June 5, 1951 T. N. KELLY 2,555,592

RETRACTABLE AIR SCREEN FOR TURBOJET ENGINES

Filed March 19, 1949 3 Sheets-Sheet 1

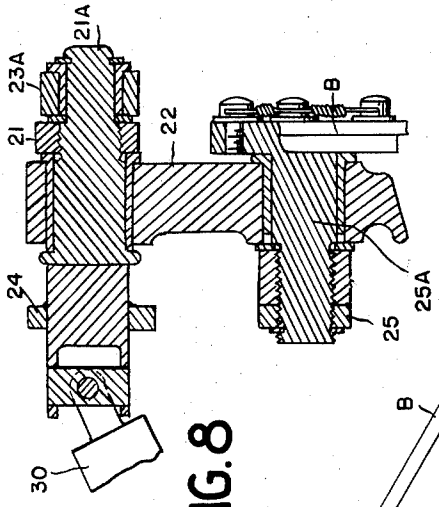

FIG.8

FIG.2.

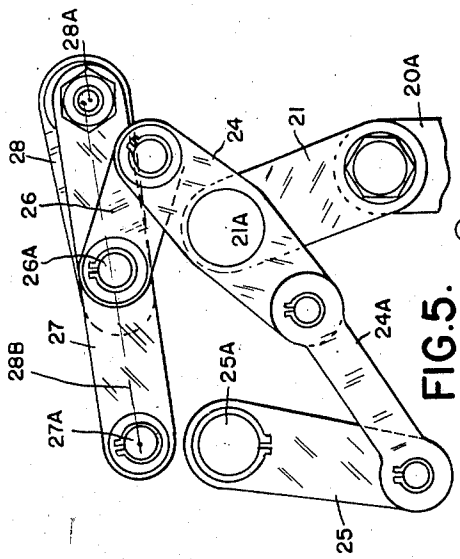

FIG.5.

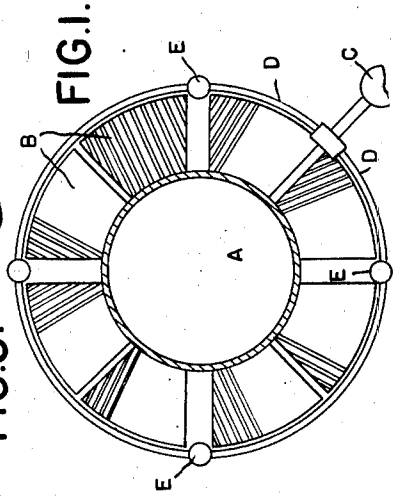

FIG.1.

