding down contact, conductor 146, contact 98 of curtain limit switch 90, conductor 147, contact 101 of pilaster limit switch 91, which is now closed, conductor 148, through the winding of magnet 109 to line 112 over conductors 120 and 122. The energization of magnet 109 in this circuit causes motor mechanism 30 to be operated in a reverse direction, thereby lowering curtains 20 and 21. When the curtains have reached their lowermost

position, nut 95 will cause the opening of contact 98, thereby de-energizing magnet 109 and stopping motor mechanism 30.

From the above description, it will be noted that when the curtain is in its fully lowered position, contacts 98 and 101 of switch 90 will be opened while contact 100 of this switch will be closed and, when the curtains are fully raised, contacts 101 and 98 are closed, while contact 100 is opened. The contrary is true in the case of the pilaster limit switch 91, contact 98 being opened when the pilaster reaches its fully raised position, contact 100 being opened and contact 101 being closed when the pilaster has reached its fully lowered position.

If now, when the curtains and pilaster are fully raised, the operator were to move the curtain control switch 105 to its down position before moving the pilaster switch 106 to its down position, the curtain would not be lowered, since its control circuit is traceable through the knife blade 145 and the down contact of switch 106. In a similar manner, if, when the curtain and pilaster are lowered, the pilaster switch 106 is moved to its up position before the curtain switch 105, the pilaster will not be raised since its control circuit must pass through the up contact of switch 105.

By means of these circuit arrangements, both of the switches 105 and 106 may be operated to their up or down positions simultaneously and the proper sequence of operations will take place,—that is, if the curtain and pilaster are up and the switches are operated simultaneously to their down position, the pilaster will be lowered before the curtain and, if the curtain and pilaster are in their lowered position and the switches are simultaneously operated to their up positions, the curtain will be raised before the pilaster. This condition is apparent, since the control circuits for the curtain and pilaster are mutually controlled through their respective limit switches; for example, with the switches 105 and 106 in their up positions, the curtain and pilaster being down, limit switch 90 will not permit the energization of the pilaster control motor, since contact 101, through which the energizing circuit was traced, is opened, this contact not being closed until the curtain is fully raised. In a similar manner, switch 91 will not permit the lowering of the curtain until the pilaster has reached its fully lowered position.

While the invention has been described in connection with the control of coiling doors, it is obvious that it is equally applicable to any arrangement of mechanisms wherein the operation is limited in travel either by distance or time, and wherein the operation of one mechanism is dependent upon the se-

quence of another operation of similar nature.

What is claimed as new is—

1. In a door mechanism, a movable door member, a movable guide member, a reversible motor for each of said members, control circuits therefor, a contact controller associated with each member and operative to actuate certain of its contacts upon the movement of the associated member to its limits of travel, said control circuits being partly completed through certain of said contacts, a two-way manually controlled switch for each of said members interposed in said control circuits, said motors being controlled in accordance with the closing of the contact of said contacting controllers, irrespective of the order of closure of said two-way switches.

2. A door mechanism, comprising in combination a movable door, a movable guide at one side of said door, means for operating the door, means for operating the guide, means for preventing the guide operating means from being thrown into operation while the door is partially or fully closed, and means for preventing the door operating means from being thrown into operation while the guide is fully or partially open.

3. A door mechanism, comprising in combination a vertically movable coiling door, a guide for said door, said guide being pivoted to swing out of door guiding position, an electric motor for operating said door, an electric motor for operating said guide, means for preventing the guide operating motor from being thrown into operation except when the door is fully opened, and means for preventing the door operating motor from being thrown into operation except when the guide is in door guiding position.

4. In a door mechanism in combination, a plurality of doors, a plurality of guides for the doors, said guides being mounted for swinging movement, an electric motor for operating said doors, an electric motor for operating said guides, circuits for the guide motor, controlling means for at least one of said circuits and controlled by the door motor for preventing operation of the guide motor until the doors have been completely raised from lowered position, circuits for the door motor, controlling means for at least one of the latter circuits and controlled by the guide motor to prevent operation of the door motor until the guides have been completely lowered from raised position, and manually operated means for controlling the circuits of said motors.

