(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 255 490**
A2

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **87830248.8**

(22) Date of filing: **01.07.87**

(51) Int. Cl.4: **B 61 B 12/12**
B 61 B 12/06

(30) Priority: **18.07.86 IT 5364586**

(43) Date of publication of application:
03.02.88 Bulletin 88/05

(84) Designated Contracting States:
AT CH DE ES FR GR IT LI SE

(71) Applicant: **AGUDIO S.p.A.**
Via Tommaso Agudio 8
I-10040 Leini (Torino) (IT)

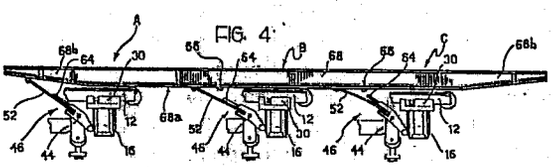
(72) Inventor: **Biengini, Sergio**
Via Funicolare No. 15
I-12086 Mondovi (Cuneo) (IT)

(74) Representative: **Jacobacci, Filippo et al**
c/o JACOBACCI-CASETTA & PERANI S.p.A. Via Alfieri 17
I-10121 Torino (IT)

(54) A device for checking clamping in continuously-moving cableways.

(57) A device for checking the clamping of cabins to the cable of a continuous cableway with automatic coupling, comprising a rocker arm (46) one end of which consists of a leaf spring (52) adapted to exert a predetermined elastic force on the coupling clamp (16) to urge it to slide parallel to the cable during the elastic engagement of the spring (52) with a fixed guide (68). This guide (68) is situated downstream of the automatic cabin-coupling zone.

FIG. 4



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Description

A device for checking clamping in continuously-moving cableways

The present invention relates to a safety device for continuously-moving cableways including a plurality of cabins provided with automatic coupling members, adapted to ensure the temporary engagement of the vehicles with a moving cable, of the type provided with means for selectively urging the coupling members to slide relative to the cable.

Devices of the above type have at least one coupling clamp pivoted on the support structure of the cabin which can be urged to slide on the cable of the system by means of a suitable control lever; this lever is operated after the coupling of the cabin onto the cable, by means of a rocker beam of appreciable mass, positioned above the cable, which exerts a predetermined force, equal to the weight of the beam, on the lever. This system has been shown to be effective for cable speeds no greater than approximately 3 m/sec. For higher speeds, such as those which can currently be achieved by modern cablecar installations, such a device is no longer reliable in that it is affected both by the appreciable inertia of the beam itself, which causes the lever to impact forcefully against the beam, and by the shorter time interval during which clamping can be checked, as well as by the weight of the beam itself.

The object of the present invention is to provide a device of the type indicated at the beginning of the description which does not have the above disadvantages and which can be used safely and reliably even on continuous cableways with automatic coupling and high cable speeds.

According to the invention, this object is achieved by virtue of the fact that the device includes, for each cabin, at least one checkable coupling member, slidably supported by the cabin and able to move parallel to the cable between first and second positions; at least one rocker arm pivoted on the cabin and having a first end associated with a portion of the arm having a predetermined flexibility and a second end adapted to act on the checkable coupling member as a result of the rotation of the arm to urge it to move from the first to the second position; the first end of the arm being adapted to cooperate elastically, during checking, with a fixed check guide arranged substantially parallel to the cable downstream of the clamping zone of the cabin, and being provided with monitoring means adapted to provide a signal indicative of the movement of the checkable coupling member on the cable as a result of pressure exerted by the rocker arm.

Due to the above characteristics, the checking force which urges the coupling clamp to slide is independent of the speed of the cable. Further, it is no longer necessary to use heavy rocker beams and it is possible to guarantee an adequate checking time.

Preferably the device includes elastic means interposed between the cabin and the checkable coupling member for retaining the latter elastically in the first position.

Further advantages and characteristics of the device according to the present invention will be apparent from the following detailed description, provided purely by way of non-limiting example, with reference to the appended drawings in which:

Figure 1 is a partially-sectioned lateral view of the device,

Figure 2 is a section taken on the line II-II of Figure 1,

Figure 3 is a section taken on the line III-III of Figure 1, and

Figure 4 is a schematic lateral view which illustrates the operation of the device.

