Dec. 17, 1957 H. TROEGER 2,816,449

STARTER JAW MECHANISM

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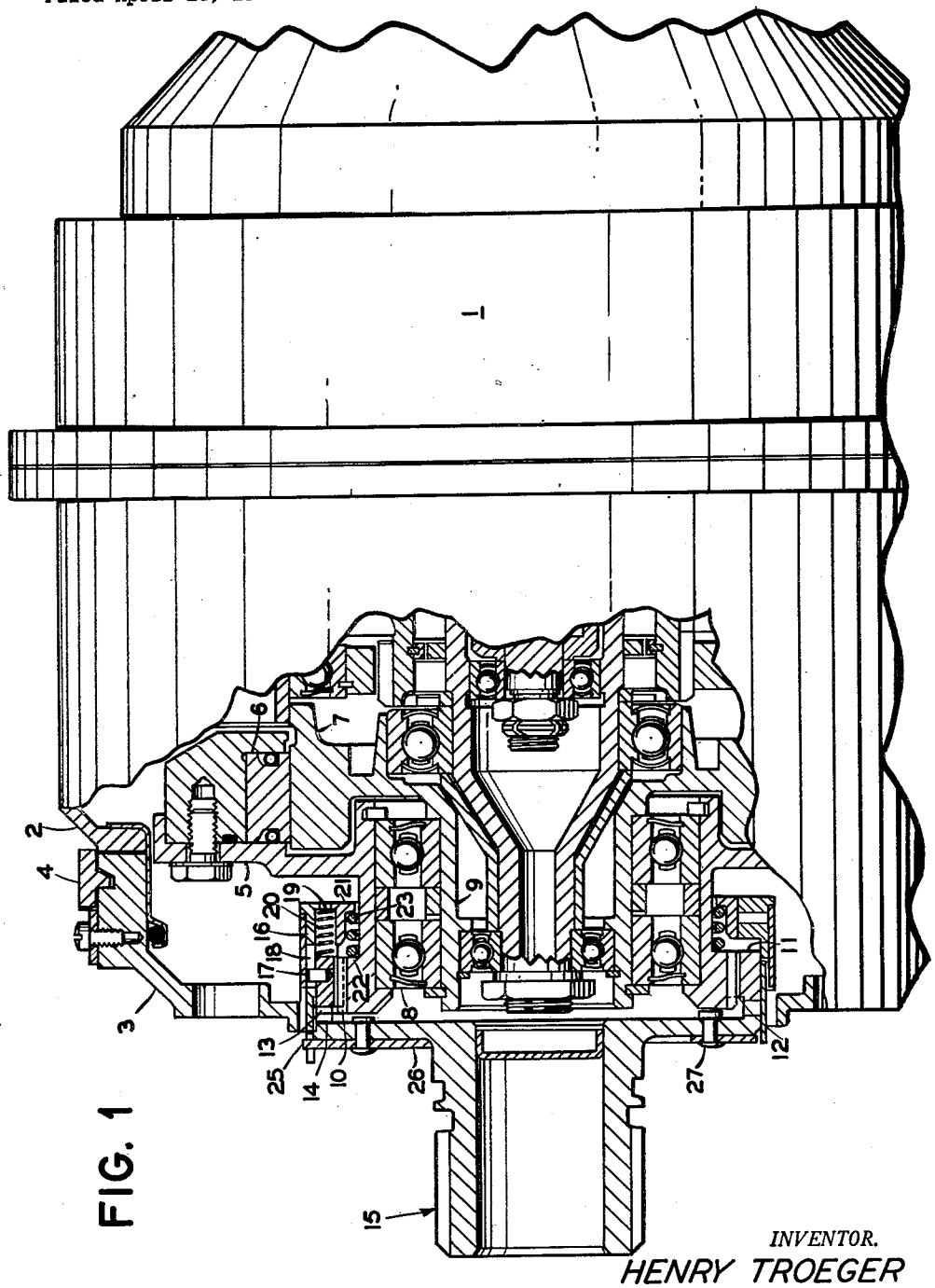


