May 11, 1948. G. L. BEERS 2,441,233

CONTROL DEVICE

Original Filed July 31, 1943

Fig. 2.

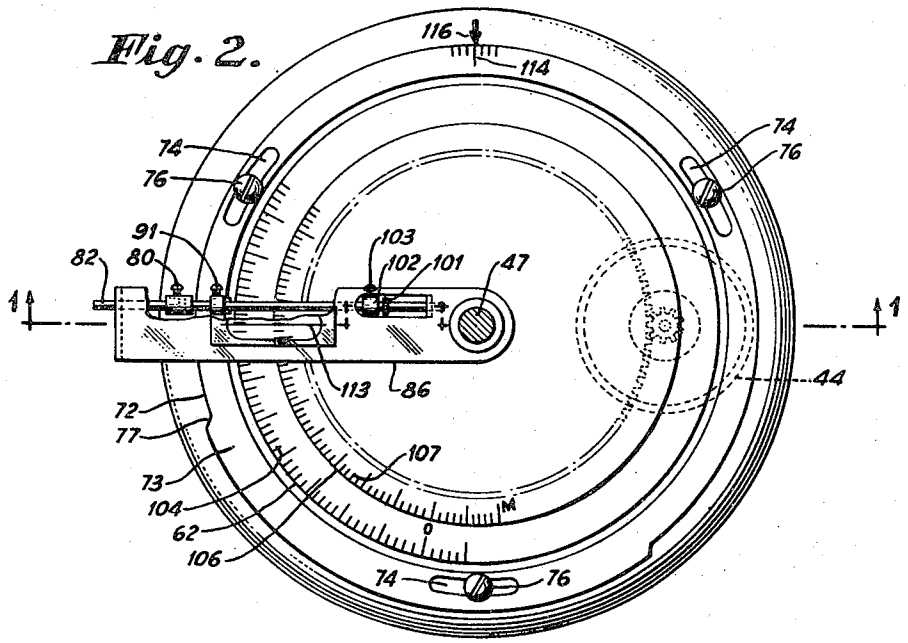


Fig. 1.

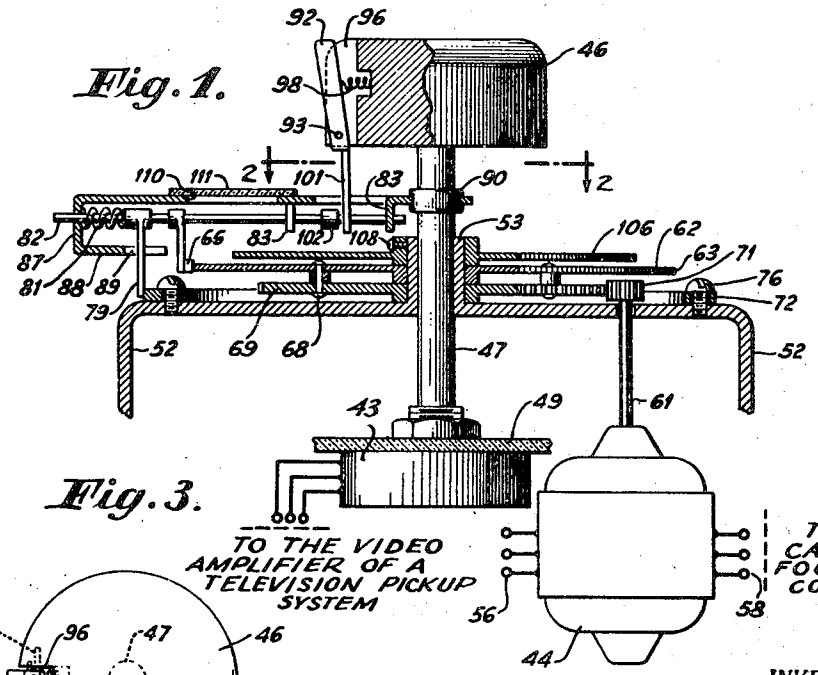
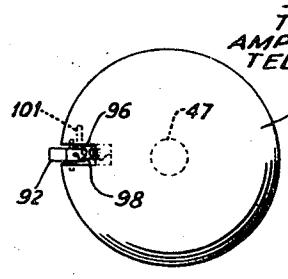


Fig. 3.



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CONTROL DEVICE

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4 Claims. (Cl. 177—380)

1

The present invention relates to a television pickup control system, and more particularly but not necessarily exclusively to a novel control arrangement for obtaining simultaneous and independent control of television pickup equipment and the like. This invention is a division of my copending application, Serial No. 496,905, which was filed July 31, 1943, now Patent No. 2,383,365.

