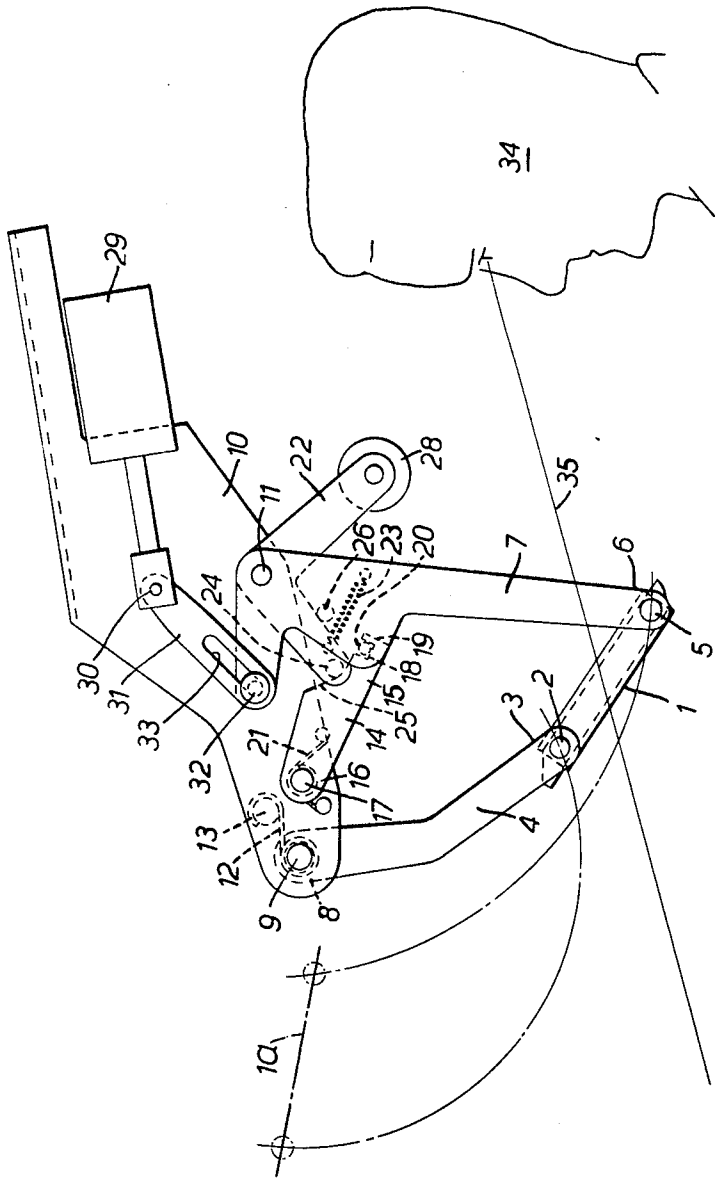
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HEAD-UP DISPLAY SYSTEMS

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HEAD-UP DISPLAY SYSTEMS

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ABSTRACT OF THE DISCLOSURE

A mechanism for removing from the line of sight of an observer the reflector of head-up display apparatus of an aircraft in the event of sudden deceleration. The mechanism includes a spring acting as an energy store, the energy of which is released by a latch either on impact with the observer's head or on receiving a movement of deceleration sensitive device.

This invention relates to automatic retraction mechanisms for display members in head-up display systems.

According to the present invention there is provided in head-up display apparatus, a display member arranged in the line-of-sight of an observer, and means for retracting said display member from said line-of-sight on occurrence of a predetermined condition.

Further according to the present invention there is provided in head-up display apparatus, a partial reflector displaceably mounted in the line-of-sight of an observer, and a retraction mechanism for displacing the reflector from the line-of-sight position to a retracted position whenever a predetermined force acts on the reflector.

Still further according to the present invention there is provided an automatic retraction mechanism for retracting a display member of a head-up display system, said mechanism comprising energy store means, and release means arranged to hold said display member in an operational position and to act on said energy store means to release the energy thereof to retract the display member from said operation position to a retracted position.

It will be appreciated that the store of energy may be mechanical, pneumatic, hydraulic, electrical or magnetic in form.

An embodiment of an automatic reflector retraction mechanism in accordance with the invention will now be described, by way of example, with reference to the accompanying diagrammatic drawing, the sole figure of which is a side elevation of the mechanism.

In the drawing a partial reflector **1** is connected by coaxial pivots **2** to the ends **3** of a pair of leading arms **4** and by coaxial pivots **5** to the ends **6** of a pair of following arms **7** (one only of each of these components being shown in the drawing). The leading arms **4** are connected at their other ends **8** by coaxial pivots **9** to a bracket **10**. The following arms **7** are connected by coaxial pivots **11** to the bracket **10**. Energy storage means in the form of a spring **12** is located adjacent the coaxial pivots **9** and acts between a pin **13** and the leading arms **4** to move the leading arms **4** and consequently the reflector **1** from an operating position (as shown in full lines) to a retracted position (as shown in chain lines at **1***a*).