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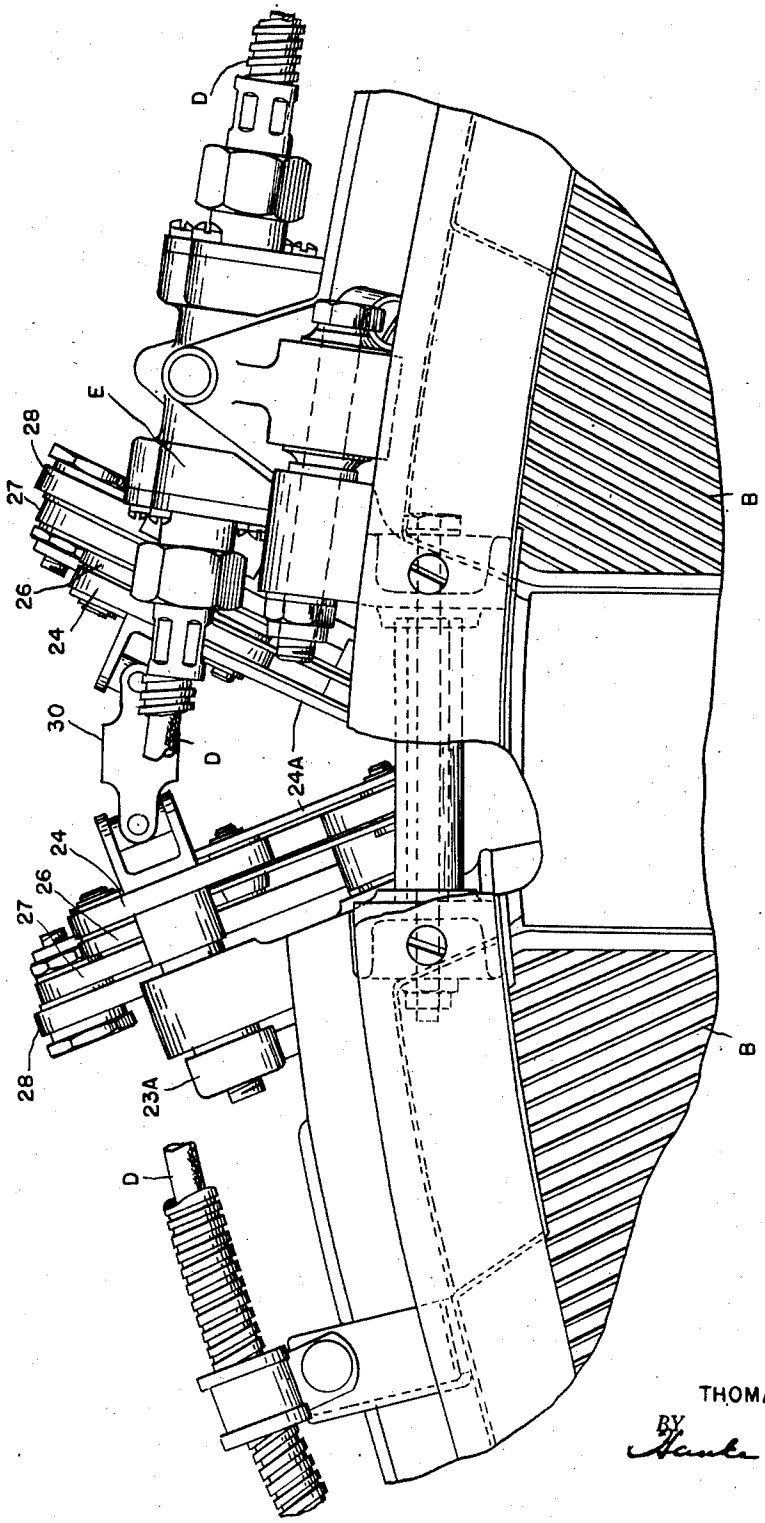

FIG. 3.

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Filed March 19, 1949 3 Sheets-Sheet 3