Certain difficulties are encountered in television pickup work because of the variation in illumination of the scene to be televised. With the usual television camera a camera operator cannot adjust the size of the stop or iris opening and fulfill his other obligations. If the iris adjustment control is made accessible to the operator when he is at his normal station in back of the camera, then it is possible for him to adjust the size of the aperture, but some indication of relative light intensity must be provided and such a device, if it gives a true indication of the effective illumination of the scene upon which the camera is trained, is complicated and expensive. The camera view finder cannot be relied upon for indicating the degree and quality of illumination on the scene which is being televised, since it is too difficult to interpret the image in the view finder in terms of the generated camera signal. Moreover, other factors affect the signal which is generated in and transmitted from the television camera, including changes in amplifier conditions, such as changing biasing and supply voltages of which the camera operator can have no knowledge. In the case of television programs which originate outdoors, such as sporting events, it is necessary that the cameraman give his individual attention to the scene in the viewfinder.

In a typical television pickup system there are two adjustable means for controlling the over all sensitivity of the system. One of these is the gain control on the video frequency amplifier and the other is the aperture control on the television camera lens. The sensitivity of the system cannot be increased beyond a certain point by increasing the gain of the video amplifier without the introduction of objectionable noise in the reproduced picture. On the other hand, the maximum sensitivity which can be obtained by increasing the aperture of the lens is in many instances limited by the depth of focus which is obtained under the wide aperture condition.

Under adverse lighting conditions it may be necessary to operate a television pickup system with the camera lens at its maximum aperture and the video frequency amplifier adjusted for high gain. If under these conditions the light intensity should increase and a corresponding reduction in the over all sensitivity of the pickup system is desired, this decrease in sensitivity can be obtained either by reduction of the gain in the

2

video amplifier or by a change in the iris diaphragm setting for the camera lens.

It is therefore apparent that in a television pickup system there are two independent controls for determining the over all sensitivity of the system. These are normally operated by different individuals, and under conditions where sudden and frequent variations in illumination may occur, as in outdoor pickup work, a certain amount of confusion may result through the use of these independent controls.

In order to obtain the maximum in performance from such a system, it is desirable, as the light intensity increases on the subject being televised, to first reduce the gain of the video frequency amplifier to the point where amplifier noise is not apparent in the reproduced picture and then to obtain any further reduction in sensitivity corresponding to a further increase in light by decreasing the lens aperture so that the depth of focus is correspondingly increased. This coordinated control of video gain and aperture setting cannot be obtained satisfactorily when two individuals are responsible for the setting of these two controls.

In accordance with the present invention means are provided to enable the operator at a monitoring control station to exercise coordinated control of the amplifier gain, taking into account all of the factors affecting the generated and transmitted camera signal, and selection of the most desirable lens aperture adjustment consistent with the production of a signal which can be used at a television receiver to recreate a faithful image of the televised scene. It will be apparent to those skilled in the art that when a television signal pickup and transmitting system embodying the invention is employed in televising a scene or object in a television studio, the lighting arrangement may be simplified or the lighting of the scene may be changed to obtain special effects, and the continuity of the program need not be interrupted for the purpose of making camera iris or gain control adjustments.

An important object of the invention herein claimed as divisional subject matter is to provide a novel combined control device capable of general use.

Another object of the invention is to provide a control arrangement whereby the camera lens aperture and the amplifier gain of a television pickup system may be correlated.

A further object of the invention is to provide a remote control means for the iris diaphragm of a television camera operable from a signal monitoring position.

A still further object of the invention is to provide a combined camera aperture and signal gain control in a television system.

Still another object of the invention is to pro-

vide an adjustable control mechanism for the combined control of the aperture of a television camera and the gain control means of a television system in which the camera is employed.

A still further object of the invention is to provide a novel system of scales for scale plates, dials, or the like associated with control equipment.

Still further objects of the invention will become apparent and suggest themselves to those skilled in the art to which the invention is directed upon reading the following specification and claims in connection with the drawing in which:

Fig. 1 is a detailed sectional view sectioned on line 1—1 of Fig. 2 showing one arrangement in accordance with the invention for operating control devices;

Fig. 2 is a plan view in section on line 2—2 of Fig. 1 of the mechanism of Fig. 2; and

Fig. 3 is a view in plan of the control knob of Fig. 1.