FIG. 1

INVENTOR.
HENRY TROEGER
BY
ATTORNEY

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FIG. 2

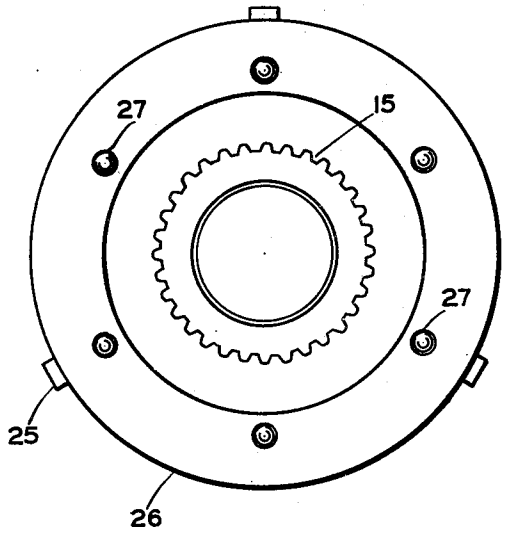
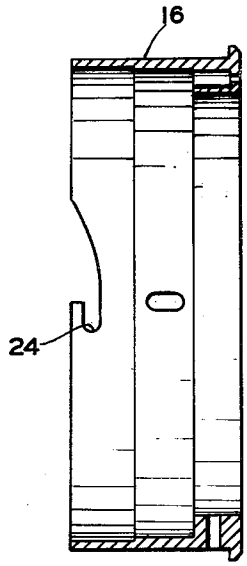


FIG. 3



INVENTOR.
HENRY TROEGER
BY
ATTORNEY

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STARTER JAW MECHANISM

Henry Troeger, Ramsey, N. J., assignor to Bendix Aviation Corporation, Teterboro, N. J., a corporation of Delaware

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6 Claims. (Cl. 74—7)

The present invention relates to engine starters and more particularly to an overload release mechanism adapted for starting jet engines.

It is necessary that starters for turbine engines operate at a high speed in order to bring the engine up to a self-sustaining speed. Various types of starters such as those of the turbine type which are suitable for the high speed operation have a very high rate of acceleration and it is desirable that the starter be connected to the engine before energizing the starter. With the conventional screw shaft type starter jaws, before meshing would occur the jaw would be up to a substantially high speed causing severe shock on meshing. It has been found that an overrunning or one-way clutch is satisfactory to connect the starter to the engine.

In operation upon the starter being energized, torque is transmitted through the overrunning clutch to the engine member. Upon the engine obtaining speed greater than that of the starter the clutch permits the engine to overrun the starter thereby disconnecting it from the engine.

In certain instances however, the overruning clutch has been known to seize and not release to permit the engine to overrun the starter. The present invention provides novel means whereby the high torque output of the starter may be satisfactorily transmitted in one direction to the engine and it will disconnect the starter from the engine should some small predetermined torque be applied in the other direction. In the present invention the jaws on the output shaft are held in driving connection with those of a spline jaw block which is held in place by a latch device which comprises a multifingered plate attached to the output shaft and which engages a cylindrical sleeve attached to the driving shaft.

It is an object of the invention to provide a novel reverse overload release mechanism.

Another object of the invention is to provide a novel jaw mechanism for a starter.

Another object of the invention is to provide an emergency release mechanism.

The above and other objects and features of the invention will appear more fully hereinafter from a consideration of the following description taken in connection with the accompanying drawings wherein one embodiment of the invention is illustrated by way of example.

In the drawings:

Figure 1 is a partial cut-away view of a starter embodying the invention.

Figure 2 is an end view illustrating the fingered plate.

Figure 3 is a cross sectional view of the cylindrical sleeve for engaging the fingered plate.

Referring now to the drawing, a starter is indicated generally by the numeral **1** and has a housing **2** adapted to be secured to an engine mounting flange **3** by a quick disconnect coupling **4**. The quick disconnect coupling **4** may be of the type disclosed and claimed in Patent No. 2,553,220 issued May 15, 1951, to Henry Troeger. A drive plate **5** is connected through overrunning clutch **6** to gearing **7** which is driven from a suitable source of motive power such as a gas turbine or the like. The plate **5** is mounted on bearings **8** supported by an extension **9** of the gearing **7**.

The plate **5** has its external splines **10** adapted to slidingly engage a spline jaw block **11** which has internal splines **12** and a starter jaw tooth set **13** on one end thereof. The teeth **13** normally engage a mating set of starter jaw teeth **14** on an output shaft **15** adapted to be splined for engagement with a main engine (not shown).

A cylindrical like sleeve **16** holds the spline jaw block **11** in engagement with the splines **10** on the drive plate **5**. A pin **17** fitted in the block **11** is adapted to engage a slot **18** in the sleeve **16** to hold the sleeve **16** in proper alignment. The sleeve **16** has a plurality of counterbore portions **19** adapted to receive a plurality of springs **20** which serve to bias the spline block **11** into engagement with the member **15**. Also positioned between a flange **21** on the sleeve **16** and shoulder **22** on the member **5** is a pull back spring **23**.