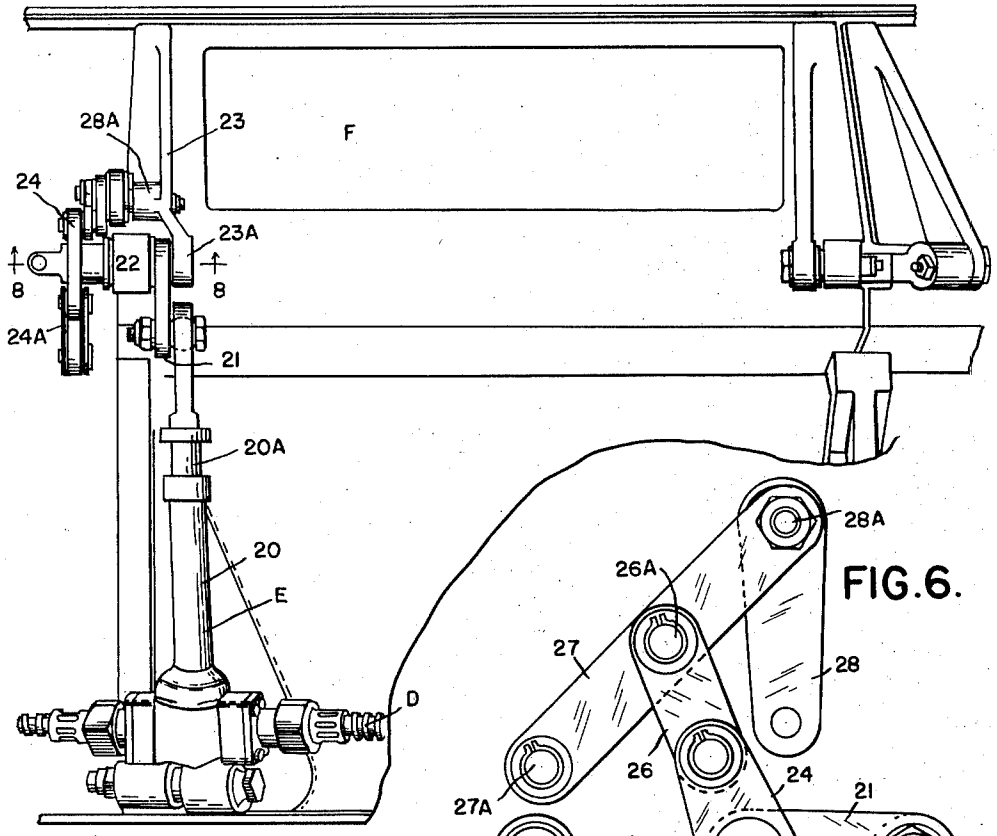

FIG.4.

FIG.6.

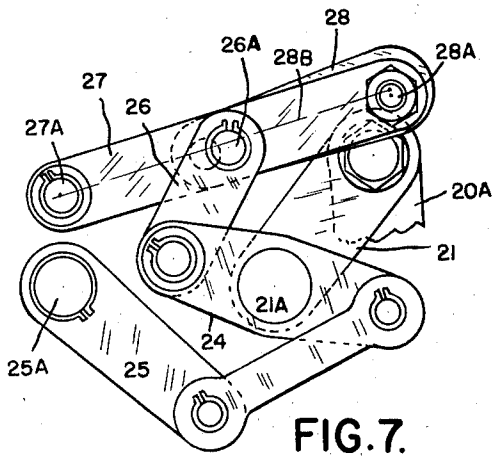

FIG.7.

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UNITED STATES PATENT OFFICE

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RETRACTIBLE AIR SCREEN FOR TURBOJET ENGINES

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Application March 19, 1949, Serial No. 82,370

3 Claims. (Cl. 183—33)

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The present invention relates to turbojet engine airplane installations and specifically to retractible screens for the air intake for such motors.

In such installations, the engine mechanism is customarily mounted axially of a tubular structure with the air intake in the form of an annulus surrounding the engine. With the annulus open at its intake end and of large cross sectional area, air rushing in at high velocity can easily carry in with it debris of one kind or another with disastrous results.

Fixed screens over the inlet are open to various objections, not the least of which is the possibility of icing and consequent restriction of air flow. Fixed screens also might become clogged by debris.

Among the objects of the present invention is the provision of means to eliminate such difficulties by mounting the screens in such fashion that they are retractible from the air inlet and automatically cleared of any debris which they may have collected.

Another object is the provision of a screen mounting and operating means which allows the screen to be cleared of debris during the screen movement and automatically locks the mechanism at the end of such movement.

Still other objects and advantages will be apparent to those skilled in the art upon reference to the following description and the accompanying drawings in which

Fig. 1 is a more or less diagrammatic view showing the screen arrangement.

Fig. 2 is also a diagrammatic view showing relative location of a screen frame and evacuation door.

Fig. 3 is a view in elevation of the screen operating mechanism as viewed from the intake side.

Fig. 4 is a plan view of the screen operating means.

Fig. 5 is a diagrammatic view of the linkage through which the evacuation door is operated—screens in active position.

Fig. 6 is a similar view showing the linkage in an intermediate position.

Fig. 7 is a similar view showing the position of the linkage when the screen is retracted.

Fig. 8 is a section on line 8—8 of Fig. 4, somewhat enlarged.

In the drawings, Fig. 1 indicates the general arrangement of the engine, air intake, air screens and means for operating the latter. The central circular space A is occupied by the engine

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and this is surrounded by the screened annular air intake, the screen being in sections B. All of the latter are indicated as being operated by a single motor C driving through a flexible shaft D a plurality of mechanisms E, each of the latter in turn operating a part of screen sections B.

Fig. 2 shows the relative location of a screen section B and its evacuation door F and also the two positions each may assume, the door F being in the dotted line position F′ at about the midway position of the screen B, that is, it is closed and locked when the screen is stationary at either end of its movement but opens and closes when the screen is opened or closed.

The arrow indicates direction of air flow.