With reference to the drawings, 10 indicates a portion of the support structure of a cabin (not illustrated) including a beam 12 arranged horizontally and parallel to the cable F and a vertical auxilliary beam 14 fixed to the beam 12. Wheels R for guiding the cabin on the overhead monorail at a station (not illustrated) are rotatably mounted on the structure 10.

An automatic coupling clamp provided with jaws 18 is indicated 16; clamping of the jaws 18 on the cable F is caused by rollers 20 operated in known manner by a control lever 22. A coupling S slidable parallel to the axis X-X of the cable F is located between a portion 16a of the clamp 16 adjacent the beam 12 and the beam 12 itself. In particular, the portion 16a of the clamp 16 has a flat surface 16b in contact with a corresponding flat surface 28 of a guide element 30 welded to the beam 12. The guide element 30 has two holes 32 with axes parallel to the axis X-X of the cable F on opposite sides of the beam 12 designed to accommodate slidably two guide pins 34.

The portion 16a of the clamp 16 also has two end bushes 36a and 36b respectively, arranged coaxially at the ends 34a of the guide pins 34 and fixed to the ends themselves. The bushes 36a and 36b are fixed by bolt devices 40 to the portion 16a of the clamp 16. Sleeves 38 of anti-friction material are interposed between the holes 32 and the guide pins 34. Helical springs 43 surrounded by protective bellows 43 of elastomeric material, coaxial with the guide pins 34, are also interposed between the bushes 36a, adjacent the vertical beam 14, and the guide element 30.

A rocker arm generally indicated 46 is pivoted on the vertical beam 14 of the structure 10 by means of a pin 44 about a horizontal axis Y-Y. The arm 46 includes a rigid portion 46a constituting an operating end 48 of the lever. A leaf spring 52 having a shaped end 54 is attached by means of compression bolts 50 to the rigid portion 46a. The portion 46a of the arm 46 also has a rigid bar 56 extending parallel to the leaf spring 52.

The end 48 of the arm 46 is provided with a rotatable pressure roller 58 in contact with a facing surface 60 of the clamp 16. A regulating screw 62 cooperating with a threaded seat 62a carried by the beam 14 is associated with the portion 46a of the arm 46.

The rigid bar 56, associated with the portion 46a of the arm 46, has a transverse pin 64 at one end 56a for cooperating with a proximity switch 66 (Figure 4) fixed to a double T beam 68 whose function will become clear from the following description of the operation of the device.

After automatic coupling of the clamp 16 to the moving cable F has occurred, the cabin, with its support structure 10, is transported by the cable F towards the checking beam 68 which is provided with a lower track 68a and has tapered end portions 68b. After the clamping of the jaws 18, the device is as shown in Figure 1, that is, with the clamp 16 in the end position (to the left of the guide element 30 with reference to Figure 1), this position being ensured, on clamping of the jaws 18, by the helical spring 42. When, during the motion of the cabin, the end 54 of the leaf spring 52 comes into contact with the guide 68a (the condition indicated A in Figure 4), the roller 58 urges the clamp 16 to slide relative to the cable F with a force proportional to the elasticity of the spring 52. Two conditions can result from this force. In the first condition, indicated by B in Figure 4, in which sliding of the clamp 16 on the cable F occurs, the respective surfaces 13b and 28 of the plate 42 and the guide element 30 slide against each other, the sleeves 38 slide on the guide pins 34 and the helical springs 42 are compressed; in other words, the distance of travel L guaranteed by the particular configuration of the clamp 16 has been used up. The above sliding is signalled by the proximity switch 66, calibrated to provide a signal indicative of the relative distance between the switch itself and the activating pin 64; in fact, as the clamp 16 slides on the cable F, the whole arm 46 rotates about the pin 44 so that the rigid bar 56 and the leaf spring 52 are kept parallel.

When the jaws 18 are coupled correctly with the cable F (the condition indicated C in Figure 4) the clamp 16 does not slide on the cable F so that the leaf spring 52 bends on contact with the guide 68a and the portion 46a does not rotate about the pin 44; in this way the pin 64 will be situated at the correct distance from the proximity switch 66 which therefore produces a signal indicative of correct coupling.