Referring to Figs. 1 to 3 of the drawings, an arrangement is shown whereby a gain control resistance unit, potentiometer 43 or the like and a remote control transmitter 44 of a Selsyn motor system or the like can be operated from a single manually operable control handle or knob 46. The potentiometer 43 and the transmitter 44 may, for example, be similar to the gain control 37 and the Selsyn transmitter 33 of Fig. 1 of the drawings of application Serial No. 496,905, above referred to. In that application of which the present application is a division, as stated above, the gain control and Selsyn transmitter are employed to control the gain of a video amplifier and a television camera focusing mechanism, respectively, in combination as claimed therein. When the control apparatus of Figs. 1 to 3 is employed in a television pickup system in conjunction with a television camera, it affords a convenient means for effecting operation of the focusing control for the camera and the gain control for the video amplifier in a manner described in broad terms above and considered in detail in application Serial No. 496,905. However, it will be understood that any two controls of a remote control system may be operated by the mechanism presently to be described in detail although a potentiometer and a Selsyn transmitter have been selected for purposes of illustration.

The knob 46 is secured at the end of the operating shaft 47 of the resistance unit or potentiometer 43. The potentiometer 43 is secured, as by a sheet of insulation 49, or in any other suitable manner, within a housing 52 which is shown fragmentarily on Fig. 1 of the drawings and in plan in Fig. 2. The top of this housing is provided with a boss 53 which is apertured to form a bearing for the shaft 47. The Selsyn transmitter 44 is also secured within the housing 52 and is provided with terminals 56 for connection with a suitable polyphase alternating current source. The transmitting terminals 58 of the transmitter are available for connection to a Selsyn receiver suitably connected to the device to be controlled.

Driving connection from the shaft 47 to the drive shaft 61 of the Selsyn transmitter is obtained through the medium of a friction drive disc 62, the periphery 63 of which is to be frictionally engaged by a shoe member 66 of any desired friction material such as leather, a plastic, or the like. The friction disc 62 is secured as by rivets 68 to a gear 69 which is rotatably mounted on the boss 53. Preferably, the friction disc 62 is also rotatably mounted on the boss 53. The gear 69 meshes with and drives a pinion 71 secured to the Selsyn transmitter drive shaft 61. Shaft 61 may be geared down to give approximately one turn of the Selsyn rotor for one turn of the indicator if desired, or the gear 69 and pinion 71 may be interchanged.

Frictional engagement of the shoe 66 with the friction disc 62 is controlled by the cam surface 72 of a ring 73 which is slotted at angularly spaced points as indicated by reference character 74 to accommodate clamping screws 76 threadedly engaged in the housing 52. The slots 74 provide for angular adjustment of the ring 73. A complete range of adjustment may be provided by locating several sets of holes for the screws 76 around the top of the casing 52 and by elongating the slots 74. The cam surface 72 is offset as indicated at 77 to reciprocate a cam follower 79 adjustably secured, as by a set screw 80 (Fig. 2), upon a reciprocable rod 82 biased to the right as viewed in Fig. 1 by a compression spring 81. The rod 82 is slidably carried by tangs 83 formed on, or integral with, a pointer or an indicator 86 which is secured directly to the shaft 47 or to a ring 90 which may be keyed or sweated on the shaft 47. The end 87 of the indicator 86 is turned at an angle to its main portion and is apertured so as to provide an additional guide for the rod 82. The inwardly turned portion 88 of the indicator end 87 has a slot 89 which guides the follower 79 and prevents rotation of the rod 82. The spring 81 reacts between the securing portion of the cam follower 79 and the end 87 of the indicator 86. The shoe member 66 is adjustably secured, as by a set screw 91 (Fig. 2), to the rod 82.

From the parts thus far described, it will be seen that as the knob 46 is turned, the indicator 86, which is secured to the shaft 47, will turn and by reason of frictional engagement of the shoe 66 with the friction disc 62, the gear 69 will be rotated causing the Selsyn transmitter shaft 61 to be rotated. Concurrently with this, the potentiometer 43 is adjusted. The shaft 47 will continue to drive the gear 69 in the manner just described until a raised portion in the cam track such as the offset 77 is reached, whereupon the rod 82 will be moved toward the left by the cam follower 79 to cause disengagement of the shoe 66 from the friction disc 62. This point of disengagement, which is also the point of engagement when the knob 46 is turned in a clockwise direction to decrease the gain of an amplifier (not shown) associated with the potentiometer 44, may be chosen so that when the amplifier gain is decreased to a given point, the iris diaphragm control of a television camera (not shown) will be operated along with the potentiometer 43. The slots 74 in conjunction with the set screws 76 permit selection of the point of engagement of the Selsyn drive.

In order to provide for conveniently releasing the Selsyn transmitter drive at any time, irrespective of the cam track 72 so that the potentiometer 43 may be separately adjusted, a member 92 is pivotally mounted at 93 in a slot 96 in the knob 46. A compression spring 98 may be provided to keep the member 92 in its inoperative position when it is not deliberately grasped by the hand of an operator when rotating the knob 46. An extension 101 on the member 92 extends downwardly to engage a stop member 102 adjust-

ably secured, as by a set screw 103 (Fig. 2), on the rod 82.

