SOME THOUGHTS ON USING RAPPEL RACKS AS BELAY DEVICES

A demonstration of an alternate reeving method which allows a Nano-Rack to function as an effective belay device, including passing the "whistle test" along with some thoughts on using other racks in a similar manner. Testing methods and results will be discussed in detail.

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Some Thoughts on Using Rappel Racks as Belay Devices

Presented at ITRS '99 by Carroll Bassett, BMS

In a recent series of experiments with our Nano-Rack we realized that an alternate reeving method might allow the device to function as an effective belay device, see fig. 1. In subjecting the device to a series of drop tests on our "drop tower" our suspicions were confirmed, see fig.2. Because of height limitations in our shop we have been unable to duplicate the full 3 meters of rope called for in the BCCTR standard [1], and substituted a length of 72 inches, slightly less than 2 meters. Also our drop weight of 600 lbs. (272 kg.) is larger than the 200 kg. called for in the BCCTR standard. These factors dictate that our test is more severe than the Canadian "Belay Competency Test" and make direct comparisons a little more difficult. Another limitation of our test setup is the inability to measure the force generated at the upper anchor point during a drop. This situation should be remedied soon but not before the publishers deadline for this paper, 10/1/99. I hope to have this information available by the actual date of this symposium, 11/4/99.

Extending this concept a little further we realized that it might be applied to other descent control devices sharing the rappel rack principal of operation. This family of devices comes in essentially two configurations; commonly known as open and closed frame racks (the latter also known as "U" frame racks). For our initial tests we used closed frame racks as that was what was available. An open frame rack may not be suitable for this technique in that it may become permanently deformed in catching the loads described here. Further testing will need to be done to confirm this. Another consideration in using all of these devices is that they have bars that swing open to facilitate reeving. This could be a safety issue in that a bar could be inadvertently opened while using the device, rendering it unable to catch a fall. The fact that prussiks come with their own set of risks, i.e. poor knot dressing or improper mating of accessory cord to rope etc., has not deterred teams from their adoption. Does the possibility of bars opening present a greater risk? Users should be mindful of these risks and proceed with extreme care.

Fig. 3 shows a closed frame rack reeved in two methods. A, the upper graphic, shows it reeved when an end of the rope is available before it is tied to the load. Fig. B shows an alternate reeving which might be used when an end of the rope is not available, i.e. rigged in the middle of a rope.

With a rack rigged in both of the fig 3 configurations (A and B), the same drop tests used on the Nano-Rack were repeated with the following results:

[1] British Columbia Council of Technical Rescue, Anor Larson, 8/2/90

Rope Slippage in Inches

Rope Held In Belayers Hand

	DROP#1	DROP#2	DROP#3
CONFIG. A	14.50"	14.75"	16"
CONFIG. B	-------NA-----------		

Rope Not Held (Whistle Test)

	DROP#1	DROP#2	DROP#3
CONFIG. A	27"	26.25"	27.75"
CONFIG. B	-----FAIL, ROPE CUT--------		

As you can see the fig. 3a configuration (3 bars engaged) did quite well in both series of tests. After 2 drops the sheath became fuzzed and then on the third drop began to glaze. The rope was changed after three drops. Somewhat to our surprise when we switched to the fig.3b configuration (4 bars engaged) the rope was pinched off between the bars on the first drop. We noticed that much less rope slipped through the rack , about 7 inches and assume that this caused the higher forces which in turn caused the rope to fail. Only one drop was made in this configuration, further drops seemed pointless.

Another series of tests involving the fig. 3 configurations was done to determine their ease of use. Both were found to be usable with soft rope, the softer the rope the easier was operation. There was a distinct advantage in the fig. 3 a reeving in that there were less friction points making it much easier to use.

In conclusion this technique (3 bars engaged) shows promise for belaying rescue loads and further testing seems indicated. For the time being this technique should be thought of as experimental and used with extreme caution. Hopefully this paper will generate enough interest in this technique to stimulate further work by others. It should be noted here that the "lock up" potential is very real and a load releasing hitch should always proceed this belay.