5. A door mechanism, comprising in combination a movable door, a movable guide at one side of said door, means for operating the door, means for operating the guide, means controlled from the door operating means for preventing the guide from being

operated except when the door is fully opened, and means controlled from the guide operating means for preventing the door from being operated except when the guide is in its fully closed position.

6. A door mechanism, comprising in combination a plurality of doors, a plurality of guides, said guides being mounted for swinging movement, a motor for operating said doors, a motor for operating said guides, circuits for said motors, circuit controlling means for preventing operation of the guide motor until the doors have been completely opened, and manually operated means for controlling the circuits of said motors.

7. A door mechanism, comprising in combination a plurality of doors, a plurality of guides, said guides being mounted for swinging movement, a motor for operating said doors, a motor for operating said guides, circuits for said motors, circuit controlling means for preventing operation of the door motor except when the guides are in door guiding position, and manually operated means for controlling the circuits of said motors.

8. A door mechanism, comprising in combination a door, a movable guide for said door, a door motor, circuits for the door motor for causing operation of the motor in directions to open and close the door, a guide motor, circuits for causing operation of the guide motor in directions to open and close the guide, means to open the door opening circuit of the door motor and close a break in the guide opening circuit of the guide motor when the door is fully opened.

9. A door mechanism, comprising in combination a door, a movable guide for said door, a door motor, circuits for the door motor for causing operation of said motor in directions to open and close the door, a guide motor, circuits for said guide motor to cause operation of said motor in directions to open and close the guide, means to open the guide motor opening circuit and close a break in the guide motor closing circuit when the guide is fully opened.

10. A door mechanism, comprising in combination a door, a movable guide for said door, a door motor, circuits for the door motor for causing operation of the motor in directions to open and close the door, a guide motor, circuits for the guide motor for causing operation of said motor in directions to open and close the guide, and means to open the guide motor closing circuit and to close a break in the door motor closing circuit when the guide is fully closed.

11. A door mechanism, comprising in combination a movable door, a movable guide for said door, a door motor, circuits for causing operation of the door motor in directions to open and close the door, a guide motor, circuits for causing operation of the

guide motor in directions to open and close the guide, and means to open the door motor closing circuit and close a break in the door motor opening circuit when the door is fully closed.

12. A door mechanism, comprising a door and a movable guide therefor, a door operating motor, circuits for causing operation of said motor in directions to open and close the door, a guide motor, circuits for causing operation of said guide motor in directions to open and close the guide, and means for opening the door motor opening circuit and closing a break in the door motor closing circuit and a break in the guide motor opening circuit when the door has reached fully opened position.

13. A door mechanism, comprising a door and a movable guide therefor, a door operating motor, circuits for causing operation of said motor in directions to open and close the door, a guide motor, circuits for causing operation of said guide motor in directions to open and close the guide, and means for opening the guide motor opening circuit and closing a break in the guide motor closing circuit when the guide reaches fully opened position.

14. A door mechanism, comprising a door and a movable guide therefor, a door operating motor, circuits for causing operation of said motor in directions to open and close the door, a guide motor, circuits for causing operation of said guide motor in directions to open and close the guide, and means for opening the guide motor closing circuit and closing a break in the guide motor opening circuit and a break in the door motor closing circuit when the guide reaches fully closed position.

15. A door mechanism, comprising a door and a movable guide therefor, a door operating motor, circuits for causing operation of said motor, in directions to open and close the door, a guide operating motor circuits for causing operation of said guide motor in directions to open and close the guide, means for opening the door motor closing circuit and closing a break in the door motor opening circuit and opening the guide motor opening circuit when the door is fully closed.

16. In a door mechanism, a movable door, a movable guide therefor, means for operating said door and guide, and means for preventing operation of the door except when the guide is in door guiding position.

17. In a door mechanism, a movable door, a movable guide therefor, means for operating said door and guide, and means for preventing operation of the guide except when the door is in fully opened position.

Signed at Norfolk, Virginia, this 24th day of February, 1926.

JOHN FARMER WINN, Jr.