Systems differing from that described above can be used to detect unsuccessful coupling and the consequent rotation of the rocker arm 46. For example deformation sensors for sensing the deformation of the guide 68a, adapted to signal the deformation resulting from the force exerted by the leaf spring 52, may be associated with beam 68. Another convenient signalling system provides for a resilient member to be installed in correspondence with the end 68b of the beam 68 opposite the starting station, the resilient member being adapted to be brought into correspondence with a proximity switch by the leaf spring 52 in the case of correct engagement.

Claims

1. A safety device for continuously moving cableways including a plurality of cabins provided with automatic coupling members adapted to ensure temporary engagement of the vehicles with a moving cable, of the type provided with means adapted selectively to urge the coupling means to slide relative to the cable, characterised in that it comprises, for each cabin,
- at least one checkable coupling member (16) supported slidably by the cabin (10) and movable parallel to the cable (F) from a first to a second position,
- at least one rocker arm (46) pivoted on the cabin (10) and having a first end (54) associated with a portion (52) of the arm (46) which has a predetermined flexibility and a second end (48) adapted to act on the checkable coupling member (16) as a result of rotation of the arm (46), to urge it to move from the first to the second position, the first end (54) of the arm (46) being adapted to cooperate elastically during checking with a fixed check guide (68, 68a) arranged substantially parallel to the cable (F) downstream of the cabin-coupling zone, monitoring means (64,66) being provided for providing a signal indicative of sliding of the checkable coupling member on the cable as a result of a force exerted by the rocker arm (46).

2. A device according to Claim 1, characterised in that it includes elastic means (42) interposed between the cabin (10, 30) and the checkable coupling member (16) for retaining the latter elastically in the first position.

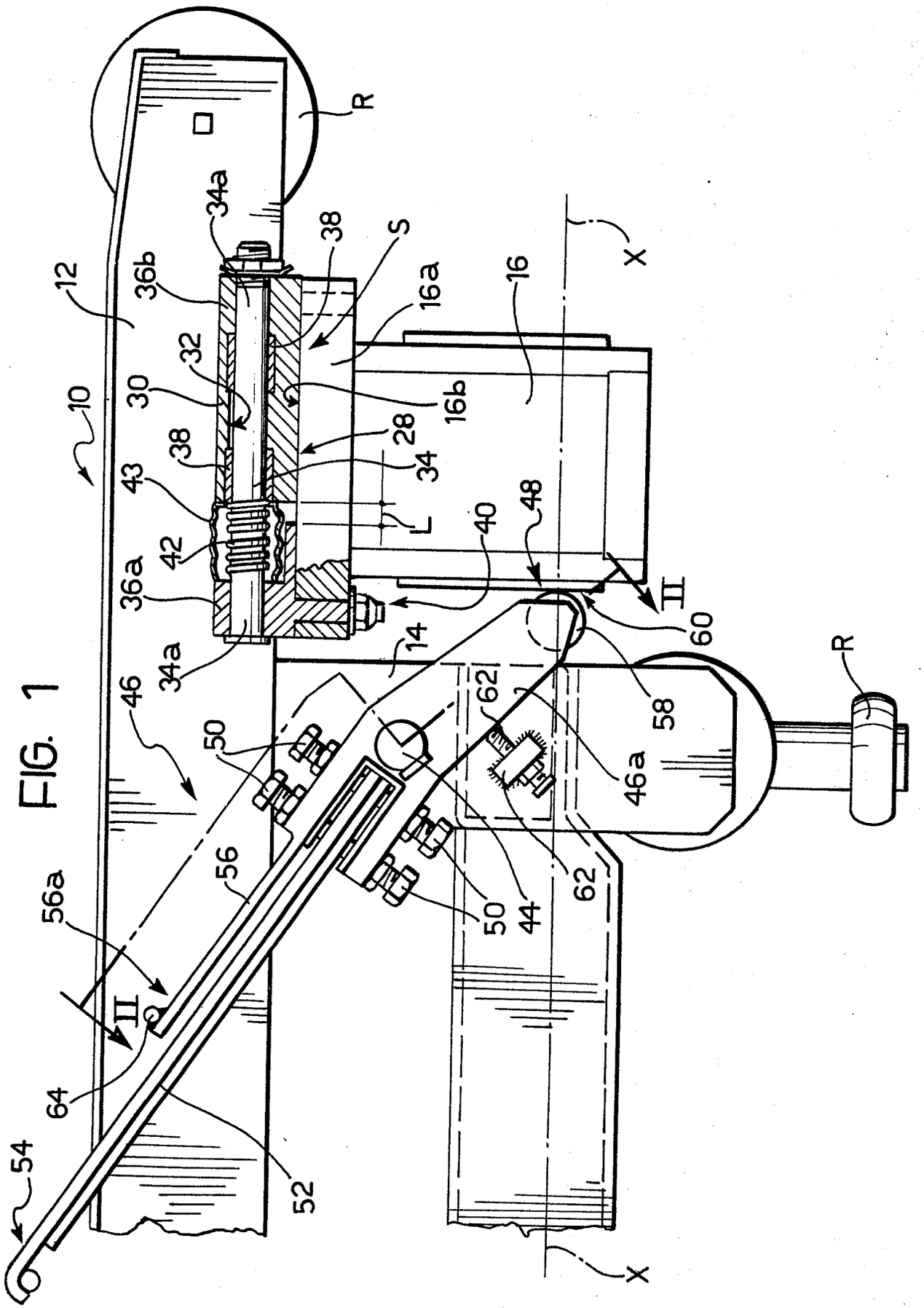
3. A device according to Claim 1, characterised in that the portion of the arm (46) which has a predetermined flexibility consists of a leaf spring (52) connected to a rigid portion (46a) of the arm (46).