When the knob 46 is turned with the member 92 pressed inwardly, it will be seen that the rod 82 will be moved to the left, releasing the shoe 66 from engagement with the friction disc 62.

The disc 62 is provided with graduations 104 (Fig. 2), and a stationary disc 106 is provided with a scale of graduations 107. The stationary disc 106 is secured in any suitable manner, as by a set screw 108, to the upper portion of the boss 53 which projects beyond the disc 62.

The indicator 86 is provided with an aperture 110 which is covered by a window 111 of suitable transparent material, such as glass or a transparent plastic, secured in any suitable manner to the indicator. A cross hair 113 is provided on the window 111 so that it will cooperate with the scales 104 and 107 of the friction disc 62 and the stationary disc 106, respectively.

The cam ring 73 is provided with graduations 114 which cooperate with a mark 116 on the housing 52 to assist in adjusting the ring 73 angularly with respect to the top of the housing 52 so that the desired point of engagement and disengagement of the shoe 66 with the periphery 63 of the friction disc 62 may be oriented with respect to any point on the stationary scale 107.

Briefly, the combined control mechanism of Figs. 1 to 3 in the drawings is operated in the following manner when this mechanism serves to control a television pickup system, for example. The several scales will then bear graduation suitable for this purpose.

When the knob 46 is manipulated to move the indicator 86 in a clockwise direction as viewed in Fig. 2, the gain of the amplifier controlled by potentiometer 48 is reduced. The maximum gain setting may be indicated by the letter M on the scale 107 as shown. The mechanism is arranged so that rotation of the disc 62 in a clockwise direction reduces the aperture of the lens of the associated television camera, for example, by an arrangement similar to that shown in Fig. 1 of the drawings of the copending parent application Serial No. 496,905 employing a Selsyn motor receiver (not shown).

The angular position of the disc 62 which corresponds to the maximum opening of the television camera iris may be indicated by a O or other suitable mark on the scale 107 coming into register with any desired indicating mark on the stationary disc 106. If the mark M on the scale 107 is chosen, the O and M will be in about the relative positions shown on Fig. 2 after turning the indicator to the position shown, since the offset 77 will have caused the disc 62 to be displaced clockwise angularly by approximately the amount shown. The relative position of the parts shown by Fig. 2 is to be taken as illustrative only and not as showing an absolute mode of operation.

Under typical operating conditions of a television system, the cam ring 73 is locked by the screws 76 in an angular position such that the cam offset 77 is effective when the indicator 86 is turned clockwise to the point where the noise level may be tolerated.

The scales 104 and 107 may be marked off in any units appropriate to the use of the controlling device of Figs. 1 to 3. In general, the graduations or scale divisions 62 will be determined by the nature of the equipment to be operated from the

shaft 61 and the graduations or scale divisions 107 will be determined in like manner by the nature of the equipment operated from the shaft 47. The shape of the lobes and the number of the lobes on the ring 72 will be governed by the desired operative interrelationship of the mechanism or devices coupled to the shafts 47 and 61.

Having now described the invention, what is claimed and desired to be secured by Letters Patent is the following:

1. A combined control mechanism for imparting operative movement to a plurality of control devices for producing interrelated operation of said devices comprising a supporting member, an operating shaft journalled in said supporting member, an operating knob surmounting said shaft, a second shaft rotatably supported with respect to said supporting member, clutch means movable with said first named shaft, driven means for cooperative driving engagement with said clutch means, said driven means being operatively connected to said second named shaft, cam means secured to said supporting means, and means for operating said clutch means by said cam means as said knob is rotated.

2. A combined control device having manual operating means, drive means for a first control device directly connected to said manual operating means, drive means for a second control device, a releasable clutch for operatively connecting said drive means for the first control device to the drive means for the second control device, cam means, means for releasing the clutch under control of said cam means, and means for positioning the cam means in a plurality of selectable positions with respect to said clutch to predetermine the time of operation of said clutch with respect to the operation of the manually operating means.

3. A combined control mechanism for imparting operative movement to a plurality of control devices for producing interrelated operation of said devices comprising a rotatable shaft, an indicator secured to said shaft, a second rotatable shaft, a dial rotatable upon rotation of said second named shaft, a dial stationary with respect to said indicator and said first named dial, releasable clutch means for operatively coupling said first shaft to said second rotatable shaft, and cam means stationary with respect to said indicator, means for operating said clutch under control of said cam means, said dials and said indicator being concentric and said indicator cooperating with said rotatable dial and said stationary dial.

4. A combined control for a transmitter and a potentiometer comprising a manually adjustable member for said potentiometer, clutch means connecting said transmitter to said member, and a cam adjustably positioned for effecting engagement and disengagement of said clutch means.

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