The sleeve **16** has a plurality of slots **24** which may best be see in Figure 3. The slots **24** are adapted to cooperate with fingers **25** on a latch plate **26** secured to the output member **15** by rivets **27**. The slots **24** are so designed that torque may be transmitted in one direction only and that a reverse torque will move the fingers **25** out of the slots **24**.

In operation when the engine has started and has attained a self-sustaining operating speed, the overrunning clutch prevents the engine from driving the starter turbine at excessively high speed, however, in the case of malfunction of the clutch **6**, the spring **20** will permit the teeth **13** and **14** to ratchet, thus placing the load upon the fingers **25**. Inasmuch as the fingers **25**, in the reverse direction, merely drive the ring **16** through friction, upon the torque exceeding a predetermined amount, the friction will be overcome and the fingers **25** will be moved out of engagement with the slots **24**. This relieves the tension upon the spring **20** and enables the spring **23** to move the spline block **11** out of engagement with the output member **15**. The rivets **27** holding the plate **26** to the member **15** are provided with a large head and serve as bearings for the output member **15** upon the jaws being released.

Although only one embodiment of the invention has been illustrated various changes in the form and relative arrangement of the parts, which will now appear to those skilled in the art may be made without departing from the scope of the invention.

What is claimed is:

1. For use in an engine starter of the type having a starter jaw connected to an engine member by an overrunning clutch, the combination comprising a first member connected for rotation in one direction by said overrunning clutch, a second member adapted to be connected to said engine member, spline means for interconnecting said members, spring means for normal biasing said spline means into engagement, and friction means responsive to a predetermined torque by said second member to release said spring means thereby to move said spline means out of engagement.

2. For use in an engine starter, the combination comprising a drive plate, output gearing, an overrunning clutch connecting said drive plate with said output gearing for transmitting torque in one direction, a splined jaw block carried by said drive plate and movable axially relative thereto, an engine jaw member adapted to mate with said jaw block, spring means normally biasing said jaw block into engagement with said engine jaw, other spring means for biasing said jaw block out of engagement with said engine jaw, and latching means for normally preventing said other spring means from disengaging said jaw block and said engine jaw, said latching means

being responsive to a predetermined reverse torque to permit said other spring means to disengage said jaw block from said engine jaw.

3. A reverse torque disconnect mechanism comprising a driving member, a driven member, a splined jaw member carried by said driving member and movable axially relative thereto, said driven member having a mating jaw portion, yieldable means for normally biasing said jaws together, spring means for urging said jaws out of engagement, restraining means for normally preventing said spring means from urging said jaws out of engagement, and means responsive to torque in a reverse direction exceeding a predetermined value to release said restraining means.

4. A reverse torque disconnecting mechanism for use in an engine starter connected to an engine member by an overrunning clutch, comprising a driven member adapted to be rotated in a predetermined direction through said overrunning clutch, a driven member adapted for connection to an engine member and having starter jaw teeth thereon, a splined jaw block carried by said driven member and movable axially relative thereto, said jaw block having mating starter jaw teeth thereon, retaining means including a spring for normally urging said teeth into engagement, latching means carried by said driven member for holding said retaining means in an operative position, said latching means being responsive to reverse torque to release said retaining means, and means for urging said jaws out of engagement upon the release of said retaining means.

5. A reverse torque disconnect mechanism for use in an engine starter connected to drive an engine member through an overrunning clutch, comprising a driving member connected for rotation through said overrunning clutch, a driven member, yieldable jaw tooth means for interconnecting said driving and driven members, and means responsive to a predetermined value of reverse torque which results when said driven member attains a speed greater than said driving member and said clutch does not release for disconnecting said jaw tooth means.

6. A reverse torque disconnect mechanism for use with an engine starter connected to an engine by an overrunning clutch, comprising a driving member, a splined jaw block rotatable with and movable axially relative to said driving member, an axially stationary rotatable driven member having jaws adapted to mate with said jaw block, a retaining ring connected for rotation with and axial movement relative to said jaw block, spring means adapted to be compressed between a flange on said retaining ring and said jaw block for yieldably urging said jaw block into engagement with said output member, a fingered plate secured to said output members and adapted to coact with slots in said ring member to hold said ring member in a position to place tension on said spring means, said fingered member being responsive to reverse torque to move out of engagement with said slots, and other spring means for urging said jaw block out of engagement with said output member upon said fingered member being moved out of engagement with said slots.

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