4. A device according to Claims 1 and 3, characterised in that the monitoring means comprise a proximity switch (66) for detecting the elastic displacement of the leaf spring (52) relative to the rigid portion of the arm (46a), this displacement being indicative of correct clamping of the checkable coupling member (16) to the cable (F).

5. A device according to Claim 1, characterised in that the check guide consists of a fixed beam (68) provided with shaped ends (68b) adapted to permit progressive cooperation between the first end (54) of each rocker arm (46) and the beam itself.

6. A device according to Claim 1, characterised in that there is a rotatable pressure roller (58) between the second end (48) of the arm (46) and the checkable coupling member (16).

7. A device according to any one of the preceding claims, characterised in that the rocker arm (46) is pivoted on a support structure of the cabin (14, 12) about a substantially-horizontal axis Y-Y perpendicular to the cable (F) and in that the first end (54) of the arm (46) is higher than the second end (48) and is inclined backwards with respect to the direction of movement of the cable (F).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38
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32
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16b
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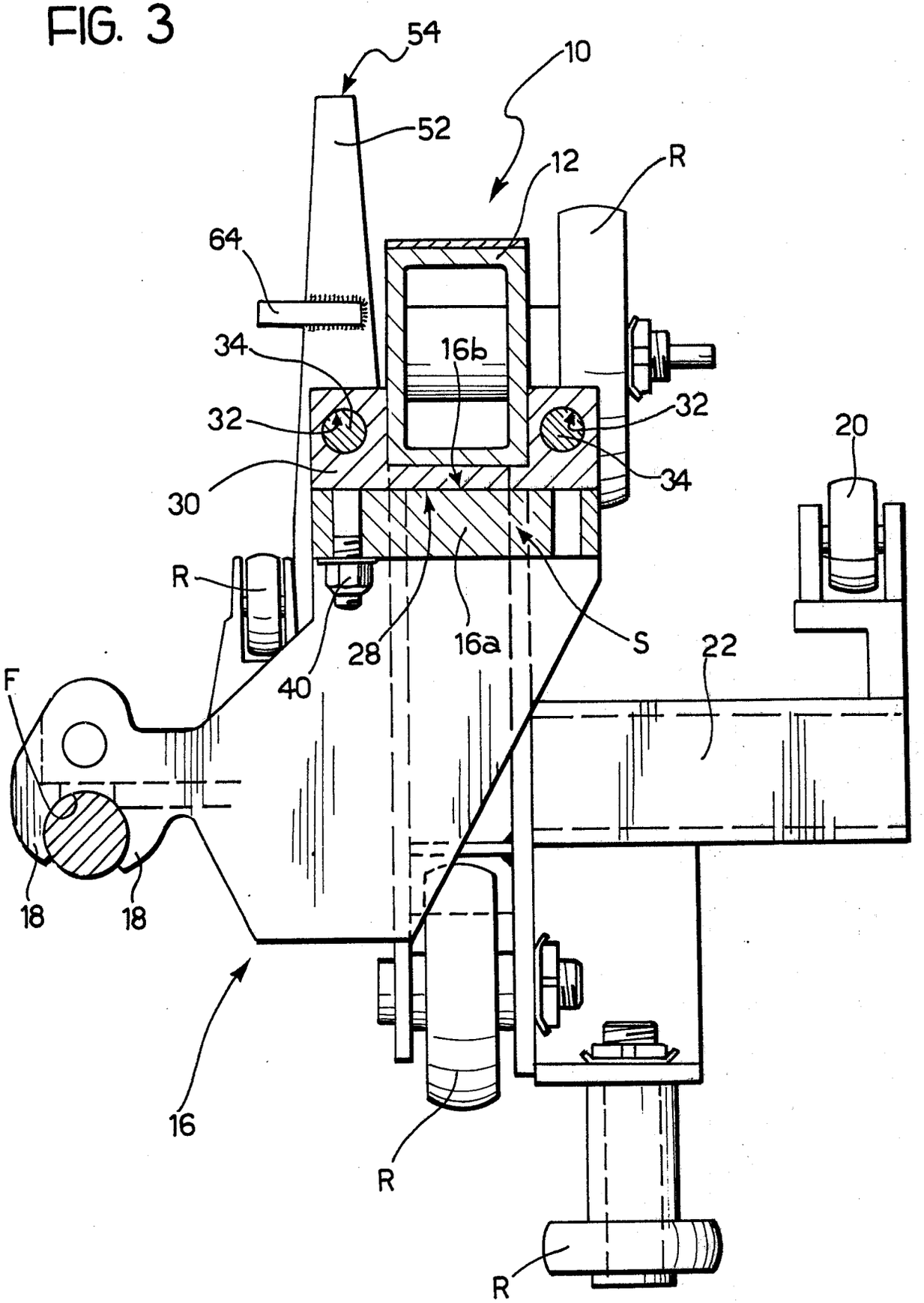
FIG. 1