FIG 1

BMS NANO-RACK
Belay Configuration

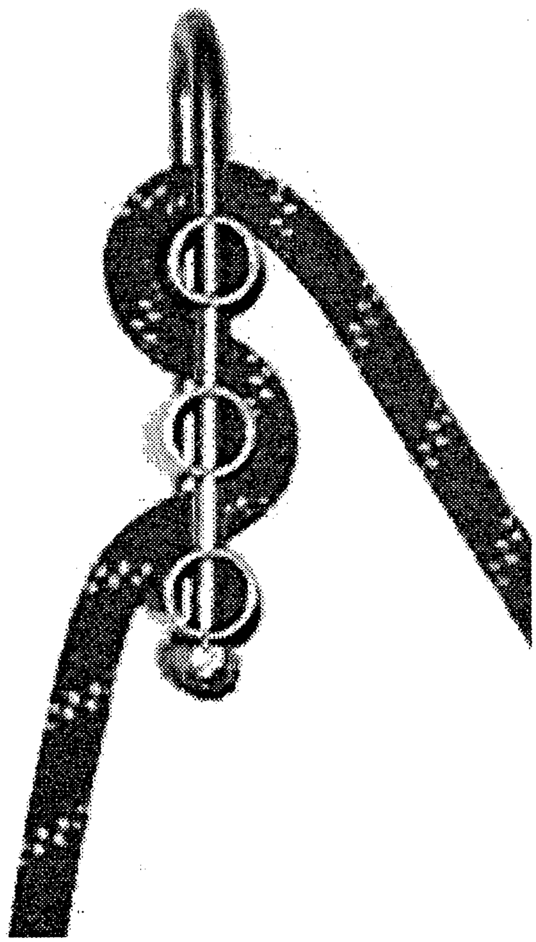
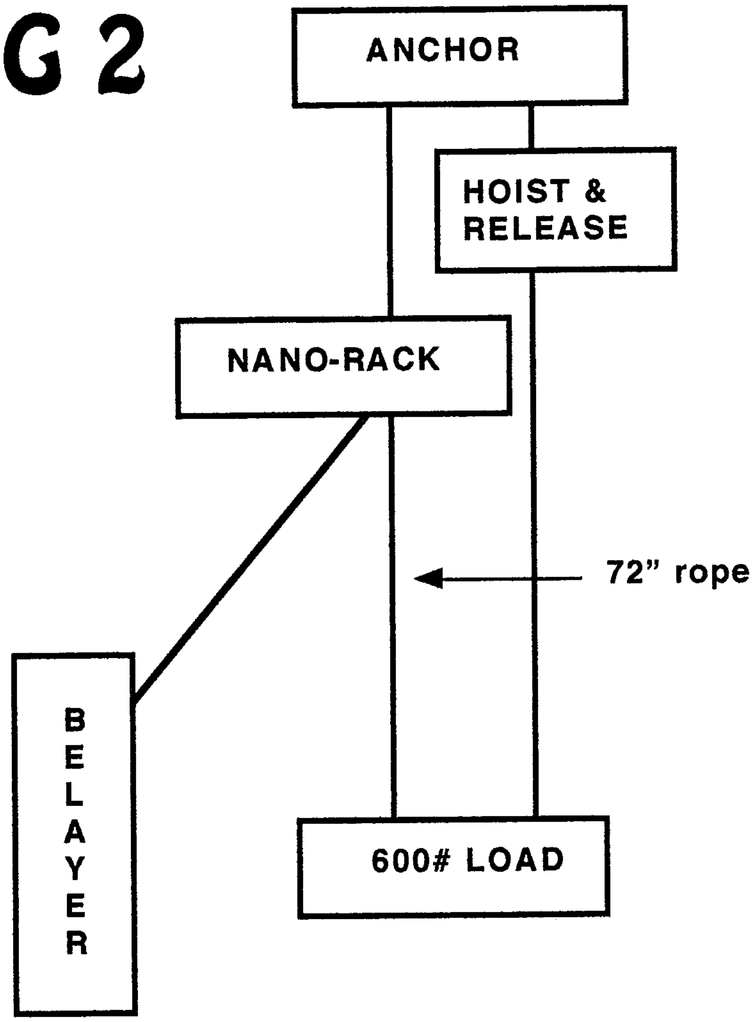