A latch assembly **14** of the mechanism includes a single latch arm **15** connected at one end **16**, by a pivot **17**, to the bracket **10** and having a slot **18**, adjacent the other end **19**, arranged (in the full line position shown) to cooperate with a pin **20** which is rigidly attached to one of the following arms **7**. The latch assembly **14** also includes a torsion spring **21** and a latch release mechanism

in the form of a bell-crank lever **22**. The torsion spring **21** urges the slot **18** of the latch arm **15** into engagement with the pin **20** and with the release mechanism **22**, which release mechanism is connected by a pivot, coaxial with the pivots **11**, to the bracket **10**, and is connected by a tension spring **23** to the one said following arm **7**. The release mechanism has a pin **24** which cooperates with a ramp **25** on the latch arm **15**. The tension spring **23** acts to bias the release mechanism **22** about the pivot coaxial with the pivots **11** and thus tends to move the pin **24** away from the ramp **25** and to urge the release mechanism **22** against a stop **26** on the one said following arm **7**.

A padded bar or other member **28** is connected to one end of one of the arms of the lever **22**. Movement of the release mechanism **22** against the tension spring **23** away from the stop **26** causes the pin **24** to engage the ramp **25** to move the latch arm **15** against the bias of the torsion spring **21** thereby to disengage the slot **18** from the pin **20** which in turn allows the torsion spring **12** to move the reflector **1** from its operating (full lines) to its retracted position (chain lines).

An air-filled dashpot **29**, rigidly mounted on the bracket **10** is arranged to be operated by movement of the one said following arm **7** and is connected thereto by a pivot **30**, a longitudinally slotted link **31** and a pivot pin **32**. The pivot pin **32** is connected to the one said following arm **7** and slidably cooperates with the slot **33** in the link **31**. Initial movement of the one said following arm **7** slides the pivot pin **32** along the slot **33** until the pivot pin **32** abuts against the end of the slot **33** nearest to the dashpot **29**. Continued movement of the one said following arm **7** operates the piston of the dashpot to reduce the velocity of the said movement.

The reflector retraction mechanism is particularly, though not exclusively, suitable for use in head-up display systems in aircraft in which the display is projected on to the reflector **1**, which is located in an operating position in the normal line-of-sight **35** of a member **34** of the aircrew and in close proximity to the face of the said member **34**. The bracket **10** could in this case be rigidly attached to the structure of the aircraft above the level and forwards of the head of the said member **34**. In the event of retraction of the reflector becoming desirable, a blow to the padded bar **28**, for example by the head of the member **34**, directed towards the left of the drawing, will operate the release mechanism **22** and the latch arm **15** to unlatch the following arms **7** and allow the torsion spring **12** to move the leading and following arms **4** and **7**, and consequently the reflector **1** from the operating position to the retracted position **1***a*, the latter part of this movement being damped by the dashpot **29**.

In an alternative construction the padded bar **28** is replaced by means for actuating the release mechanism on occurrence of a predetermined deceleration in the form of a weight which acts to produce an inertia force on occurrence of the said deceleration.

I claim:

1. In head-up display apparatus,

bracket means arranged to be secured to a vehicle carrying the apparatus,

a linkage pivoted to the bracket means and generally depending therefrom,

a partial reflector forming an optical component of the head-up display apparatus pivotally mounted on the linkage, and movable together with the linkage between an operative position in which the reflector is in the optical vision of an observer and a displaced position in which the reflector is spaced from said optical path,

latch means operative to maintain the reflector in the operative position,

energy-store means biasing the reflector towards the displaced position, and

latch-release means operative on the receipt of a predetermined force to release the latch means whereby the energy-store means move the linkage and the reflector to the displaced position.

2. Apparatus according to claim **1**, wherein said latch-release means includes a padded bar arranged to engage an observer's head on sudden deceleration of the apparatus and to yield under the loading imposed thereon whereby injury to the observer's head is at least reduced.

3. Apparatus according to claim **1**, wherein the linkage comprises,

a pair of leading arms each pivoted at respective ends thereof to the bracket means and to the partial reflector, and

a pair of following arms each pivoted at respective ends thereof to the bracket means and to the partial reflector.

4. Apparatus according to claim **3**, wherein said latch-release means includes

a bell-crank lever pivoted to the bracket means, and

a tension spring connecting one end of the bell-crank lever to one of the said following arms,

said tension spring acting to bias the latch-release means as a whole about the pivot axis of the bell-crank lever to rest against said following arm.

5. Apparatus according to claim **1**, wherein said energy-store means comprises a spring.

6. Apparatus according to claim **1**, comprising

means for retarding movement of the partial reflector at least during the latter part of the movement caused by release of the latch means.

7. Apparatus according to claim **6**, wherein said retarding means comprises

a pneumatic dashpot mounted on the bracket means and connected to one of the following arms of the linkage.

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