Referring first to Fig. 4 which shows a plan view of the mechanism, the actuator E consists of a more or less conventional screw jack, the base portion **20** containing a screw and nut adapted to move a plunger **20A** in or out of the base portion. The plunger **20A** is connected at its free end to a crank arm **21** fixed to a short shaft **21A** (see Fig. 8) mounted in a bearing in a fixed frame member **22**. Mounted to rotate freely upon the adjacent end of shaft **21A** is the eye **23A** of the hinge member of door F, the hinge member being the rib **23B** forming part of the door structure.

That portion of shaft **21A** beyond member **22** has fixed to it in any suitable manner, as by welding, a double crank member **24** having at one end pivoted thereto a link **24A** whose other end is pivoted to a crank arm **25** fixed to a shaft **25A**, also carried in a suitable bearing in frame member **22**, which also serves as a hinging member for one of the screen sections B. The other end of the double crank **24** has pivoted upon it a short link **26** pivoted at its other end to the central portion of a lever arm **27** mounted to swing about a pin **27A** carried upon frame member **22**. At the free end of arm **27** is pivoted a link **28** which connects with the rib **23B** on door F, being hinged thereto through a suitable pin and boss **28A**.

The operation of the plunger **20A** through its actuation of the double crank **24** will therefore swing the screen B from one to the other of the positions shown in Fig. 2 and simultaneously open and close the door F.

It should be noted that the pin is so formed that the center of that portion in lever **27** is slightly offset from the center of that portion in arm **28** and slightly above the latter when looked at in Figs. 5 and 7. This formation provides for some adjustment but its main function is to pro-

vide locking means for the linkage at both ends of the screen movement. Referring to Figs. 5 and 7, it will be seen that the center of pin **26A** is slightly below a line **28B** drawn from the center of the bearing for arm **28** to the center of pin **27A**. This construction provides a toggle, over-center locking action for the linkage.

As shown in Fig. 3, two of the linkages are connected by means of an universal joint drive **30** and both operated by one actuator E. At the other end of a screen section B the screen B and door F are both mounted on simple hinges, the hinge for the door being shown at the right of Fig. 4.

I claim:

1. In combination with the annular air intake conduit of a jet engine, an air screen in said conduit, said screen consisting of sections swingable from their operative screening position to a position approximately parallel to the axis of the air annulus, a door opening outwardly and located rearwardly of the screen in the outer wall of said conduit, in position to permit debris to be ejected from said screen through said door, and means for swinging said screen sections and opening and closing said door, said means consisting of motor means, a crank arm actuable thereby, a shaft to which said arm is fixed, said shaft having also fixed thereto a second arm, screen actuating means operable by one end of said second arm and door actuating means operable by the other end of said second arm.

2. In combination with the annular air intake conduit of a jet engine, an air screen in said conduit, said screen consisting of sections swingable from their operative screening position to a position approximately parallel to the axis of the air annulus, a door opening outwardly and located rearwardly of the screen in the outer wall of said conduit, in position to permit debris to be ejected from said screen through said door, and means for swinging said screen sections and opening and closing said door, said means consisting of motor means, a crank arm actuable thereby, a shaft to which said arm is fixed, said shaft having also fixed thereto a second arm, a link pivoted to one end of said second arm, said link adapted to swing a screen section, a link pivoted to the opposite end of said second arm, a lever of the third class actuated by the latter link, and means operatively connecting the free end of said lever to said door.

3. In combination with the annular air intake conduit of a jet engine, an air screen in said conduit, said screen consisting of sections swingable from their operative screening position to a position approximately parallel to the axis of the air annulus, a door opening outwardly and located rearwardly of the screen in the outer wall of said conduit, in position to permit debris to be ejected from said screen through said door, and means for swinging said screen sections and opening and closing said door, said means consisting of a motor means, a crank arm actuable thereby, a shaft to which said arm is fixed, said shaft having also fixed thereto a second arm, a link pivoted to one end of said second arm, said link adapted to swing a screen section, a link pivoted to the opposite end of said second arm, a lever of the third class actuated by the latter link, and means operatively connecting the free end of said lever to said door, the center of the point of attachment of the latter connecting means being above the center line of said lever passing through the centers of the fulcrum and the center of the point of attachment of the second link thereto.

THOMAS N. KELLY.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,381,705	Vokes	Aug. 7, 1945
2,407,194	Vokes	Sept. 3, 1946