FIG 2

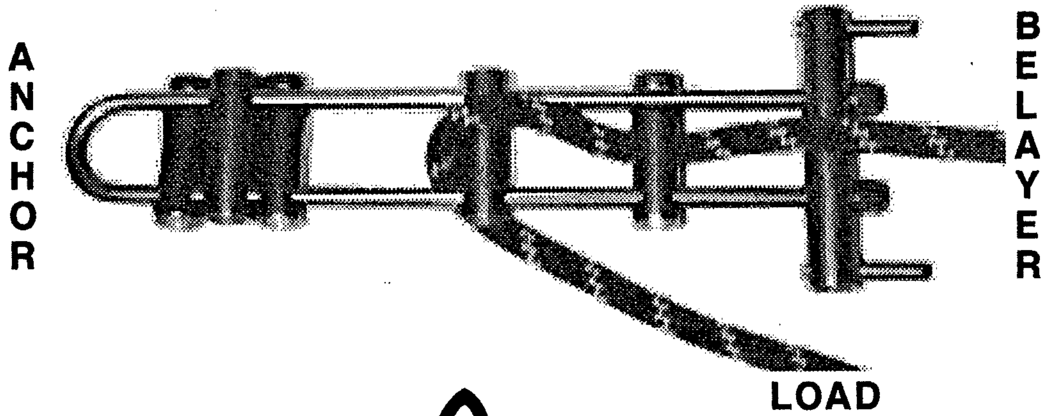


Initial test setup for determining belay competency of 3 bar Nano-Rack reeved in "belay configuration" using PMI 1/2" EZ Bend rope.

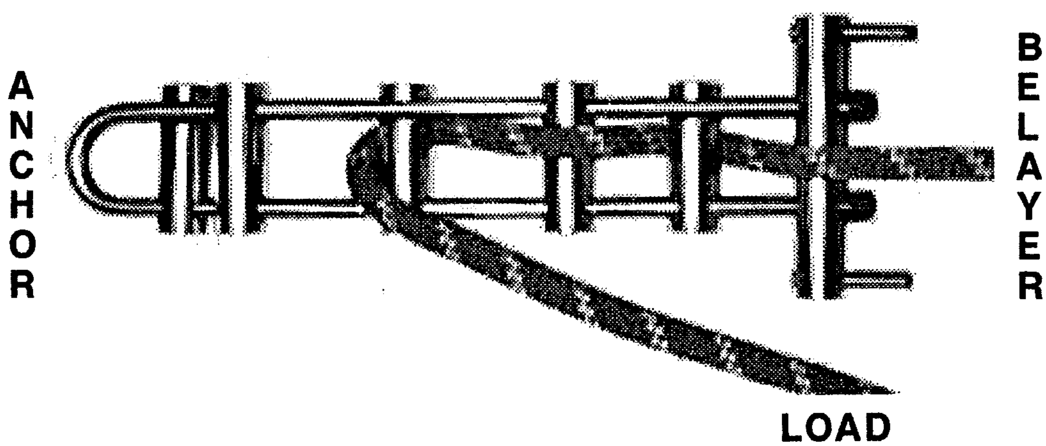
Test #1: The load was raised 36" leaving the 72" of rope connected to the load and the Nano-Rack. A belayer grasped the belay side rope with one gloved hand and the load was released. The device successfully caught the load allowing 17" of rope to travel through it with no evidence of damage to the device or the rope other than flattening of the rope which passed through the device.

Test #2: Same as above except no belayer grasping the rope (hanging free). This time 28" of rope traveled through the device with no sign of deterioration to device or rope.

FIG 3



A



B