FIG. 3



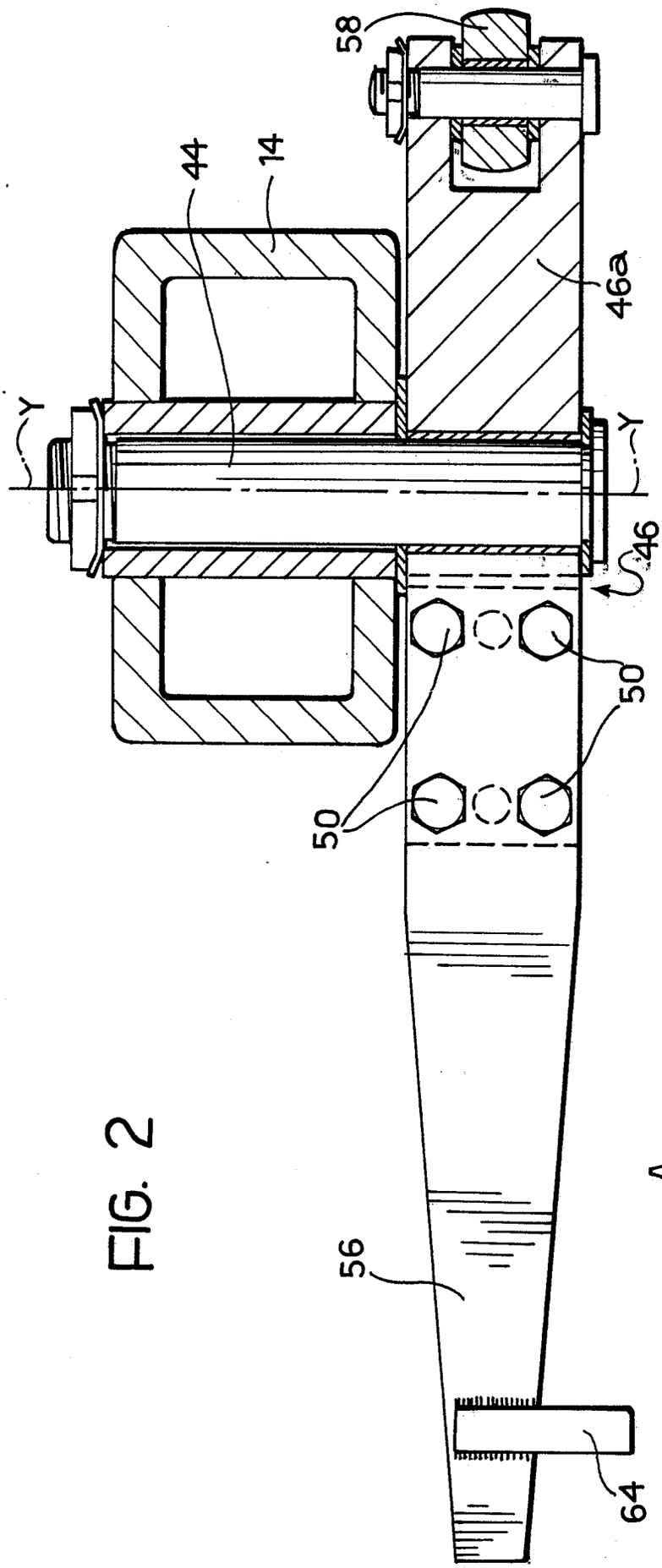
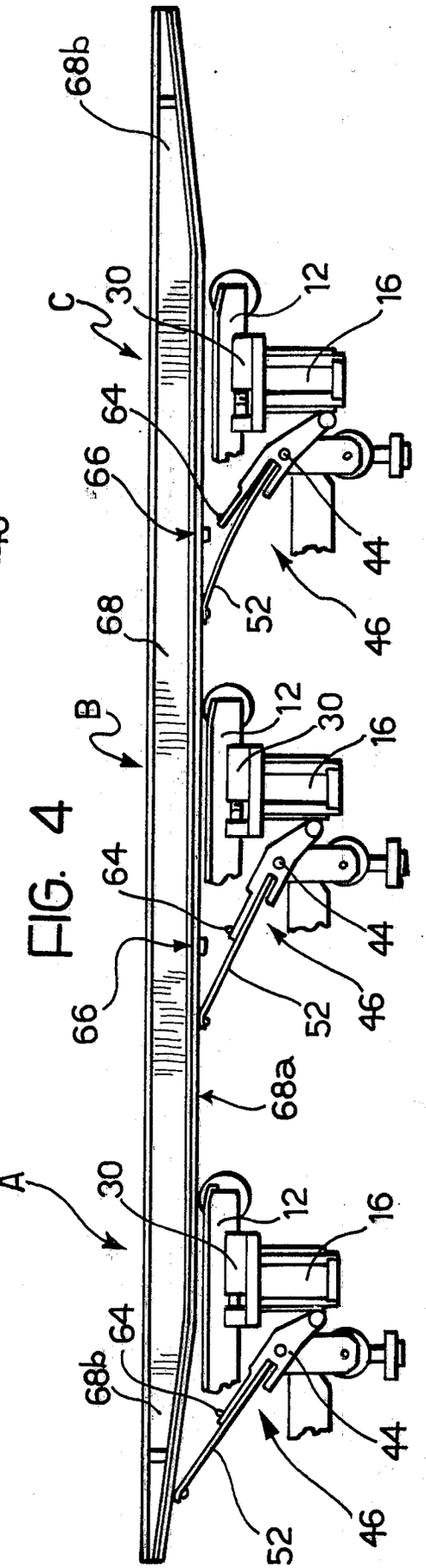

58
44
14
46a
Y
Y
46
50
50
56
64

FIG. 2


68b
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68a
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FIG. 4